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ABSTRACT

The purpose of this research is to examine the distributive implications of income aggregation within the household, as well as to identify the factors behind the decrease in inequality, which took place in Spain during the eighties.

Given the parallelism between the dynamic analysis of income mobility and the composition of household income as the aggregation of its members income, we utilize the mobility indices proposed by Chakravarty, Dutta y Weymark (1985), to analyze the contribution of the income of different household members to overall inequality.

The results obtain for Spain show a neutral effect of female income and an equalizing impact of the income of young and elderly individuals; due mainly to permutations caused by their incomes on households relative positions. In spite of the important growth in female labor force participation that took place in the eighties, we find that the distributive effect of female income remains stable over the decade. The contribution of the rest of household members remains also stable.

Key words: Income distribution, female labor force participation, and mobility, Spain
JEL: D31, J16

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1.- Introduction

The analysis of personal income distribution in the Spanish case shows an increase in the dispersion during the eighties. For the same period, and following a trend opposite to most OECD countries, Spain experienced an unambiguous decrease in the inequality of household income.

Recent years have witnessed upward trends in the labor market participation of women, specially married women, and in the share of women's earnings on family income. This fact together with the demographic transformations, changes in the labor market, and policy changes that had taken place in the last decades had a potential effect on family income inequality.

However, as pointed out by Gottschalk and Smeeding (1997) the connection between individuals earnings and household income distribution raises a set of analytical and measurement issues that render difficult to identify the contribution of different income sources to household inequality and its variations across time.

In the absence of a behavioral model and complete agreement in the literature about the best way to measure how a source contributes to inequality, the traditional approach to the problem has been the use of inequality indices decomposable by factor components, specially the Gini and the squared coefficient of variation[1].

Thus, Cancian and Reed (1998); Cancian, Dazinger and Gottschalk (1993); and Shaw (1989) decompose the squared coefficient of variation to assess the impact of wives income on US household inequality, while the analysis of Jenkins (1995) decompose United Kingdom inequality.

[1] See Lerman (1999) for a recent survey of alternative approaches.

Among the studies applying the Gini index decomposition by factor components are those of Shorrocks (1982) for the United Kingdom; and Karoly and Burtless (1995), Lerman and Yitzhaki (1985) and Danzinger for the United States (1980). The results obtained from the previous analysis are very sensible to the way of assessing the impact of different sources and therefore lead to very different conclusions without providing an unequivocal answer[2]. The studies referred to the Spanish case ((Alba and Collado (1998); Gradín and Otero (1999)), apply a similar methodology, without finding clear evidence of the distributive effect of female income.

Given the parallelism between the dynamic analysis of income mobility and the composition of household income as the aggregation of its members income, we utilize the mobility indices proposed by Chakravarty, Dutta y Weymark (1985), (CDW) and the decomposition suggested by Ruiz-Castillo (1998), to analyze the contribution to household inequality of the income of different household members.

The main contribution of this research is to analyze the distributive impact of the income of household members during the eighties in Spain. The study will not be restricted to the effect of wives earnings as most of empirical studies do, and we will differentiate the effect of gender, age and relationship with the household head. The application of CDW mobility indices as an alternative to decomposable indices, avoid some of the problems presented by the former and contributes to the debate.

2.- Methodology

According to CDW (1985), the concept of mobility is the result of comparing the welfare associated to an observed income structure with the welfare associated to an hypothetical one, that would maintain constant relative positions occupied by individuals in the reference situation.

Let us consider an income distribution Y among a set of households $N= \{1,...,h,...n\}$ according to a set of income sources $K= \{1,...,j,...k\}$, namely, $Y: K \rightarrow R^n_+ \setminus \{0\}$. Where y^h_j denotes the income of individual h coming from source j and Y_j the vector of income distribution according to source j, such that the aggregated income distribution Y_a can be defined as $Y_a=\Sigma_k Y_k$.

[2] Cancian and Reed (1998) show that the Gini decomposition by income sources lacks of significance as indicator of

We will restrict for the moment to the case of two income sources K= {1,2}, with $Y_a=Y_1+Y_2$ and $\mu(Y_1)$ and $\mu(Y_2)$ being the mean income from sources 1 and 2. Let be Y_{2b} the distribution resulting if income from source 2 (Y_2) would be distributed such that every household received the same income share that in the reference distribution (k=1):

$$Y_{2b} = (y^1{}_{2b},...,y^h{}_{2b}) = \left\{ y^1{}_1 \frac{\mu(y_2)}{\mu(y_2)},...,y_1{}^h \frac{\mu(y_2)}{\mu(y_2)} \right\}. \quad (1)$$

Let be $Y_b = Y_1+ Y_{2b}$ the "hypothetical aggregated income distribution", in the absence of mobility with respect to the reference distribution Y_1. Thus, by definition $\mu(Y_1)= \mu(Y_b)$ and $I(Y_1)= I(Y_b)$, being I(Y) any relative inequality index.

Let us define W(Y) as the Social Welfare associated to income distribution Y with

W: R2 → R1, and W(Y) continuous and increasing along equality rays from the origin. CDW suggest the following type of mobility indices:

$$M_{CDW}(Y) = \left\{ \frac{W(y_a) - W(y_b)}{W(y_b)} \right\}. \quad (2)$$

Under additional restrictions (see Dutta and Esteban (1992)), Social Welfare can be expressed as a multiplicative trade off between efficiency and equality by means of two statistics of the income distribution: the mean and an index of relative inequality, that is:

$$W(Y) = \mu(Y)(1 - I(Y)). \quad (3)$$

But which Social Welfare Functions (SWF) within these classes should we use in applied work? The following property leads us to an appropriate selection. Suppose that we have two islands where income is equally distribute but whose means are different. If they now form a single

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the contribution of income sources to overall inequality.

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 we are interested in expressing social welfare for the population as the sum of two terms: a weighted average of welfare within the groups, minus a term which penalizes the inequality between groups. In this case, we say that the SWF is additively decomposable by population subgroups.

This requirement allows to express Social Welfare as a function of the mean and any member of the generalised entropy (GE) family of inequality measures. Furthermore, if seems reasonable to impose that the weight assigned to the welfare of every population subgroup equals its demographic share[3]. This further condition leads us to the use of the inequality index proposed originally by Theil and defined as:

$$I_1 = \frac{1}{H}\sum\nolimits_h \left\{\left(\frac{y^h}{\mu(y)}\right)\log\left(\frac{y^h}{\mu(y)}\right)\right\}. \tag{4}$$

Thus, equation (3) can be written as $W(Y) = \mu(Y)(1 - I_1(Y))$. By definition $\mu(Y_1) = \mu(Y_b)$ and $I_1(Y_1) = I_1(Y_b)$, so equation 2 can be expressed as:

$$M_{CDW}(Y) = \left\{\frac{I_1(Y_1) - I_1(Y_a)}{1 - I_1(Y_1)}\right\} * 100. \tag{5}$$

Ruiz-Castillo (1998) proposes the decomposition of $M_{CDW}(Y)$ in two components: *Structural Mobility* (SM) and *Exchange Mobility* (EM). This decomposition requires distinguishing two types of rank reversals. Those produced between the reference and the second distribution or *permutations,* and rank reversals produced between the reference and the aggregated *distribution*

[3] According to this formulation any index of the GE class allows to express social welfare as the weighted welfare within the groups minus the penalty associated to between-group inequality. The only differences are the weights assigned to every group welfare. For instance, while the Theil index weights are the demographic shares, the mean logarithmic deviation weights subgroups according to their income share. See Ruiz-Castillo 1995b.

that will be called *rerankings.* In the presence of permutations, the order of vectors Y_1 and Y_2 will differ. Let be Y_{1*} the vector of income distribution according to source 1 such that $Y_{1*} = \{ y^1_1, y^2_1,...,y^n_1\}$ with $y^1_1 < y^2_1,...,<y^n_1$ and Y_{2*} income distribution from source 2 arrange also in increasing order. Then we define Y_c as $Y_c = Y_{1*} + Y_{2*}$. Structural and exchange mobility are defined by the following equations:

$$SM(Y) = \left\{ \frac{W(Y_c) - W(Y_b)}{W(Y_b)} \right\} * 100 = \left\{ \frac{I(Y_1) - I(Y_c)}{1 - I(Y_1)} \right\} * 100, \tag{6}$$

$$EM(Y) = \left\{ \frac{W(Y_a) - W(Y_c)}{W(Y_b)} \right\} * 100 = \left\{ \frac{I(Y_c) - I(Y_a)}{1 - I(Y_1)} \right\} * 100, \tag{7}$$

with:

$$M_{CDW}(Y) = SM(Y) + EM(Y). \tag{8}$$

Thus, *Structural Mobility* captures the impact due to differences in inequality between the two income sources, while *Exchange Mobility* reflects the welfare effect of permutations between the reference distribution Y_1 and distribution Y_2. Ruiz-Castillo (1998c) shows that, in the presence of permutations, Exchange mobility is always socially desirable, *i.e*. EM>0. On the other hand, the structural component of mobility will be positive if and only if the reference distribution is more unequally distributed than the reference one.

As far as the decomposition of inequality by income sources is concerned the mobility approach offers some advantages. It allows to obtain conclusions in welfare terms exclusively through inequality comparisons. Furthermore, the decomposition in the structural and exchange terms gives insight of the reason behind the changes. However, it presents some important shortcomings. First of all, its original formulation by CDW is restricted to the two period's case, and the results are not independent from the reference distribution. In a dynamic framework it could be somehow natural to see first period distribution as the reference. The choice is not that obvious in the context of successive aggregation of household members' income.

Traditionally men's income has been considered the reference distribution with respect to which the contribution to inequality of the rest of family members has been evaluated it. The empirical exercise developed in this paper will take as reference overall household income minus the source whose welfare impact is being assessed. Thus, for example, the contribution of women to welfare will be given by the difference between household income inequality without and with women's earnings. If inequality is higher for the distribution that does not include women's earnings, then we can say that women's earnings have an equalizing effect, and therefore a positive impact on household welfare. This positive effect could be due either to the fact that women's earnings are more equally distributed that the rest of household income, and therefore the structural component of mobility would be positive, or to the permutations induced by that kind of income that would reduce overall inequality.

It is obvious from equation 5 that the contributions defined above have a marginal interpretation in terms of inequality (the difference between overall inequality and inequality if we drop the income source which effect if being assess). Nevertheless, these contributions do not add up to the amount of total welfare that needs to be explained which constitutes another drawback of this approach[4].

3.- Data and descriptive analysis

Our results are obtained using microdata on household budgets collected by the Spanish Statistics Institute (EPF) for the years 1980 and 1990 that offer information on income received by individuals[5].

[4] Chantreuil and Trannoy (1999) propose applications of concepts of cooperative game to the decomposition of 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 inequality. However, an important drawback of the Shapley inequality decomposition is that the contribution of any factor depends on how many types of income are distinguished. See Trannoy and Sastre (2000) for an empirical application.

[5] Up to four members by household.

Household income is the sum of resources received by household members. It will be defined in annual terms and net of social security contributions and income taxes. It does not include non-cash income components such as imputed rents or in-kind salaries. Capital income has also been exclude due to imputation and reliability problems.

We have equalized household income to take account of family size. Although different scales produce slightly different results the main findings are very similar for all scales considered. Following Buhmann *et al.* (1988) household h equivalent income y^h_e has been defined as:

$$y^h_e = \frac{y^h}{s^\theta_h}, \tag{9}$$

where s_h and y^h are respectively the number of individuals and the income of household h. The parameter θ is the equivalence elasticity. Calculations presented use $\theta=0.5$[6].

In order to assess their contribution to household welfare individuals older than 15 years have been classified in three main groups. (i) *Non-dependent men,* group formed by those men who are household heads. (ii) *Non-dependent women,* that includes women that appear in the survey as household heads or spouses. (iii) *Dependent members of the household*: women and men under 30 years old (*young*) or over 30 years (*other adults*) who are neither household heads nor spouses.

Table 1 presents the percentage of individuals in every group and the relative weight of their income on overall family monetary resources.

Table 1 around here

Several important stylized facts stand from the data presented above. During the eighties women's income have become an increasingly large proportion of family resources due mainly to the growth in the participation of non-dependent women in the labor force. This increase was

[6] Results for other values of parameter θ do not change the main results obtained in this paper. They are available from the authors under request.

accompanied by an increment in the relative share of dependent's income and the consequent decrease in the weight of male income within the household.

The distributive implications of these facts will depend of multiple factors, among others the correlation in income between household members, the structure of income sources by deciles or the evolution of different household members' income. Considering only couples, the following graph shows the percentage of wives that receive income classified by their husband's income deciles and the trend in the eighties.

Figure 1 around here

The graph presents a profile in **U** with the highest values in the extreme deciles. In 1980 around 34 percent of women whose husbands' income were in the bottom decile received earnings or transfers income. In contrast, only 18 percent of the wives with husbands in the highest decile obtained income. Over the ten-year period there have been substantial increases in the percentage of wives with income regardless of their husbands place in the distribution. However the largest increased occurred among women with husbands in the highest deciles. Thus, the signs of a potential equalizing effect of female income seem to deteriorate along the decade.

This first approximation to the distributive effect of married women income will be completed in the next section. The application of the methodology introduced above will allow us to assess the contribution of different family members to welfare.

4.- Empirical application

4.1 – Female income contribution to household welfare

Most empirical research in this field restricts to the study of working married women contribution to household inequality through the decomposition of inequality indices by factor components. For the Spanish case, Alba and Collado (1998) conclude that women labor force participation had a very slight contribution to the eighties inequality reduction. The study of Gradín

and Otero (1999) does not provide a definitive answer. Their results depend on the reference distribution.

In this subsection we will analyze not only wives' income distributive effect, but also the contribution of the rest of women. They represent a non negligible percentage of income earners (around 12 percent) and around 6 percent of household income.

In assessing the effect of female income distribution (Y_2), the reference distribution will be overall household income minus women's income (Y_1). Mobility decomposition requires evaluating the inequality[7] of distribution Y_2, which poses an operational problem due to the different sizes of both distributions. To try to isolate this difficulty the analysis has been realized for different types of households. The first four lines of Table 2 summarize the distributive impact of wives income for the 1990 survey. The rest of the table presents results for all women.

Table 2 around here

The distributional impact of married women labor force participation is slightly equalizing. This effect is lower than the contribution of married women whose income comes mainly from public transfers (typically women in elderly couples).

What are the reasons behind these effects? An explanation of this positive impact on household welfare can be found in mobility decomposition. Wives' income induces changes in household relative positions (permutations) that reduce overall income inequality. The negative sign of structural mobility reduces the former positive effect on welfare, and it is a consequence of the relatively high dispersion of women's income.

Dependent women increase the welfare contribution of female income. The permutations produced by this source compensate its elevated inequality and explain the opposite signs of exchange and structural mobility.

[7] Inequality is assesed according to the Theil index. This measure present attractive features in terms of welfare decomposibility. However, it does not allow to deal with the presence of values of zero income. The use of measures such as the coefficient of variation would avoid this problem and will be applied in further work.

4.2 – Men's income contribution to household welfare

Household head's income (typically men's income) is usually considered as the reference distribution with respect to which the distributive impact of the rest of sources is assessed. However the framework adopted in this paper allow estimating its contribution in a similar way to the rest of household members.

In order to interpret the results it is necessary to take into account that male income constitute around two thirds of households resources. Therefore, the reference distribution (the one that excludes men's income) present an extremely high dispersion. As men's income is more equally distributed than the rest of household revenues the contribution of the income of husbands is highly equalizing. The effect is even greater when including all men income as can be seen in three last lines of Table 3.

Table 3 around here

4.3 – Dependent' income contribution to household welfare

Dependent' income has a positive contribution to household welfare. This contribution is especially intense when restricting to households where dependent members receive income. The origin of this equalizing effect can be found in the changes induced by this income source in household relative positions that reduce overall inequality.

Table 4 around here

In this subsection we will examine the impact of young and *other adults* income by gender. Table 5 shows the results.

For the Spanish 1990 survey the equalizing effect of young adults income oscillates between 2 and 7 percent and it is slightly lower than the effect of all dependent members of the household. As expected, the contribution is greater when our sample restricts to households with young adults receiving income. The main reasons behind this positive contribution to the reduction

of household inequality are again the permutations induced by this source. Thus, exchange mobility compensates the negative sign of the structural component of mobility, due to the fact that young adults' income is more unequally distributed than the rest of family income. Regarding to differences by gender, young men incomes have a higher equalizing impact than young women do. In both cases this is due to the positive effect of permutations that compensate the negative sign of structural mobility.

Estimations obtained for *other adults* (see also Table 5) are not very different from the distributive impact of the income of young members of the household. The contribution is especially intense for men and when restricting to families with other adults receiving income. Again, permutations are the main reason behind this equalizing effect. In addition, the relatively low dispersion of this source is behind the small values of Structural mobility than in some cases (positive values) increase the equalizing effect of the source.

Table 5 around here

6.- Conclusions

Our results show a neutral effect of female income on household inequality and an equalizing effect of the income of young and elderly members of the household; due mainly to permutations caused by their incomes on household's relative positions.

The rigorous analysis of the trend in the distributive contribution of the income of household members would require the use of panel data. Although this information is not available for the Spanish survey, cross section data allow us to compare the estimations obtained for the 1980 and 1990 surveys[8]. In spite of the important growth in female labor force participation that took place in the eighties, we find that the distributive effect of female income remains stable over the decade. The contribution of the rest of household members, whose relative importance on household income grew on the decade, remains also stable. Therefore, our results suggest that changes in the income distributions of women and other members of the households are not the main responsible for the reduction in economic inequality that took place in Spain in the eighties.

[8] Estimations for the EPF 1980 are available under request.

Table 1. Summary statistics

	Individuals		Income Receivers		Household income share	
	80/81	90/91	80/81	90/91	80/81	90/91
1)Non dependent men	**33,2**	**31,7**	**55,9**	**46,1**	**71,6**	**64,0**
2)Non dependent women	**35,7**	**35,2**	**19,3**	**25,1**	**16,3**	**21,0**
3)Young members of hh.	**21,5**	**24,5**	**14,4**	**18,1**	**7,1**	**9,0**
Young men	11,8	13,2	8,7	10,7	4,5	5,7
Young women	9,7	11,3	5,8	7,4	2,6	3,3
4) Other adults	**9,7**	**8,6**	**10,4**	**10,7**	**5,0**	**6,0**
Other adult (men)	3,4	3,4	4,5	4,5	2,4	2,8
Other adult (women)	6,3	5,2	5,9	6,2	2,6	3,2
All men	**48,3**	**48,2**	**69,1**	**61,3**	**78,5**	**72,5**
All women	**51,7**	**51,8**	**30,9**	**38,7**	**21,5**	**27,5**
TOTAL	100,0	100,0	100,0	100,0	100,0	100,0

Figure 1.

Couples. Percentage of wives perceiving income classified by husbands' income deciles EPF 80/81 and EPF 90/91

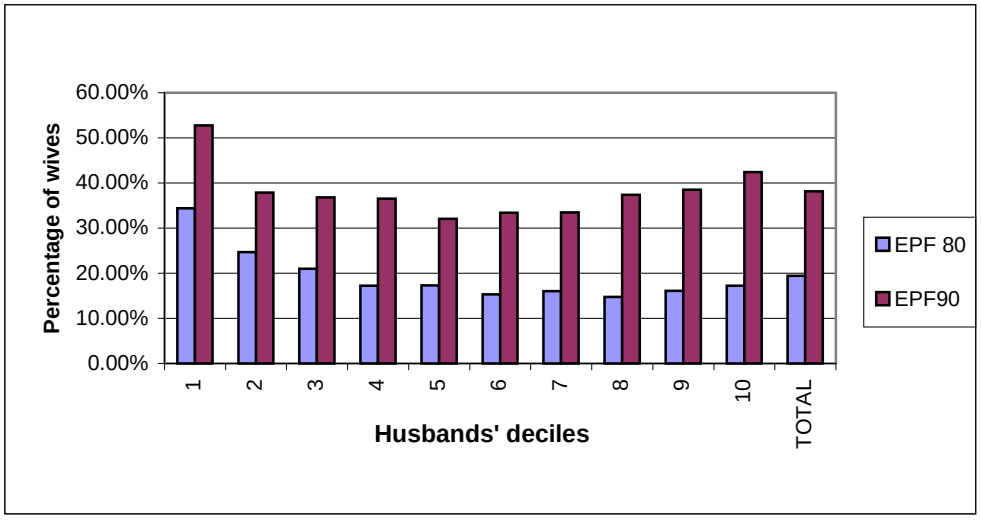

Table 2. CDW Mobility index decomposition. Female income contribution to overall household welfare.

	EFP 90/91		
	Overall Mobility	Structural Mobility	Exchange Mobility
Two earners couples	3,406	-3,596	7,002
Two earners couples (a)	2,897	-3,206	6,103
Two earners couples (b)	7,366	-0,872	8,238
All couples	0,001	-9,537	9,538
Households with women earners	5,311	-3,780	9,091
All households with women	1,699	-11,372	13,071
All households	1,933	-11,379	13,312

(a) Main women's income source: wages or self-employment income.

(b) Main women's income source: transfers

Table 3. CDW Mobility index decomposition. Male income contribution to overall household welfare.

EFP 90/91			
	Overall Mobility	Structural Mobility	Exchange Mobility
Two earners couples	12,419	3,227	9,193
All couples	15,848	4,725	11,123
Households with men earners	20,146	9,633	10,513
All Households with men	19,499	6,572	12,927
All households	17,997	-7,521	25,518

Table 4. CDW Mobility index decomposition. Contribution of dependent members of the household to welfare.

EFP 90/91			
	Overall Mobility	Structural Mobility	Exchange Mobility
Hh. with dependent members earners	8,958	-2,685	11,642
All households	4,406	-12,469	16,875
Dependent members' contribution by gender			
Households with depend. (men) earners	8,414	-1,586	10,000
Households with depend. (women) earners	5,079	-4,2773	9,3559
All households (dep. Men contribution)	2,316	-8,801	11,116
All households (dept. women contribution)	1,316	-6,909	8,2252

Table 5. CDW Mobility index decomposition. Contribution of dependent members of the household to welfare according to gender and age.

EFP 90/91			
	Overall Mobility	Structural Mobility	Exchange Mobility
All households			
Young members' contribution	**2,151**	**-9,623**	**11,774**
Young men's contribution	**1,205**	**-6,793**	**7,998**
Young women's contribution	**0,492**	**-4,529**	**5,021**
Other adults' contribution	**1,951**	**-6,526**	**8,477**
Other adults' (men) contribution	**1,003**	**-3,860**	**4,863**
Other adults' (women) contribution	**0,782**	**-3,878**	**4,660**
Hh. with dependent members earners			
Young members' contribution	**6,876**	**-4,255**	**11,131**
Young men's contribution	**6,147**	**-3,081**	**9,228**
Young women's contribution	**3,621**	**-5,350**	**8,970**
Other adults' contribution	**9,131**	**-0,861**	**9,991**
Other adults' (men) contribution	**11,328**	**1,727**	**9,600**
Other adults' (women) contribution	**4,833**	**-1,095**	**5,928**

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