EQUIVALENCE SCALES IN TAX AND TRANSFER POLICIES

LUIS AYALA
Universidad de Castilla-La Mancha
ROSA MARTÍNEZ
JESÚS RUIZ-HUERTA
Universidad Rey Juan Carlos

Income distribution and poverty measurement require weighting the impact of both economies of scale and the different needs of each household member. Different models of equivalence scales have been defined. Equivalence scales are also present in many tax and benefit programs. This paper reviews the equivalence scales implicit in personal income tax in Spain. We identify the adjustments contained in the new income tax and highlight the differences with those used in other social programs and the scales normally used to study poverty. An empirical analysis of poverty rates for different kinds of households is carried out using both these implicit scales as well as conventional equivalence scales. The results illustrate that economies of scale are taken into account to a lesser extent in income tax legislation than in income distribution analysis.

Keywords: Equivalence scales, personal income tax, poverty.

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1. Introduction

The theory of personal income taxation and analyses of income distribution face some similar basic problems. Choosing the tax-paying unit and assessing that unit's ability to pay (as a basis for determining the level of taxation) have much in common with the choice of the unit of analysis and the quantification of "adjusted" income levels in poverty and inequality studies. Equivalence scales are relevant in both fields. Concerning income tax, these scales are frequently implicit in the way

tax laws treat taxpayers having different family circumstances. Equivalence scales are also present, either implicitly or explicitly, in many transfer programs such as pensions, minimum guaranteed incomes or family and child benefit schemes.

The Personal and Family Minimum (hereinafter PFM), approved in the Spanish income tax reform of 1998, explicitly aims to graduate individuals' income tax liabilities. Resources considered to be essential to cover the basic needs of individuals or family units are exempted from taxation. In this way, the new PFM simultaneously includes an evaluation of the income required to cover basic needs (a concept closely related to the notion of the poverty thresholds used in income distribution studies) and an assessment of the adjustments needed when personal and family circumstances of the taxpayer differ in order to define different amounts to be exempted from taxation.

The equivalence scales implicit in the PFM are analysed in this study. The assessment of the family circumstances in the PFM is compared with assessments applied in other fields. The concept of equivalence scales and the different procedures that can be used to determine them are briefly reviewed in Section 2. We then go on to study the adjustments contained in the PFM and highlight the differences that exist with those used in other social benefit programs, as well as the equivalence scales normally used in poverty studies (Section 3). Lastly, an empirical analysis of the demographic structure of poverty when the PFM scales are used (instead of thresholds adjusted with conventional equivalence scales) is made in Section 4. The article ends with a brief section of conclusions.

2. Justification and types of equivalence scales

An important presupposition when analysing inequality and poverty is that income is a good indicator for measuring the economic wellbeing of similar individuals having the same needs and paying the same prices. In fact, however, researchers and legislators on fiscal matters have to deal with units that vary considerably concerning their characteristics and needs (number of household members, geographic location, disabilities, etc.). This situation gives rise to the need of using adjustments to convert non-comparable incomes obtained by different households into comparable incomes that can constitute an adequate

indicator of the economic well-being of the individuals forming part of the households[1].

In order to establish comparisons of the situations of individual well-being it is therefore necessary to analyse the relationship between the needs and resources available to different households. Generally speaking, putting together equivalence scales requires carrying out two kinds of main adjustments. Firstly, an adjustment based on *household size* is necessary to take into account the *economies of scale* in consumption as household size increases. Secondly, it is generally recognized that the *needs* of different households vary as a function *of the ages of their members or other circumstances* considered to be relevant.

In formal terms, the construction of equivalence scales is based on the supposition that the economic well-being reached by the members of the $i - th$ household depends on the income level of household Y_i, its size n_i and the remaining socio-demographic characteristics considered to be relevant (c_i):

$$U_i = f\left(Y_i, n_i, c_i\right)$$

If we take a household with characteristics $\{n_0, c_0\}$ that reaches a determined level of economic well-being U_0 with an income level Y_0 as a reference, then the equivalence scale of a household h with characteristics $\{n_h, c_h\}$ will be given by the multiplier e_h, which determines the income Y_h needed for that household to reach the same level of economic well-being as the one taken as a base:

$$e_h = \frac{Y_h\left(n_h, u_0, c_h\right)}{Y_0\left(n_0, u_0, c_0\right)}$$

The above expression could be interpreted as a "cost index of household characteristics"having a similar structure as price indices. It provides a *deflator* applicable to the household income of different kinds of households to obtain incomes that can be compared with

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[1] Although the use of equivalence scales is a generalized procedure when analysing income distribution, the sensitivity of the results and the options adopted have lead to some authors searching for other methods that do not require this kind of adjustments. Atkinson and Bourguignon (1982 and 1987) defined different dominance criteria to compare heterogeneous households when these could be sorted by their different levels of needs. More recently, Ebert and Moyes (2000) proposed Lorenz-type quasi orderings under different criteria in order to reduce value judgments so that comparisons could be consistent.

the one obtained by the reference household (generally a single-person household) in terms of economic well-being.

A question that has not been resolved in the literature on equivalence scales is whether the relation described above is independent of income or the utility level at which the comparison is made[2]. If we assume that this independence exists, the "equivalent"income Y_i^e of any household i can be calculated by dividing the total income of household Y_i by the relevant equivalence scale e_i, which depends only on the size and demographic characteristics of the household:

$$Y_i^e (Y_i, n_i, c_i) = \frac{Y_i}{e_i (n_i, c_i)}$$

Most of the scales used for analysing income distribution do not vary with income, thus implying identical proportional adjustments for different levels of income. It should be highlighted that a constant equivalence scale necessarily implies that additional income levels to cover the costs of a child, for example, are greater in absolute terms when the household's income level increases. This assumption has obvious theoretical justifications when analysing relative inequality or poverty. However, it could be less appropriate when defining equivalence scales for social policy or tax purposes[3]. This is particularly true concerning personal income tax, because the introduction of family allowances that increase with the level of income could be difficult to justify in terms of vertical equity.

The range of equivalence scales employed in studies on income distribution is very wide[4]. They can be divided into three different groups:

1. A first group includes the scales estimated from household consumption data, usually obtained from large family budget surveys. The best known consumption scales are based in the Engel Method, which places a comparable level of well-being for households that allocate the same percentage of their spending on food[5]. Other methods used to estimate the scales, such as Rothbarth's and its variants developed

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[2] See Lewbel (1989) for an analysis of the assumptions behind equivalence scales independent of the base level of income or utility. See also Conniffe (1992).

[3] See Ebert and Lambert (2002) for an analysis on the implications for progression of different types of income dependent equivalence scales in income tax.

[4] See Cowell and Mercader (1999) for an extensive survey of fundamental difficulties with the different approaches for the construction of equivalence scales.

[5] See Deaton (1998) for a formal discussion of the costs related to the different household members.

in recent years, follow a similar philosophy, but use other kinds of consumption (generally some kind of spending on "adult goods") to establish the comparisons[6]. Econometric scales can be therefore derived from micro-data on income, consumption and socio-demographic characteristics of the households included in family budget surveys[7].

2. As an alternative to the previous method, some researchers have proposed deducing equivalence scales from consumer opinions on wide-ranging categories such as the standard of living. The procedure is based on using some of the subjective questions included in household income or expenditure surveys which ask interviewees to answer questions on their standard of living or well-being. As Cowell and Mercader (1999) have observed, "qualitative questions directly reveal the population's views on well-being". As is well-known, the influence of the researcher's value judgements regarding the way qualitative questions are formulated and/or the plausible relationship between responses and effective budget restrictions are some of the problems posed by subjective scales.

3. Most of the scales used when studying income distribution, particularly in international comparisons of inequality or poverty, do not have an explicitly specified empirical base. Perhaps the best known scale within this group is the one designed by the OECD and its variants. This scale is based on a system of weightings that assigns a unitary value to the first adult and weightings of lower value to the remaining household members:

$$e_h = 1 + \beta \left(a_h - 1\right) + \gamma m_h$$

where the variable ah represents the number of adults in the household h, and m_h, the number of children. The original OECD scale assigns a value of 0.7 to adults other than the head of the household and a value of 0.5 to children. The correction for economies of scale is therefore reduced due to the lower weighting received by the second adult.

A different formulation that has been widely used is the parametric formulation (Buhmann *et al.,* 1988). It calculates the number of equiva-

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[6] See Hourriez and Olier (1997), and Deaton, Ruiz-Castillo and Thomas (1989).

[7] The main criticism that has been made on obtaining scales by this procedure refers to the fact that it is not possible to calculate equivalence scales without including some previous presupposition. Demand patterns represent conditional preferences (Pollack and Walles, 1979 and Van Praag, 1994).

lent adults by elevating household size to a parameter ranging between 0 and 1:

$$e_h = n_h^{\phi}, \qquad 0 \leq \phi \leq 1.$$

The parameter ϕ (equivalence elasticity) can be interpreted as the elasticity of non-adjusted income with regard to household size. As many different studies have shown, many more complex scales can come close to a parametric form as expressed above with a small margin of error (Banks and Johnson, 1994, and Jenkins and Cowell, 1994). The main disadvantage of this formulation is that the scale only takes into account household size. As some studies have suggested (particularly the committee of experts in charge of reviewing the U.S.'s official method for measuring poverty), the disadvantages arising from not considering the differences between adults and minors can be avoided by proposing a more general formula for the parametric equivalence scale[8]:

$$e_h = (a_h + \gamma m_h)^{\phi}, \qquad 0 \leq \gamma \leq 1 \text{ y } 0 \leq \phi \leq 1$$

where a_h is the number of adults, and m_h the number of minors in household h. The main advantage of this formula is that it allows two different aspects to be determined: the adjustment introduced to consider the lower costs of children (through the factor γ) and a correction that assesses economies of scale (by means of parameter ϕ).

Equivalence scales used in fiscal or social policies have several specific features when compared to the methods described above. Firstly, their objectives and justifications can be quite different from those used in income distribution analyses. In public transfer programs, scales are generally aimed at determining the amount of benefit that different types of family units are entitled to. They are usually based on the requirement of ensuring a basic level of income for the population covered by the program. In income tax, family related adjustments (in the tax base, the tax rates or through family tax credits) are mainly intended to graduate the tax burden according to a tax unit's real ability to pay. In both cases, however, other objectives are also possible and these frequently contribute to shape the scales (e.g. to protect specific types of family, to foster women's participation in the labour force or even to encourage an increase in birth rate).

Secondly, equivalence scales in social or tax policy are generally *implicit* in the way benefit payments or taxes are graduated according

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[8] See Citro and Michael (1995), Cutler and Katz (1992) and Hourriez and Olier (1997).

to household characteristics. These scales need to be inferred from the relevant benefit or tax regulations. Such procedures are not always straightforward. Concerning personal income tax, a commonly used approach is to calculate the different levels of income for which tax units of *different* compositions are considered to be *equal* in terms of economic capacity. As a result, these units will bear the same tax burden. This method usually implies the need to convert tax credits or tax rate reductions to their corresponding base-equivalents for different family types. A general characteristic of the implicit scales obtained in this manner is that they vary with the level of income, usually decreasing as income rises. As was noted above, this is a feature that distinguishes these equivalence scales from most of ones used in income distribution analyses.

In democratic countries, an advantage of this kind of scales is that they are normally the result of the population's preferences revealed through the electoral process (Atkinson, 1995). These scales, however, also have some potential drawbacks. Their main disadvantage is probably the lack of any *a priori* analytical justification. Likewise, the combination of adjustment elements along with the introduction of incentives or protective measures targeted at specific population groups can lead to results that are difficult to justify from a theoretical viewpoint[9].

Although the differences in the overall aims of equivalence scales used in the different fields should be taken into account, public opinion increasingly demands a minimum degree of consistency in the design of public policies. This is especially true when comparisons are made of areas in which final objectives are similar (for instance, setting social assistance benefits at adequate levels to reach a social minimum and tax base reductions for the amounts required to cover basic needs). Also relevant in this regard is the possible lack of linkage between the scales traditionally used in income distribution analyses and those implicit in government tax and transfer programs. In following section we try to analyse these differences by comparing the adjustments of the new Spanish Income Tax with the Minimum Guaranteed Income and parametric scales.

[9] A good example would be increasing the amounts of child benefit paid out to families with many children, which would suggest recognizing the existence of negative economies of scale.

3. Equivalence scales implicit in the PFM

The Spanish Income Tax Law passed at the end of 1998 put into effect a new way of adjusting the tax burden for the different kinds of households by means of the notion of the Personal and Family Minimum (PFM). This new approach taxes discretionary income, which is defined as disposable income once all the basic necessities of a taxpayer are met. These necessities vary according to the taxpayer's characteristics (age, disability) and existing family responsibilities. Thus, the PFM simultaneously reflects the existence of a basic level of income that should not be taxed (a concept previously taken into account through a zero-rate tax base bracket) and adjustments to graduate the tax burden as a function of a tax payers' family circumstances (which leads to family tax credits in personal income tax). Additionally, the new personal income tax regulations maintain the possibility of filing joint tax returns, but eliminates the reduced tax schedules previously applicable in such cases. *Discretionary* income (income less PFM exemptions) is taxed according to a single tax schedule.

TABLE 1
Implicit scales in legislation on the Personal and Family Minimum

Personal minimum	Scale
Adult less than 65	1.00
Adult 65 and over	1.18
Adult with a disability between 33% and 65%	1.54
Adult with a disability equal to or greater than 65%	2.09
Adult without spouse, with children	1.64
Adult over 65 without spouse, with children	1.82
Disabled adult (33%-65%) without spouse, with children	2.18
Disabled adult (≥ 65%) without spouse, with children	2.73
Family minimum	Δ Scale
Per ascendant ≥ 65 years whose income does not exceed the Minimum Wage[1]	0.18
Per single descendant < 25 years whose income does not exceed 6.010,12 €	
For the first and second child	0.36
For the third and successive children	0.54
Supplement for school materials (descendants between 3 and 16)	0.05
Supplement for children below 3 years of age	0.09
Supplement for handicapped ascendant or descendant of any age whose income does not exceed 6.010,12 €[1]	
Disability between 33% and 65%	0.54
Disability equal to or greater than 65%	1.09

Note[1]: 6.068 € for 2001.

The way PFM works is as follows. There is a basic personal minimum allowance. The amount of this basic personal minimum allowance de-

pends on a series of personal characteristics. For instance, when a taxpayer has children or ascendants to support (who do not file tax returns and do not receive any income above a certain level), the minimum is increased by means of family supplements. Each taxpayer calculates his/her PFM tax exempt amount according to the sum of all the personal and family minima that correspond to the tax unit. Each taxpayer is therefore only liable to pay tax for any income above this level.

Table 1 shows the scales implicit in the personal minimum when a single adult younger than 65 years of age is taken as the point of reference. As we can see, the PFM increases from $18\,\%$ to $173\,\%$ as a function of variables like age, level of disability or being the breadwinner of a single-parent family. At the same time, the existence of family charges increases the PFM in cumulative proportions depending on the number, age and other characteristics of the household's additional members. Considering the variables that are taken into account to determine the overall reduction in the tax base, the implicit equivalence scale in the PFM can be expressed as:

$$e_h = f\left(a_h, m_h, v_h, d_h, g_h, d_h, s_h\right)$$

where a_h represents the number of adult taxpayers (one in an individual tax return and two in a joint return), m_h is the number of children, v_h the number of ascendants, g_h is the vector of ages of the tax unit members, d_h the vector containing information about the disability status of adults and children, and s_h is a variable reflecting single-parenthood.

It is important to highlight that values shown in Table 1 are the implicit scales at the level of income set by the PFM, which implies a zero tax base. Due to the fact that amounts exempted from taxation are independent of income, implicit equivalence scales tend to diminish as income rises. Nevertheless, this zero tax base level is used because we are interested in establishing comparisons with family adjustments used in other social minima or poverty lines[10].

3.1. *Implicit scales in the PFM vs. minimum income scales*

It is worthwhile asking oneself what relationship exists between the implicit assessment on family costs included in this approach with those

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[10] See Ruiz-Huerta, Martínez and Ayala (2001) for a comparison between implicit equivalence scales in the present and the previous income tax at different income levels.

of other minima foreseen in Spanish social protection legislation or in the thresholds used to measure poverty. Making a comparison with the guaranteed minimum income systems turns out to be specially useful to carry out this assessment as such benefits attempt to guarantee all families receive a minimum income that is sufficient to cover their basic needs. These systems graduate benefits according to household size and, in some cases, the age of the members of the family receiving benefit.

The decentralized nature of these schemes in Spain must be highlighted. The lack of a central government program encouraged regional governments to begin establishing their own minimum income systems in the 1990s. These regional initiatives have been handicapped by serious problems of co-ordination and financing from their inception. This has resulted in a mosaic of highly varied schemes with a striking disparity of regulations and results. The number of equivalent adults derived from taking an average of the different equivalence scales implicit in the various minimum income systems of the Spanish Autonomous Communities (Regional Governments)[11] can be defined as:

$$e_h = 1 + a_h \sum_{i=1}^{n} \frac{\delta_i}{n} + m_h \sum_{i=1}^{n} \sum_{j=1}^{p} \frac{\theta_{ij}}{nM_p}$$

where $i = 1_{....}, n$ (i = Autonomous Community), $j = 1_{....}, p$ (j = number of non-adult household members), e_h represents the household's equivalent adults, a_h the number of adults other than the head of the household, δ_i the weighting given in each Community to each adult

TABLE 2
Implicit equivalence scales in Personal and Family Minimum of regional and European minimum income programs

Kind of family unit	Personal and Family Minimum		Minimum Income Average Spain		Minimum Income Average EU	
	Scale	Δ	Scale	Δ	Scale	Δ
One adult[1]	1.00	–	1.00	–	1.00	–
Two adults[1]	2.00	1.00	1.16	0.16	1.62	0.62
Couple + 1 child[2]	2.41	0.41	1.29	0.13	1.99	0.37
Couple + 2 children[2]	2.82	0.41	1.40	0.11	2.37	0.38
Couple + 3 children[2]	3.41	0.59	1.49	0.09	2.77	0.40
Couple + 4 children[2]	4.00	0.59	1.57	0.08	n.a.	n.a.

Notes: [1] Adults < 65 years of age without disabilities; [2] Descendants aged 3-16 years.
Sources: Own research based on Table 1, European Commission (1999) and data supplied by the Spanish Autonomous Communities.

[11] The supplements allocated to each additional person vary between the extremes represented by Castilla-León and the Basque Country. The benefit is established independently of household size in the former whereas in the latter two 30 % more is allocated to a second member and 20 % more for the third and the following members. See Ayala (2000)

other than the head of the household, m_h the number of children living in each household, and θ_{ij} the weighting given to each additional child in each region up to a maximum number (M_p)[12].

Table 2 shows the average equivalence scales that are implicit in the regional and European minimum income programs for the most common family types compared with the ones implicit in the personal income tax's PFM . The latter is obtained from Table 1 taking adults of less than 65 years of age without disabilities and with descendants aged between 3 and 16. The first thing that strikes us about the comparison above is the contrast between the negligible variation of the guaranteed minimum income provided by the regions as household size increases and the increases foreseen by the Personal and Family Minimum in personal income tax. Thus, the minimum income obtained by a household composed of two adults is 16 % more than the income received by a single individual. This proportion is much lower than the 100 % implicit increase in the PFM thresholds. The cost assessment associated with children is also clearly lower. The amount of benefit a couple with four children is entitled to is only 57 % more than the benefit received by a single person, while the Minimum for a family unit of these characteristics is four times greater than for one adult.

The implicit scales in the European Union programs turn out to be higher despite the fact that they are also lower than the ones included in the PFM foreseen in personal income tax. The main difference in this case is due to the less than proportional increase in benefit when a second adult is added. This fact is coherent with the existence of economies of scale linked to household size which the adjustment scheme of the personal and family minimum allowance does not foresee[13].

3.2. *Implicit Scales in the PFM vs. scales applied in income distribution analyses*

As was mentioned before, no consensus exists on the çorrect"scales to use to measure poverty or inequality. Nevertheless, almost all the empirical scales have equivalent elasticity values that range from 0.20

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[12] Most regional programs establish additional supplements for a maximum of eight children.

[13] These differences in the assessment given to spouses can be noted in other comparisons with other minimum benefits existing in the Spanish social protection system. Thus, the increase in minimum pensions that contemplate having a dependent spouse is situated around 18 %.

to 0.80 in the parametric formula. That is why we include three scales with parameters of $\phi = 0,25, \phi = 0,50$ y $\phi = 0,75$ in the comparison. These are intended to cover quite different assumptions regarding the size of the economies of scale within households. The first of these presupposes the greatest economies of scale. It is very close to the estimated elasticity of subjective scales and is only slightly lower than the scale obtained from household consumption surveys. The second is used in much recent research on international comparisons and represents an adjustment close to the one implicit in the scales based on the determination of minimum budgets for different types of households. The third presupposes lower economies of scale than the previous two and could summarize the adjustments implicit in statistical scales put forward without any specific theoretical or empirical grounds to make comparative income distribution analyses. In addition, two other scales are included in the comparison incorporating different adjustments for adults and children. These are the OECD scale[14], which has been widely used in poverty and income studies in Spain, and the bi-parametric scale $(\gamma = 0,7, \phi = 0,7)$[15].

TABLE 3
Implicit equivalence scales in the PFM and statistical scales
applied in income distribution analyses

| Type of Household	PFM	Parametric scales				OECD
		γ=1.00			γ=0.70	
		ϕ=0.25	ϕ=0.50	ϕ=0.75	ϕ=0.70	Scale
One adult[1]	1.00	1.00	1.00	1.00	1.00	1.00
One person > 65	1.18	1.00	1.00	1.00	1.00	1.00
Two adults[1]	2.00	1.19	1.41	1.68	1.62	1.70
Two people > 65	2.36	1.19	1.41	1.68	1.62	1.70
One adult + 1 child[2]	2.05	1.19	1.41	1.68	1.45	1.50
One adult + 2 children[2]	2.45	1.32	1.73	2.28	1.85	2.00
One adult + 3 children[2]	3.05	1.41	2.00	2.83	2.21	2.50
One adult + 4 children[2]	3.64	1.50	2.24	3.34	2.55	2.70
Two adults + 1 child[2]	2.41	1.32	1.73	2.28	2.00	2.20
Two adults + 2 children[2]	2.82	1.41	2.00	2.83	2.35	2.70
Two adults + 3 children[2]	3.41	1.50	2.24	3.34	2.68	3.20
Two adults + 4 children[2]	4.00	1.57	2.45	3.83	3.00	3.70

Notes: [1] Adults < 65 years of age without disabilities; [2] Descendants aged 3-16 years.

[14] Some studies have found certain equivalence between OECD scale and that resulting from $\phi = 0,75$.

[15] The commission of experts charged with reviewing the official methods to measure poverty in the United States recommends a weighting of 0.70 for children and an equivalent elasticity value situated between 0.65 and 0.75. See Citro and Michael (1995).

Table 3 shows the values of the resulting scales for twelve possible types of family units based on the head of the household, the existence or not of a spouse and the number of children the family unit is responsible for. As can be seen, none of the scales considered implement a graduation as detailed as the Personal and Family Minimum. Amounts do not vary for adults over 65. Concerning the relative size of the adjustments, the PFM is different from the rest of the statistical scales considered by assigning the same weight to the main breadwinner and the spouse (no economies of scale). This is obviously due to the wish of not disincentivising joint tax returns.

FIGURE 1
Scale increases for different family units in the PFM
and other equivalence scales
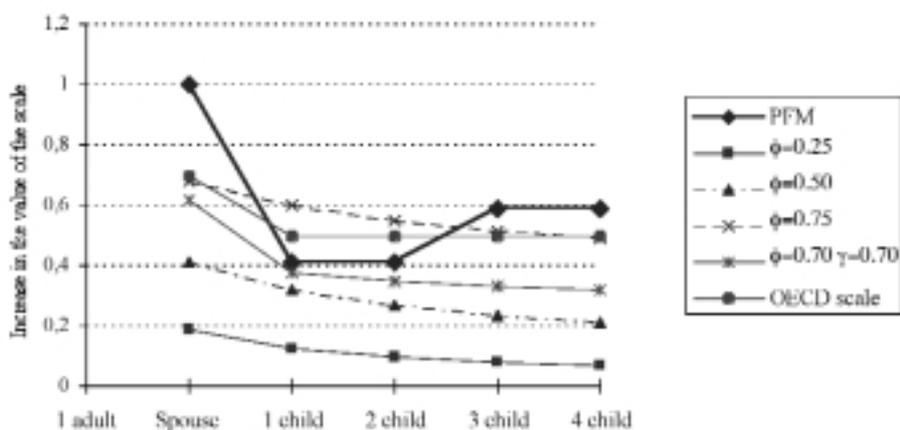
The increases in the scale arising from the family unit having children are situated slightly above the increases recommended by the commission of American experts and below the implicit scales of the OECD for the first two children. However, the amounts foreseen by the tax law for the third and successive children are more generous than in all the other scales under consideration. The fact the Minimum increases more from the third child onwards represents an "anomaly" in these implicit scales (lack of economies of scale in large families). As can be observed in the figures, all the other scales incorporate adjustments that decrease slightly as household size increases, except for the OECD scale (whose adjustment is constant from the first child onwards). The

explanation also probably resides in the existence of objectives besides merely quantifying the levels of income needed to cover basic needs. Such objectives could include the desire to provide special protection in the form of a tax relief to families with more than two children.

4. The PFM and measuring poverty

As is well known, equivalence scales tend to have an influence on the socio-demographic structure of poverty. This question will be analyzed in this section by comparing the poverty rates obtained for fifteen kinds of households when the PFM is applied with the poverty rates obtained from three different adjustments, particularly the poverty rates derived from the OECD scale, the parametric scale with f=0,5 and the double parameter scale ($k = 0, 7, \phi = 0, 7$).

In Ruiz-Huerta, Martínez and Ayala (2000) we used the 1st wave data of the European Community Household Panel (ECHP) to calculate the poverty levels that would be obtained if a threshold equivalent to the PFM was applied instead of the thresholds that are normally used in most studies[16]. Assuming an average underestimation of 23 % in reported income, we reached the conclusion that 13.6 % of the Spanish population belonged to households that obtained income levels below their respective PFM's expressed in 1993 prices. This figure is approximately 65 % of the relative poverty index obtained with a threshold of half of the average equivalent income for the same year. Given that our aim is to assess the pure effect of the equivalence scales implicit in the PFM on the structure of poverty, we have chosen relative thresholds that generate poor populations of approximately equal sizes (about 13.6 % of the total population). This can be achieved using lines set at 42 % of average equivalent income for the various equivalence scales used in the analysis.

The classification of household types has been differentiated into households having only a single tax unit and households made up of more than one such unit. The former are solely formed by individuals/couples with children or ascendants to support. In the latter, on the other hand, there are members that cannot be considered as *dependants* of the main breadwinner or his/her spouse, because they are not part of the family or because they have incomes above the

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[16]The European Community Household Panel (ECHP) is an income and living conditions survey carried out simultaneously in almost all countries of the European Union. The sample in Spain amounts to about 7,000 households.

maximum levels set by law (see Table 1). In these cases, the poverty rates according the PFM have been calculated by comparing the household's total income with the sum of PFM's of the different tax units. We therefore chose the household as the unit of analysis to obtain the poverty rates derived from both the PFM and conventional relative scales. However, it was taken into account that the overall PFM of a household depends on its structure regarding the number of tax units within the household, as the weighting of main taxpayers and dependants are not the same in the PFM.

TABLE 4
Poverty indices for different types of households

Type of household	% Population	Equivalence scales			PFM scale
		$\phi=0.5$	$\phi=\gamma=0.7$	OECD	
Only one tax unit					
Single person < 65 years	1.7	18.5	14.0	9.8	10.6
Single person ≥ 65 years	2.4	16.1	6.2	4.4	4.8
Couple without children, both < 65 years	5.9	12.0	9.9	8.1	11.0
Couple without children, both ≥ 65 years	5.9	18.1	8.7	4.7	19.6
Single adult with 1 or 2 children	1.3	28.3	26.9	22.2	25.6
Single adult with 3 or more children	0.4	44.7	46.8	49.8	40.8
Couple with 1 child	12.5	15.0	14.3	12.8	11.7
Couple with 2 children	19.9	17.2	15.7	15.8	12.7
Couple with 3 children	7.2	19.8	20.4	22.0	16.4
Couple with 4 or more children	2.1	32.3	34.5	37.8	33.5
Households with an ascendant > 65 years[1]	1.8	12.9	12.8	16.5	6.9
More than one tax unit					
Adult with children[2]	4.2	13.5	13.6	10.6	14.1
Couple with children[2]	18.4	8.4	9.3	10.5	11.2
Adult/couple with children and other members[3]	13.0	8.0	10.2	13.8	15.5
Adult/couple without children and other members[3]	3.3	7.2	13.2	6.3	9.3
TOTAL	100.0	14.0	13.2	13.3	13.6

Notes: [1] Households composed of adults or couples, with or without children, and one or more ascendants entitled to deduction. [2] At least one child not entitled to a deduction in the PFM of the first tax unit. [3] A child and/or other member not entitled to a deduction in the PFM of the first tax unit.
Source: Own research with ECHP data, 1994.

Table 4 shows the specific poverty rates that result for each kind of household in the four cases under consideration. Table 5 shows the same information in terms of the relative incidence of poverty (RI), defined as the ratio between the specific poverty index and the general index for the population as a whole. This second indicator can be interpreted in terms of the relative risk of being poor for each kind of

household in relation to the risk suffered by an average individual. The groups with $RI > 1$ face an above average risk of being poor, while the opposite is true for the ones with an $RI < 1$.

TABLE 5
Relative incidence of poverty for different types of households

Type of household	Equivalence scales			PFM scale
	$\phi=0.5$	$\phi=\gamma=0.7$	OECD	
Only one tax unit				
Single person < 65 years	1.31	1.06	0.74	0.78
Single person ≥ 65 years	1.15	0.47	0.33	0.35
Couple without children, both < 65 years	0.85	0.75	0.61	0.80
Couple without children, both ≥ 65 years	1.28	0.66	0.36	1.44
Single adult with 1 or 2 children	2.01	2.04	1.66	1.88
Single adult with 3 or more children	3.18	3.54	3.73	3.00
Couple with 1 child	1.07	1.08	0.96	0.86
Couple with 2 children	1.22	1.19	1.18	0.93
Couple with 3 children	1.41	1.55	1.65	1.20
Couple with 4 or more children	2.30	2.61	2.83	2.46
Households with an ascendant > 65 years[1]	0.92	0.97	1.24	0.51
More than one tax unit				
Adult with children[2]	0.96	1.03	0.80	1.04
Couple with children[2]	0.60	0.70	0.79	0.83
Adult/couple with children and other members[3]	0.57	0.77	1.03	1.14
Adult/couple without children and other members[3]	0.51	0.53	0.47	0.68
TOTAL	1.00	1.00	1.00	1.00

Notes: [1] Households composed of adults or couples, with or without children, and one or more ascendants entitled to deduction. [2] At least one child not entitled to a deduction in the PFM of the first tax unit. [3] A child and/or other member not entitled to a deduction in the PFM of the first tax unit.
Source: Own research with ECHP data, 1994.

The structure of poverty varies considerably depending on the adjustment used. Focusing our attention on the three relative scales, it is obvious that the parameter $\phi = 0{,}5$ significantly increases the risk of poverty attributable to single-person households and, to a lesser extent, households with two members. On the other hand, it attributes lower levels of poverty than the other scales for large households such as couples with 3 or more children or households with an adult or couple with children and other members. This is due to the presupposition of greater economies of scale as household size increases, which in turn leads to a better relative position for larger households within the income distribution. The other two adjustments suppose a greater concentration of poverty among large households, especially so the

OECD scale. As was mentioned previously, this scale hardly takes into account the economies of scale associated with the increase in household size.

Despite the differences in the intensity of poverty that result from the application of one or other scale, all three coincide in pointing out single-parent households and couples with four or more children as the main groups at risk of suffering poverty. Adults with three or more children have rates that are more than three times the national rates. It is interesting to note that people over the age of 65 living alone have poverty rates that are always lower than single adults aged below 65. Childless couples also show a lower incidence of poverty than the average, except for those made up of older people with the 0,5 parameter scale.

Applying the adjustments implicit in the notion of PFM does not notably change the delimitation of the groups at risk. Single-parent and large families still constitute the types of households suffering the highest poverty rates. However, the relative incidence of poverty in these groups is generally somewhat below the results obtained when other scales are used. The main differences reside in the way the PFM handles households with ascendants. These differences give rise to a poverty rate index that is notably lower for this group. A second peculiarity can be found in the relative position of childless couples who normally obtain higher levels of poverty (especially older couples) with PFM scales. The reason behind this result is the equal weighting given to both spouses in the PFM, an aspect that none of the other scales shares. Lastly, applying the PFM gives rise to higher poverty rates for the four household types constituted by various tax units. This is due to the fact that the tax law does not take into account any economies of scales when various tax units live in the same household, contrary to the other scales. Since almost 40 % of the population belongs to these four types of households, this difference is responsible for a large part of the overall effect of using tax instead of statistical scales when identifying the poor. It also explains the results obtained for single-parent families, whose *relative* position is not worsened by PFM scales, in spite of the more generous scale used in the PFM when compared to other adjustments.

To sum up, although all the scales analysed coincide in delimiting the main groups at risk, the incidence of poverty in the different kinds of households varies to a certain extent depending on which adjustment

is used. The graduation of needs included in the PFM leads to some peculiarities when compared to the other equivalence scales. Such peculiarities are essentially the result of the equal weighting given to both spouses, the small adjustment introduced for dependant ascendants and the differences that arise from the more restrictive way of defining the tax unit (and therefore taking into account economies of scales) in comparison to the household concept used in conventional poverty analyses.

5. Conclusions

Equivalence scales constitute an indispensable tool to establish welfare comparisons among individuals who face different personal and family circumstances. These scales are also necessary to adequately determine the needs or the ability to pay of individuals who are targeted by social or tax policies. This study has made an attempt to compare the scales implicitly introduced by the PFM, which was designed for the 1998 income tax reform, with the scales used in minimum income policies and others that tend to be applied in income distribution studies.

As a first conclusion, it should be highlighted that our results show there is a clear contrast between the increases in needs associated with larger family units in the PFM and the graduation of benefits in the main national income maintenance programs. Generally speaking, the equivalence scales implicit in the PFM are more generous than the ones foreseen in welfare benefit programs. In our view, this could lead to some problems concerning the coherence of tax and expenditure policies, which should be looked at in more detail.

Comparing the adjustments at the levels stipulated by the PFM and the ones employed in other widely used equivalence scales to analyse poverty reflects some differences that suggest economies of scale are considered to a lesser extent. This is a result of the fact that both spouses are given equal weighting as well as the increase in the applicable minimum allowance for the third and successive children. This approach contrasts with the ones followed by other scales, which always assign a lower coefficient to the second adult as well as decreasing or, in some cases, assigning equivalent values to additional children. The treatment given to single-parent households is also more generous in the PFM because none of the other scales studied includes a specific threshold for this kind of household.

Overall we can say that the scales implicit in the Personal and Family Minimum have the advantage of providing a more detailed graduation of sums dependent on circumstances such as being disabled or a single-parent, which other scales do not take into account. Nevertheless, the PFM adjustments include a notion on economies of scale that is anomalous in the context of poverty studies and is therefore difficult to transfer to an analysis of the economic position of households.

Although we have to admit that different reasons and goals exist behind the income tax scales, a greater linkage between the different areas in which equivalence scales are used would be desirable. This is especially true in the case of public policies that should, to a certain extent, have a common approach concerning the way *basic needs* are defined, whether it be to determine the level of tax exemption or the amount of welfare benefits to be paid.

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Resumen

El análisis de la distribución personal de la renta y la pobreza exige valorar el efecto de las economías de escala dentro del hogar y las diferentes necesidades de cada uno de sus miembros. Para ello se han desarrollado diferentes tipos de escalas de equivalencia. Estas escalas están también presentes en varios tipos de impuestos y prestaciones sociales. En este artículo se revisan las escalas de equivalencia implícitas en el impuesto sobre la renta en España. Se identifican los ajustes que incorpora el nuevo impuesto y se subrayan las diferencias con los utilizados en otras prestaciones sociales y las escalas habituales en el estudio de la pobreza. Se estiman las tasas de pobreza para diferentes tipos de hogar utilizando tanto estas escalas implícitas como las tradicionales. Los resultados revelan que la legislación fiscal concede una menor valoración a las economías de escala dentro del hogar que el análisis distributivo.

Palabras clave: Escalas de equivalencia, impuesto sobre la renta, pobreza.