A SOCIAL WELFARE MODEL FOR THE EVALUATION OF THE SPANISH INCOME TAX SYSTEM 

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I. INTRODUCTION

One of the features of general Franco's regime, which lasted from 1939 to 1975, was the absence of a modern income tax system of the type we have come to expect in a democratic state. However, shortly after it was elected in 1978, the first Spanish democratic parliament adopted a progressive income tax, the *Impuesto sobre la Renta de las Personas Fisicas* (IRPF for short), which will be analyzed in the sequel. Since its inception, the IRPF has been subject to several reforms. Here we concentrate in a comparison between the 1986 and 1988 versions. Between these two years, two major changes took place. On the one hand, there were changes in average and marginal tax rates. On the other hand, the 1986 IRPF was a family tax, combined with a fixed tax credit for every earner and a variable deduction determined as a function of the incomes of the first two wage earners. In 1988, as a consequence of a sentence passed by the Supreme Court *(Tribunal Constitutional),* the possibility of filling in separate returns for earners of the same family

was introduced. At the same time, the variable deduction was reformed in order to provide an incentive for tax units to fill in joint returns.

Since behavioral responses are beyond the scope of this chapter, we shall concern ourselves exclusively with the evaluation of the IRPF in the light of the classical principles of horizontal and vertical equity which demand, respectively, equal treatment of equals and different treatment of unequals. In a heterogeneous world in which tax units differ not only in income but in non-income characteristics, these principles are applied in equivalent or adjusted income space.

We use a traditional social welfare framework, where social or aggregate welfare is summarized by two statistics of the income distribution: the mean, and an index of relative or absolute vertical inequality. Thus, on the one hand, the greater the reduction of inequality, usually known as the redistributive effect *(RE* for short), the better. But on the other hand, since tax payments are extracted from individuals, their after tax welfare is certainly reduced.[1] This revenue effect *(REVE* for short) manifests itself at the social level as a reduction in mean disposable income.

In a second step, following Lambert and Ramos (1996) the RE is decomposed into horizontal and vertical components *(HI* and *VR*, respectively, for short). This decomposition requires additively separable measurement instruments. Ideally, the additive separability property should be applied to the partition by exact equals in adjusted income space. However, one of the well known difficulties in the measurement of horizontal inequality is that in the real world one seldom encounters two tax units with the same income.[2] As a way out, we follow again Lambert and Ramos in widening the notion of "exact equals" to "close similars" (or simply, similars) in the empirical part.[3]

The main novelties we introduce are the following three.

1. Consider the demographic characteristics usually taken into account in the definition of adjusted income. Designers of personal income systems do realize that it would be horizontally inequitable if, in spite of differences in size and composition, two tax units with the same income were to be charged the same tax. To avoid these inequities, the IRPF grants tax credits as a function of these characteristics, implicitly defining what we may call a fiscal equivalence scale. In many cases, including the Spanish one, the fiscal authority appears to follow an absolute notion of inequality in the treatment of family characteristics: all tax units with identical number and types of dependents are granted the same tax credit independently of their income. However, all empirical studies we know of adopt a concept of relative inequality. In the relative framework, when tax units of the same characteristics are given the same tax credit, there is an improvement in relative inequality. On our part, we thought interesting to experiment with an absolute framework in which such family tax credits do not cause a change in absolute inequality.

Absolute notions of inequality and welfare constitute one of the polar cases discussed in the theoretical literature,[4] but are seldom used in the empirical work. A convenient consequence of adopting an absolute framework, is that the expression for the social welfare change *(SWC* for short) induced by the tax system,

becomes equal to the *RE* plus the *REVE*. On the other hand, when we add the additive separability property to the usual ones, Blackorby and associates (1981) establish that in the absolute case we end up necessarily with the family of Kolm-Pollak welfare and inequality measures. This settles the question of the choice of measurement instruments.

As income distribution analysts, we assume that the only ethically relevant characteristic is tax unit size. We follow Buhmann and associates (1988) and Coulter and associates (1992a, 1992b)'s idea of parametrizing the value judgements implicit in the definition of adjusted income. We apply this methodology, making sure that the income adjustment procedure does not change the absolute inequality of the subgroups within the basic partition by tax unit size.[5]

2. The IRPF can be described in terms of the following four main elements: (i) the notion of pre-tax income; (ii) the taxable income, which is equal to pre-tax income less allowable exemptions; (iii) the tax schedule, which taxes differently regular as opposed to irregular income; and (iv) a number of tax credits to be deducted from the gross tax to reach the tax liability. After-tax income is equal to pre-tax income less tax liability.

However, in this chapter we view the IRPF as the combination of a tax schedule on unadjusted pre-tax income, and a set of adjustments introduced by the fiscal authority for very different reasons, some having to do with the avoidance of horizontal inequities and some not. An advantage of this point of view, is that the Hi usually measured in the literature can be seen to consist of two parts: the ///due to the exemptions and tax credits not based on equity considerations, and what we may call *unintended HI* arising from: (i) the practice of applying a progressive tax schedule to unadjusted incomes followed by family tax credits, rather than applying directly the tax schedule to income adjusted by family circumstances; (ii) differences between the analyst's equivalence scale and the implicit fiscal scale, both based only on demographic characteristics, and (iii) the existence of other characteristics, ignored by the analyst but taken as ethically relevant by the fiscal authority. Examples of the latter studied in this paper, are the differential tax treatment of irregular income, the second earner's income, and wage earnings as opposed to other income sources.

3. We highlight a fundamental difficulty in all methods, including ours, that rely on the partition by similars for the measurement of *HI*. Consider the ideal partition of exact equals in adjusted income space. The pre-tax inequality within each subgroup in this partition is zero. Therefore, the application of a progressive tax schedule to unadjusted incomes gives rise to *HI* which contributes *negatively* to the *RE*. However, in the real world the pre-tax inequality within each subgroup in the partition of similars is, hopefully small, but greater than zero. As we will see below, in the case in which a small or no adjustment is made for tax unit size, the application of the tax schedule may very well lead to a measure of *HI* which contributes *positively* to the *RE*. These complications can only be studied if one isolates the impact of the tax schedule from the other elements of the system and,

simultaneously, one considers different values for the parameter which defines the generosity of the equivalence scale. This double condition is not fulfilled by any of the previous studies we know of.

The *Instituto de Estudios Fiscales* in Spain has been collecting a panel of about 200,000 income tax returns for the period 1982 to 1990. This has made possible a number of microeconomic studies[6] on the distributional impact of the Spanish IRPF. Previous work on the IRPF has led to the following stylized facts:

(i) From 1982 to 1990, the *RE* has been consistently increasing. The explanation is to be found in an increase of the mean of the pre-tax distribution in money and real terms, an increase over time in the inequality of that distribution, and to a smaller extent, in the changes introduced in the tax system during this period.[7]

(ii) However measured, the *HI* has been of a small order of magnitude. As far as the trend is concerned, it has been declining over time, except for an unexpected increase in 1988, the year in which the separate returns system was first introduced.[8]

In this chapter we work with a random sample of more than 10,000 tax returns for 1986 and 1988, representative of the *Institute's* panel. We study two types of empirical questions. On the'one hand, we confirm previous findings for the *RE* and the *HI* of the system as a whole. In our framework, it is immediate to obtain also estimates for the overall *SWC.*

On the other hand, we concentrate on the structure of the IRPF at two levels of desaggregation. First, we break down the system into two blocks: the application of the tax schedule on pre-tax income (after the correction for the favourable treatment of irregular income), and the rest of the exemptions and tax credits taken as a whole. The main finding is that the second block contributes negatively to the *RE* but positively to the *SWC.*

Secondly, we estimate the fundamental concepts in this chapter—the *RE,* the *REVE,* the *SWC,* as well as the decomposition of the *RE* into *HI* and *VR* components—for each of six different stages. The first two are the application of the tax schedule to pre-tax unadjusted income, and the correction introduced by family tax credits. The next three deal with the fiscal authority's attempts to avoid horizontal inequities arising from tax unit characteristics absent in the definition of adjusted income. These are the treatment of irregular income, the second earner's income, and wage earnings. Stage six includes all other exemptions and tax credits justified by other than equity reasons. Among other things, this breakdown allows us a more detailed explanation than previous studies of the increase in the ///between 1986 and 1988.

The rest of the chapter is organized in five sections and an Appendix. Section II lays down the welfare comparisons between tax units of different size, the social evaluation procedure, and the distinction between horizontal and vertical inequities. Section III contains a description of the IRPF and an exposition of which concepts might be signed *a priori* at each of the six separate stages. Section IV is devoted to the empirical results. Section V focuses on unintended *HI.* Section VI presents a

summary of results and some concluding remarks. The Appendix describes in detail how the data was organized into the six stages.

II. THE CONCEPTUAL FRAMEWORK[9]

A. Welfare Comparisons between Heterogeneous Tax Units

Assume we have a heterogeneous population of $i = 1, \ldots, N$ tax units, which may differ in their pre-tax income x' and/or a number of non-income characteristics. In addition to a person known as the taxpayer, tax units may include a spouse and/or a number of dependents. In this chapter the only ethically relevant characteristic is tax unit size, denoted by s'. Original incomes x' and x^7 are non comparable unless $s' = s^7$. Otherwise, one can define adjusted or equivalent income in the absolute case as

$$x^i(\lambda) = x^i - \lambda(s^i - 1),\ \lambda \in [0, \lambda^{\#}],$$

where the parameter λ can be interpreted as the cost of a person, so that $\lambda(s' -])$ is the income we can subtract from a tax unit of size s' for a reference taxpayer to enjoy the same utility level with the remaining income. The parameter X indicates the importance we are willing to give to the economies of scale in consumption within the tax unit; the greater is X, the smaller are the economies of scale.

Let x^* denote the vector of incomes for units of size $k = 1, \ldots, K$, and let $A\{.\}$ be any index of absolute inequality. Then for any A;

$$A(x^k(\lambda)) = A(x^k);$$

that is, adjusted income inequality within each ethically homogeneous subgroup of identical tax units, is equal to original income inequality. In other words, the adjustment procedure does not alter the inequality within homogeneous subgroups.

People live grouped in families and/or households, but we only have information on incomes and characteristics at the tax unit level. Since a family or a household may consist of more than one tax unit, economies of scale at family or household level are probably larger than at tax unit level. This makes any attempt to establish individual welfare comparisons even harder than usual. Therefore, we take as our object of study the unweighted distribution of tax unit adjusted income.

B. Social Welfare Functions

A social welfare function is a real valued function Φ defined in the space R of adjusted incomes, with the interpretation that for each income distribution, say $r = (r^1, \ldots, r'')$, $\Phi(r)$ provides the aggregate welfare from a normative point of view. For any income distribution r and any social welfare function Φ, let $x(r)$ be the equally-distributed-equivalent income *(EDEI)* defined by

For any partition of the population, we are interested in welfare measures capable of distinguishing—in a convenient additive way—between two components: welfare within the subgroups, weighted by demographic shares, and the loss of welfare due to the inequality between the subgroups. Without loss of generality, let us choose the partition by tax unit size into k - 1, . . . ,K subgroups. Blackorby and associates (1981) define between-group inequality as the inequality that would result if each household received her subgroup's *EDEI*, $E(r^k)$. These authors establish that, combined with the usual assumptions on social welfare functions,[10] the separability conditions required to estimate the *EDEI* of any subgroup in any partition independently of the rest of the distribution lead in the absolute case to the Kolm-Pollak family:

$$\Phi_\gamma(r) = -[1/\gamma]\ln[(1/N)\Sigma_i\, e^{-\gamma r i}], \quad \gamma > 0,$$

where y is interpreted as an aversion to inequality parameter: as y increases, the social indifference curves show increasing curvature until only the income of the poorest person matters.

Let *A A.)* be the index of absolute inequality consistent with O_y defined by

$$A_\gamma(r) = [1/\gamma]\ln[(1/N)\Sigma_i\, e^{\gamma(\mu(r) - ri)}], \quad \gamma > 0.$$

It can be shown that

$$\Phi_\gamma(r) = \mu(r) - A_\gamma(r),$$

where u.(.) is the mean of the distribution. On the other hand, since

$$A_\gamma(r) = \Sigma_k\,[N^k/N]A_\gamma(r^k) + A_\gamma(\xi^*),$$

where

$$\xi^* = (\xi^1, \ldots, \xi^M), \quad \xi^k = (\xi(r^k).1^{Nk}), \quad k = 1, \ldots, M,$$

we have that

$$\Phi_\gamma(r) = \Sigma_k\,[N^k/N]\Phi_\gamma(r^k) - A_\gamma(\xi^*).$$

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

Recall that, in our definition of adjusted income, we have parametrized as follows the weight we give to economies of scale in consumption: $r'(k)$ =r - $X(s'$ - 1). Thus, social welfare of adjusted income distribution $r(X)$ is equal to

$$\Phi_\gamma(r(\lambda)) = \Sigma_k\,[N^k/N]\Phi_\gamma(r^k) - \lambda(S - N)/N - A_\gamma(\xi^*(\lambda)),$$

where $S = \Sigma^{N} f_i$ is the total number of persons in the population and, for each k,

$$\xi^{k}(\lambda) = [\xi(r^{k}) - \lambda k]\, 1^{Nk} \text{ and } A_{\gamma}(r^{k}(\lambda)) = A_{\gamma}(r^{k}).$$

C. The Social Welfare Change (SWC)

Let $x = (x^{1}, \ldots, x^{N})$ be the pre-tax income distribution, $T = (T^{1}, \ldots, T^{N})$ the tax vector, and $v = (v^{1}, \ldots, v^{N})$ the after-tax income distribution, where $v^{i} = x^{i} - T^{i}$, $i = 1, 1., N. .$ Given parameter values for γ and X, social welfare before taxes is $\Phi_{\gamma}(x(\lambda))$, while welfare after taxes is $\Phi_{\gamma}(v(\lambda))$. Therefore, the *SWC* induced by the tax system is:

$$SWC(\lambda, \gamma) = \Phi_{\gamma}(v(\lambda)) - \Phi_{\gamma}(x(\lambda)).$$

Since

$$\Phi_{\gamma}(\cdot) = \mu(\cdot) - A_{\gamma}(\cdot),$$

we have that

$$SWC(\lambda, \gamma) = RE(\lambda, \gamma) + REVE,$$

where

$$RE(\lambda, \gamma) = A_{\gamma}(x(\lambda)) - A_{\gamma}(v(\lambda))$$

is the redistributive effect of the IRPF, dependent on both X and γ, and

$$REVE = \mu(v(\lambda)) - \mu(x(\lambda)) = -\mu(T)$$

is the revenue effect which is independent of both parameters.

D. Horizontal and Vertical Inequities

As far as the measurement of *HI* is concerned, we do not introduce explicit value judgements on its deleterious effects." Following Lambert and Ramos (1996), we express the *RE* as the sum of two terms capturing the horizontal and the pure vertical effect. For this purpose, consider the partition by similars in the distribution of pre-tax adjusted income, $x(X)$, with N^{e} tax units in subgroup $e = 1, \ldots, E$. Let $x^{e}(X)$ and $v^{e}(X)$ be the vectors of before and after tax adjusted income, respectively, for the subgroup of similars e, and let $\xi_{\gamma}(x^{e}(X))$ be the *EDEI* for that subgroup. We apply the additive separability property to *RE*[12] as follows:

$$RE(\lambda, \gamma) = A_{\gamma}(x(\lambda)) - A_{\gamma}(v(\lambda))$$

$$= \Sigma_{e} [N^{e}/N] [A_{\gamma}(x^{e}(\lambda)) - A_{\gamma}(v^{e}(\lambda))] + [A_{\gamma}(\xi^{*}_{xe}(\lambda)) - A_{\gamma}(\xi^{*}_{ve}(\lambda))],$$

where

$$\xi^{*}_{xe}(\lambda) = (\xi^{1}_{x}(\lambda), \ldots \xi^{E}_{x}(\lambda)), \qquad \xi^{e}_{x}(\lambda) = (\xi(x^{e}(\lambda))1^{Ne}),\ 1^{Ne} = (1, \ldots, 1) \in R^{Ne},$$

and similarly for the post-tax distribution *v(X).* Therefore,

$$RE(\lambda, \gamma) = HI(\lambda, \gamma) + VR(\lambda, \gamma)$$

where the expression

$$HI(\lambda, \gamma) = \Sigma_{e}\ [N^{e}/N]\ [A_{\gamma}(x^{e}(\lambda)) - A_{\gamma}(v^{e}(\lambda))]$$

measures the *HI* for the population as a whole, while the expression

$$VR(\lambda, \gamma) = A_{\gamma}(\xi^{*}_{x}(\lambda)) - A_{\gamma}(\xi^{*}_{xe}(\lambda))$$

is the pure vertical effect induced by the IRPF. As Lambert and Ramos (1996) point out, it is as if horizontally, the tax acts to increase the inequality where there was little before—within each group of pre-tax similars in adjusted income space—and vertically, it acts to reduce inequality between such groups. Because the expression *HI(k,* y) = *RE(X,* y) — *VR(X,* y) is expected to be negative, Lambert and Ramos indicate that horizontal inequality gets measured as a loss of vertical performance.

III. A DESCRIPTION OF THE IRPF

A. Basic Features

The key elements of the system which need to be described are the following four: (i) the notion of pre-tax income *(rendimiento neto);* the taxable income *{base imponible),* which is equal to pre-tax income less allowable exemptions; (iii) the tax schedule, which taxes differently regular as opposed to irregular income; and (iv) a number of tax credits to be deducted from the gross tax *(cuota Integra)* to reach tax liability *(cuota liquida).* After-tax income is equal to pre-tax income less tax liability.

(i) Pre-tax income consists of regular plus irregular income. Regular income is equal to wage or salary income, less mandatory contributions to the public Social Security system, plus income—net of necessary expenditures—from entrepreneurial, professional or agrarian activities, capital income, and imputed income from owner-occupied housing.[13] Most people receive a regular income flow of this type per unit of time, where the unit of time is the fiscal year. However, some people may collect discontinously income amounts that have been earned during a period of time longer than one fiscal year. Together with this component, irregular income includes realized capital gains less compensation from patrimonial losses in present and previous years.

(ii) Taxable income is equal to pre-tax income less unemployment compensation and a proportional deduction from wage income. Unemployment compensation is exempted by virtue of a Supreme Court sentence. Of course this exemption creates

HI which, as in previous studies, cannot be measured in this chapter. Non-wage earners are allowed deductions on account of expenditures necessary to earn their income. Because it is harder for wage earners to justify expenditures of this sort, a 2 percent deduction is allowed for them. On our part, we have included this deduction as part of the favorable treatment of wage earners in the fifth stage of the analysis described below and in the Appendix. Finally, in 1988 contributions to private pension funds up to a certain limit are also exempted.

(iii) In both years, the tax schedule for regular income is progressive in the sense that average and absolute tax rates are increasing functions of income. Marginal tax rates are less than one, so that there can be no rerankings from the application of the schedule. In 1986 there is no minimum exempted income, and tax rates start at 8 percent up to an income equal to 500,000 pesetas. In 1988, incomes below 600,000 pesetas are tax exempted, and average and marginal rates change considerably relative to 1986. In both years, irregular income is divided into two parts: an annualized component, and the rest of irregular income. The first component is taxed as regular income, while the second is taxed at a smaller rate. The gross tax is the consequence of applying the tax schedule to regular and irregular taxable income.

(iv) Tax liability is equal to the gross tax less a number of tax credits. We distinguish between two classes. The first class consists of tax credits granted by the fiscal authority to avoid horizontal inequities in three different situations. The first two situations are common to both years: a tax credit for dependents,[14] equal to a fixed deduction for each dependent of a given type, and an additional compensation to wage earners, this time in the form of a fixed tax credit. The third and more complex case, differs considerably between the two years.

The 1986 IRPF is a family tax: all tax units have to fill in a joint return, and pre-tax income is equal to income from all sources accruing to all family members. In exchange for this, the following tax credits are allowed: a fixed allowance for every taxpayer, a second allowance if a spouse is present, a third allowance depending on the number of earners, and a variable deduction depending on the income of the first two earners. The variable deduction recognizes that an income vector (90, 10) should not be taxed as an income vector (50, 50), nor as an income of 100 units accruing a tax unit consisting of a single taxpayer. To avoid discrimination against married individuals a tax credit is granted to the first two tax units in the example, with the first one receiving a greater tax break than the second.

In 1988, the main difference is the introduction of the possibility of filling in separate returns. Tax units with a spouse but a single earner are allowed a fixed deduction as before. Tax units with two earners are allowed to fill in either a joint return, or two separate returns. In the first case, they are given a tax credit equal to the maximum of the fixed deduction or a variable deduction depending again on the vector of incomes. Those choosing separate returns, have their incomes taxed separately with no deductions whatsoever. However, to ensure comparability

between the two tax regimes, in the empirical analysis separated tax returns are combined to produce a single observation for each family.

Tax credits in the second class are those justified on grounds unrelated to horizontal equity considerations. This class includes tax breaks linked to current expenditures on health, the acquisition of the primary and secondary residential housing, and other types of saving through the acquisition of life insurance or other financial assets either privately or publicly issued, and a large number of minor items which is not necessary to list here.[15]

B. The Six Stages of the Analysis

For the purpose of this chapter, the above elements are reorganized in six consecutive stages. (See the Appendix for details on the use of the data for this purpose.) We begin with the application of the tax schedule to total pre-tax family income, treated entirely as regular income. Then, we consider the correction for demographic characteristics taken into account in the definition of adjusted income: the presence of dependents of various types and/or a spouse, whether an income earner or not. The next three stages are reserved for the favorable treatment of tax unit characteristics absent in the analyst's equivalence scale. These are, respectively, the presence of irregular income, the second earner's income, and wage earnings. Finally, the sixth stage isolates the impact of the remaining tax credits.[16]

To simplify notation, let us omit the parameters *y* and *X* capturing, respectively, the aversion to absolute inequality and the generosity of the equivalence scale as a function of tax unit size. Then, for each stage $j = 1, \ldots, 6$, let us denote by *RE., REVE-, SWCj, HI.,* and *VR,* the central concepts of this study: the redistributive effect, the revenue effect and the social welfare change, where

$$SWC_j(\lambda) = RE_j + REVE_j;$$

and the horizontal and the vertical contribution to the redistributive effect:

$$RE_j = HI_j + VR_j.$$

The question is: what can be said *a priori* about the sign and relative magnitude of these concepts at each stage and for the IRPF as a whole?

Stage 7. *The Tax Schedule*

Let *zl'(X)* denote the adjusted income of tax unit *i* after the gross tax on pre-tax family income, *GT(x'):*

$$z1^i(\lambda) = x^j(\lambda) - GT(x^j),$$

where *x'(X)* = x' - *X(s'* - 1). Then stage 1 takesusfromx(l) = (x'(A.),..., A^(A,))to *zl(k)* = (zl *l(k),..., z\N(k)).* The expression for social change is:

$$SWC_1(\lambda) = \Phi(z1(\lambda)) - \Phi(x(\lambda)) = RE_1(\lambda) + REVE_1$$

where

$$RE_1(\lambda) = A(x(\lambda)) - A(z1(\lambda))$$

and

$$REVE_1 = \mu(z1(\lambda)) - \mu(x(\lambda)) = -\mu(GT(x)).$$

On the other hand, by applying the additive separability property of the Kolm-Pollak index of absolute inequality to the partition of similars $e = 1, \ldots, E$, we have that

$$RE_1(\lambda) = HI_1(\lambda) + VR_1(\lambda)$$

where

$$HI_1(\lambda) = \Sigma_e [N^e/N] [A(x^e(\lambda)) - A(z1^e(\lambda))]$$

and

$$VR_1(\lambda) = [A_\gamma(\xi^*_{xe}(\lambda)) - A_\gamma(\xi^*_{z1e}(\lambda))].$$

Notice that if we could work with exact equals, then $A(x^e(X)) = 0$ for all e, so that $HI_X(X) < 0$ for all values of A. with 7/7,(0) = 0. This is the *HI* due to the fact that the tax schedule is being applied to unadjusted income, while the evaluation procedure considers the partition by exact equals in adjusted income space. However, the most we can hope for is to construct a partition of similars in $x(X)$ space. Whatever the means used to accomplish this task, to which we will return in the empirical part, we have *that* $A(x^e(X)) > 0$ for all e. Therefore, our estimate of 777 provides un upper bound for the 777 in the partition by exact equals. In particular, think of the polar case in which $X = 0$. Then, because of the progressivity of the tariff, we have that $A(x^e(0)) > A(zl^e(0))$ for all e, and therefore 777, (0) > 0. Of course, this quantity does not reflect a type of 777 we want to do away with. It simply captures the effect of a progressive tariff within similars in unadjusted income space. However, for X sufficiently large, it may very well be the case that $A\{x^e(X)) < A\{z\backslash^e\{X))$ for some e, so that 777, (A,) becomes negative.

On the other hand, the expression $VR_{l}(X)$ measures the pure vertical effect induced by the tax schedule. Because of the progressivity of the tax schedule, we expect $VR\wedge X) > 0$ and large[17] for all X, and hence, $RE\wedge X) > 0$. However, $REVE_J$ should be large also, but of the opposite sign, so that nothing can be said *a priori* about the sign of SWC_V

Stage 2. Demographic Deductions

Tax units with several members will typically have larger pre-tax family income, but also greater needs. Thus, exactly for the same reasons that the income distribution analyst considers tax unit size in the definition of adjusted income, the fiscal

authority compensates tax units for the costs incurred by a spouse and/or dependents of different types. The term $HI_2(X)$ measures the ///created by family deductions aimed to compensate for the fact that the tax schedule applies to unadjusted income. Thus, for large enough X, we expect $HI_2(X) > 0$. However, the term $VR_2(k)$ cannot be signed *a priori*. Correspondingly, $RE_2(X)$ is also unsigned. Therefore, in spite of the fact that $REVE_2$ is positive, SWC_2 cannot be signed either.

Stage 3. The Correction for Irregular Incomes

As we have seen, the fiscal authority applies a lower tax rate to some part of irregular income, in order to avoid horizontal inequities between tax units with the same pre-tax income but a different composition in terms of regular and irregular components. However, since irregular incomes are received mostly by the rich, we expect the *VR^X)* component to be negative for all X. On the other hand, in some subgroup of similars some units may have irregular incomes and some not. Thus, the favorable treatment of irregular income (which tries to avoid the excess of progressivity on individuals getting life-time incomes in a non regular way) leads to an increase in absolute inequality within these subgroups, and hence to a negative *HIjiX)* component. Therefore, the corresponding *RE^'X)* is expected to be negative. Of course, as in every stage except the first one, $REVE_3$ is positive; therefore $SWC_3(X)$ is unsigned *a priori*.

Stages 4 and 5. The Treatment of the Second Earner's Income and of Wage Income

Notice that nothing can be said *a priori* about the sign of *REXX)* or *VRIX)* for any $j = 4, 5$. This simply reflects the fact that whether these types of deductions generates a progressive or a regressive impact is an empirical question. Nothing can be said either about the sign of *HI&X)* in either case. As a matter of fact, the sign and magnitude *of* HI_4 after the introduction of the separate returns system in 1988, is one of the issues that has attracted more attention in recent research about the Spanish IRPF.

Stage 6. Deductions Not Justified on Equity Grounds

In the sixth place, we have the tax credits granted by the fiscal authority for other than equity reasons. However legitimate their respective justification from other points of view, all deductions in this class typically cause some *a priori* social concern because it is feared that they give rise to ethically unjustifiable *HI^X)* £ 0 and possibly negative. On the other hand, neither *VR^X)* nor *RE^X)* can be signed *apriori,* although it is expected that this type of tax break is ultimately regressive, that is, $RE_6(X) < 0$. However, whether this may lead to a $SWC_h(X) < 0$ cannot be said *a priori*.

Because of the relative importance of the progressive tax schedule, we expect both $VR(k)$ and $RE(X) > 0$ for all X. However, based on all previous investigations,[18] we expect $HI(X) < 0$ but small.

IV. EMPIRICAL RESULTS

A. The Data

Our data comes from a representative random sample of the panel of income tax returns collected by the *Instituto de Estudios Fiscales.* For comparability purposes, separate returns in 1988 have been aggregated into a single tax unit. The distribution of tax units with positive pre-tax income[19] for 1986 and 1988 is in Table 1. Tax units have been classified by the type of return. We distinguish between individual returns, separate returns and, within joint returns, those who benefit only from fixed family tax credits, and those who benefit from the variable deduction depending on the incomes of the first two earners.

In 1988 the number of new entrants in the panel is greater than the number of exits. In relative terms there are more individual and fewer joint returns. However, the demographic structure does not change much. As can be observed in Table 2, the proportion of small units tends to increase, while the proportion of tax units with 5 or more people tends to decrease. Consequently, from 1986 to 1988 mean tax unit size decreases from 3.02 to 2.89. On the other hand, the distribution by size within each type, remains rather stable during the period. Three quarters of tax units with a single taxpayer consists of a single individual, and the rest have at most 1 or 2 dependents. Among tax units with at least two people and/or two earners, those receiving the fixed tax credits have a slightly greater average size and a larger share of dependents in 1986. In 1988, those filling separate returns are indistinguishable with those filling a joint return with fixed family tax credits.

The evolution of pre-tax incomes is shown in Table 3 for several values of the parameter X. When we do not take into account tax unit size, that is, when $X = 0$, average money income increases by 24.5 percent from 1986 to 1988. Since the rate

Table 1. Distribution of Tax Units in the Sample by Return Type

Return Type	***1986***	**%**	*1988*	**%**
Individual returns	3,046	27.7	3,757	31.2
Joint returns				
Fixed family tax credits only	**6,481**	**59.0**	6,237	51.8
Variable deduction	**1,466**	13.3	**1,263**	10.5
Separate returns	—	—	773	6.4
Total	10,993	100.0	12,030	100.0

Table 2. Distribution of Tax Units by Return Type and Tax Unit Size

	Tax Unit Size, 1986							
Return Type	*1*	*2*	*3*	*4*	5	6 *or +*	*Total*	*Mean*
Individual returns	76.0	17.1	5.1	1.1	0.5	0.2	100.0	1.33
Joint returns								
Fixed family tax credits	—	21.2	24.4	31.8	13.8	8.8	100.0	3.70
Variable deduction	—	20.6	30.7	32.0	10.1	6.6	100.0	3.55
Total	21.1	20.0	19.9	23.3	9.6	6.1	100.0	3.02
	Tax Unit Size, 1988							
Individual returns	75.1	18.0	5.0	1.4	0.4	0.1	100.0	1.35
Joint returns								
Fixed family tax credits	—	22.7	24.3	32.5	12.9	7.6	100.0	3.62
Variable deduction	—	21.2	30.0	34.7	9.8	4.3	100.0	3.48
Separate returns	—	24.3	28.7	24.8	12.8	9.4	100.0	3.61
Total	23.4	21.2	19.2	22.5	8.6	5.1	100.0	2.89

of inflation was 10 percent, there is a considerable growth in real terms of 14.5 percent. However, tax revenues increased even more.[20] Thus, as we can see in Table 3, fiscal pressure defined as

$$F(\lambda) = (\mu(T)/\mu(x(\lambda))100$$

increases from 11.9 percent in 1986 to 13.2 in 1988, when $X = 0$. Of course, the greater is X, the greater is fiscal pressure in every year.

The distribution of taxable income by income sources is presented in Table 4. Wage earnings represent close to 80 percent in both periods, although the share of most other sources increases slightly in 1988. In particular, the share of irregular income is considerably larger in 1988.

B. The Influence of the Parameters Representing the Generosity of the Equivalence Scale (A) and the Aversion to Inequality (y)

We begin by choosing y = 2.2E^, and X = 90,000/120,000 for 1986/1988, respectively. Absolute inequality is not scale independent, but these two k values

Table 3. The Evolution of Pre-tax Incomes and Fiscal Pressure

	7986				*1988*			
λ =	0	30,000	90,000	120,000	0	40,000	120,000	200,000
$\mu(x(\lambda))$	1,431,745	1,371,051	1,249,665	1,188,972	1,782,861	1,707,074	1,555,500	1,403,925
$F(\lambda)$	11 9	12 5	13.7	14.4	13 2	13.8	15.2	16.8

Table 4. Taxable Income by Income Sources

Income Sources	*1986*	*1988*
Wage earnings	79.7	*773*
Entrepreneurial	8.4	9.3
Professional	2.6	2.6
Agrarian	1.8	1.8
Capital income	5.0	5.8
Imputed net housing rent	1.6	1 0
Irregular income	0.9	2.2
Total	100.0	100.0

represent, approximately, 15 percent of mean per capita pre-tax income in both years. Table 5 presents estimates of the mean, as well as the absolute inequality and welfare of the pre-tax and after-tax adjusted income distributions. These allow us to compute the first three fundamental concepts of this chapter: the *RE*, the *REVE*, and the *SWC* in each year. The decomposition of *RE* into *HI* and *VR* components is treated in a separate section.

As expected, *RE* is positive in both years. Relative to the absolute inequality of pre-tax income, it represents an improvement of 28.6 and 26.9 percent in inequality in 1986 and 1988, respectively. However, *REVE* is larger than *RE*, so that *SWC* <

Table 5. The Impact of the IRPF in the Central Case: $y = 2.2E"^{6}$ and X = 90,000/120,000 in 1986/1988

		1986	*1988*
Pre-tax distribution x			
Mean:	$\mu(x)$	1,249,665	1,555,500
Inequality:	$A(x)$	538,141	791,519
Welfare:	$\Phi(x) = \mu(x) - A(x)$	711,524	763,981
Post-tax distribution v			
Mean:	$\mu(v)$	1,061,886	1,319,125
Inequality:	$A(v)$	384,332	578,748
Welfare:	$\Phi(v) = \mu(v) - A(v)$	677,554	740,376
Changes induced by the IRPF:			
$RE =$	$A(x) - A(v)$	153,809	212,771
$REVE =$	$\mu(v) - \mu(x) = -\mu(T)$	-187,779	-236,375
$SWC =$	$\Phi(v) - \Phi(x) = RE + REVE$	-33,970	-23,604
Changes in relative terms:			
$(RE/A(x))100$		28.6	26.9
$(SWC/\Phi(x))100$		-4.8	-3.1

Table 6. The Impact on SWC and RE of Changing y and *X*

1986	*X:*	0	*30,000*	*90,000*	*120,000*
	y = 2.2f[7]	39.9	40.3	40.6	40.5
RE/A(x)	y=2.2r[6]	28.1	28.5	28.6	28.1
in %	7=1 F"[5]	18.7	18.8	16.9	—
	Y = 2.2£~[7]	-10.5	-11.0	-12.2	-12.9
SWC/W(x)	y = 2.2f"[6]	-3.9	-4.2	-4.8	-5.2
in %	y = 1 F[5]	-0.2	-0.1	0.0	—
	Y = 2.2F[7]	39.5	39.9	40.2	39.9
RE/A(x)	Y = 2.2F[6]	26.5	26.9	26.9	25.4
in %	y = 1 F[5]	17.6	17.7	15.3	—
	y=2.2F[7]	-9.6	-10.1	-11.2	-12.7
SWC/W(x)	Y = 2.2f"[6]	-2.5	-2.7	-3.1	-3.9
in %	y = 1 F[5]	0.0	0.0	0.0	—
1988	*X:*	0	*40,000*	*120,000*	*200,000*
	y = 2.2E-[7]	39.5	39.9	40.2	39.9
RE/A(x)	*y = 2.2E~[b]*	26.5	26.9	26.9	25.4
in %	y=1 T[5]	17.6	17.7	15.3	—
	7=2.2f"[7]	-9.6	-10.1	-11.2	-12.7
SWC/W(x)	y = 2.2f-[6]	-2.5	-2.7	-3.1	-3.9
in %	**y = i r[5]**	0.0	0.0	0.0	—

0 in both years. This social welfare loss, prior to any benefit derived from the public expenditure and transfers made possible by the tax revenue, is of a small order of magnitude: between 3 and 5 percent as a percentage of pre-tax welfare.

Table 6 presents the impact on *RE* and *SWC* of changes in y and *X*. Two comments are in order. In the first place, given y, the absolute inequality of adjusted income, *A (x(X)),* first decreases and then increases as a function of *X*. Beyond a certain point, absolute inequality becomes larger than mean income and social welfare becomes negative, a situation which presents problems of interpretation. This leads us to fix the upper bound of *X* at 120,000/200,000 pesetas in 1986/1988, respectively. However, since the inequality of pre-tax and after-tax income follow the same non-linear pattern with *X,* the *RE* varies little with *X*. Since the *REVE* is independent of A, the same is the case for the *SWC{X) = RE(X) + REVE.*

In the second place, given *X,* the greater the aversion to inequality parameter y, the greater is the improvement in inequality captured by the RE_V and the smaller the social welfare loss. As a matter of fact, when y = \E~ , there is no social welfare loss for most values of *X*. We must take into account that the greater the y, the greater is the inequality of pre-tax income and the smaller is social welfare.[21] Thus, the ratios *(RE /A (x))* and *(SWCJO (x))* both decrease as y increases.

Given these results, we feel justified in concentrating our attention to the central case in which y = $2.2ET^6$, and A, = 90,000/120,000 for 1986/1988.

C. The Tax Schedule Versus Exemptions and Tax Credits

We begin with an overall view of the tax in both years. We reorganize the six stages into two main blocks: the operation of the tax schedule, including the treatment of irregular income, and the rest of exemptions and tax credits taken as a whole. The information is in Table 7.

As expected, in both years the tax schedule contributes positively to the *RE*. However, in both years the exemptions and tax credits have a regressive effect on the *RE,* which amounts to a reduction of 23.5 and 26.9 percent in 1986 and 1988, respectively, of the *RE* attributable to the tax schedule.[22] On the other hand, the exemptions and tax credits represent a 36.2 percent of the gross tax revenue collected in 1986, versus 33.2 percent in 1988.

The *RE* of the tax schedule is smaller than its *REVE,* so that the *SWC* attributable to it is negative. This welfare loss is 13.1 percent and 8.2 percent of pre-tax welfare in 1986 and 1988, respectively. On the contrary, the increase in disposable income due to the exemptions and tax credits is greater than its negative contribution to the *RE,* so that they contribute positively to the overall *SWC.* As we know, the net *SWC* is negative, but of a small order of magnitude: 4.8 and 3.1 percent in 1986 and 1988, respectively.

It would be tempting to use this analysis to draw definite conclusions about whether the legislative changes introduced in 1988 have caused the tax schedule, the exemptions and tax credits, or the IRPF as a whole to be more or less progressive

Table 7. An Overall View of the Redistributive and Welfare Effects of the IRPF

	1986	*J 988*
RE due to:		
1. The tax schedule	200,964	291,047
2. Exemptions and tax credits	^7,155	-78,276
Total Rf=1 +2	153,809	212,771
RFVFdueto:		
3. The tax schedule	•294,425	-353,493
4. Exemptions and tax credits	106,646	117,118
Total *REVE* =3 +4	•187,779	-236,375
SWC due to:		
5. The tax schedule = 1+3	-93,461	-62,446
6. Exemptions and tax credits = 2 + 4	59,491	38,842
Total *SWC*= 5 +6	-33,970	-23,604

than in 1986. However, in order to do that we would have to take into account the impact of the exits and entries into the sample, as well as the role of the initial pre-tax distribution, distinguishing between the change in the unit of account and the change in real terms in both the mean and absolute inequality—a task left for further research.[23]

D. The Different Stages of the IRPF

Now is time to look at the different stages in some detail. In Table 8 we present the information for each of the six stages on the breakdown of the *RE* into a *HI* and a *VR* component, the *REVE,* and the *SWC.* There are two rows for each stage: the first is for the absolute amounts in pesetas; the second, in parenthesis, is for the expressions *(HI/RE)100* and *(VR/RE)100.*

It should be noted that, after some experimentation, the criterion to form the similars partition in adjusted income space has been the following. For each subgroup of similars $e = 1,. . . ,E$, we have fixed the absolute inequality $A(x^e(k))$ less than or equal than 0.5 percent of the inequality for the population as a whole, $A(x(X))$. In this way, for example, for $k = 90{,}000/120{,}000$ in 1986/1988, the number of subgroups turned out to be $E = 86/130$ in a sample of 10,993/12,030 tax units.

It would be best to treat one year at a time, starting with 1986. Each row in Table 8 allows us to understand the sign of the *RE* attributable to each stage. (1) Notice that the application of the tax schedule leads to a small negative ///,, only 2.7 percent of the corresponding RE_X, which is of course positive. The explanation for $HI_1 < 0$ is twofold: on the one hand, the tax schedule applies to unadjusted income but we evaluate the effect on adjusted income space for a sufficiently large $k =$ 90,000 pesetas. On the other hand, this value of k need not coincide with the implicit fiscal scale. (2) Family deductions are meant to correct the ///, created in step 1. This is exactly what we observe: HI_2 is now positive. However, a large enough $VR_2 < 0$ leads to a $RE_2 < 0$. (3) When we correct for the treatment of irregular income, we find an important $///_3$ effect, greater than 50 percent of the corresponding RE_y Notice that $VR_3 < 0$, indicating a not surprising pro-rich bias in this stage. Hence, $RE^{\wedge} < 0$. (4) The help granted by the IRPF to two-earner tax units creates a small $HI_A < 0$ effect, 8.7 percent of the corresponding RE_4. The fact that $VR_4 < 0$, shows that these tax credits tend to favor the rich more than the poor. (5) Tax breaks to wage earners have two components in 1986: one is fixed, the other is proportional to wage income. The second component leads necessarily to an increase in absolute inequality. We actually observe a small $HI_S < 0$ effect and a $VR_5 < 0$, so that $RE_5 < 0$. (6) Finally, deductions not justified on equity grounds give rise to negative HI_6 and VR_6 effects, as expected.

The sum of all effects attributable to the various exemptions and tax credits, generate a negative *HI* as well as a negative *VR,* and hence a negative contribution to *RE,* as we saw before. This is exactly the same conclusion obtained by Camarero and associates (1993) in their study of all the tax returns for the province of Vizcaya

in 1989. Their grouping of deductions is somewhat different than ours, and they measure *HI* by applying a scale invariant measure of distributional change to the partition by similars in income adjusted space. These authors study the impact on *HI* of eliminating the different tax breaks, maintaining in each case the tax revenue constant. They find that only the elimination of family tax credits will increase *HI*. The elimination of all other tax breaks, including the important case of tax credits for two-earners tax units, will reduce the ///—the pattern described above.[24]

Table 8. The Stages of the IRPF

1986

Stages	*HI*	*VR*	*RE*	*REVE*	*SWC*
1. Tax schedule	-551	202,543	201,992	-296.064	-94,071
	(-0.3)	(100.3)	(100.0)		
2. Family tax credits	1,232	-6,639	-5,407	31,995	26,588
	(-22.8)	(122.8)	(100.0)		
3. Irregular income	-598	-430	-1,028	1,638	610
	(58.2)	(41.8)	(100.0)		
4. Second earner's income	-619	-6,528	-7,147	9,204	2,057
	(8.7)	(91.3)	(100.0)		
5. Wage earnings	-284	-9,758	-10,043	23,313	13,271
	(2.8)	(97.2)	(100.0)		
6. Non-equity exemptions and tax credits	-2,087	-22,471	-24,557	42,133	17,575
	(8.5)	(91.5)	(100.0)		
All	-2,907	156,717	153,809	-187,779	-33,970
	(-1.9)	(101.9)	(100.0)		

1988

Stages	*HI*	*VR*	*RE*	*REVE*	*SWC*
1. Tax schedule	-1,505	298,373	296,868	-359,249	-62,381
	(-0.5)	(100.5)	(100.0)		
2. Family tax credits	1,957	-15,434	-13,477	35,082	21,605
	(-14.5)	(114.5)	(100.0)		
3. Irregular income	-2,438	-3,38	-5,821	6,056	235
	(41.9)	(58.1)	(100.0)		
4. Second earner's income	-3,421	-25,705	-29,126	31,791	2,664
	(11.7)	(88.3)	(100.0)		
5. Wage earnings	-632	-15,997	-16,629	27,041	10,412
	(3.8)	(96.2)	(100.0)		
6. Non-equity exemptions and tax credits	-2,322	-16,721	-19,043	22,903	3,860
	(12.2)	(87.8)	(100.0)		
All	-8,361	221,132	212,771	-236,375	-23,604
	(-3.9)	(103.9)	(100.0)		

The small negative HI_X effect attributable to the tariff, is completely offset by the positive VR_X, which leads to a $RE_X > 0$. On balance, there is an overall $HI < 0$, but of a small order of magnitude: 19 percent of the overall *RE*. The pattern by stages in 1988 is very similar. The main difference is that the overall *HI* represents now 3.9 percent of the *RE*. For our two years, Lambert and Ramos (1996) results in the relative case are as follows: they estimate a negative ///contribution in both years, equal to 1.9 percent of the *RE* in 1986 and to 2.5 percent in 1988.

These global results are in line with previous studies:

(i) In Spain, like in other countries, *HI* is a small quantitative phenomenon however it is measured. Recall, however, that in the Spanish case two sources of *HI* could not be taken into account: unemployment compensation, exempted from taxable income, and fiscal evasion.

(ii) As in Lambert and Ramos (1996) in the relative case, in the absolute case *HI* detracts from the improvement in vertical inequality which we expect from an income tax system.

(iii) Like Pazos and associates (1994), and Lambert and Ramos (1996), we find that *HI* increases in 1988. Our detailed approach allows us to search for the cause of this increase. The relevant information is in column (1) of Table 9, which presents the percentage contribution of each stage to the overall *HI*.

Table 9. The Stages of the IRPF. Percentage Distributions

1986	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*
Stages	*HI*	*VR*	*RE*	*REVE*	*SWC*
1. Tax schedule	18.9	129.2	131.3	157.7	276.9
2. Family tax credits	-42.4	-4.2	-3.5	-17.0	-78.3
3. Irregular income	20.6	-0.3	-0.7	-0.9	-1.8
4. Second earner's income	21.3	-4.1	-4.6	-4.9	-6.0
5. Wage earnings	9.8	-6.2	-6.5	-12.5	-39.1
6. Non-equity exemptions and tax credits	71.8	-14.4	-16.0	-22.4	-51.7
All	100.0	100.0	100.0	100.0	100.0
1988	*(1)*	*(2)*	*(3)*	*(4)*	*IS)*
Stages	*III*	*VR*	*RE*	*REVE*	*SWC*
1. Tax schedule	18.0	134.9	139.5	152.0	264.3
2. Family tax credits	-23.4	-7.0	-6.3	-14.8	-91.5
3. Irregular income	29.2	-1.5	-2.7	-2.6	-1.0
4. Second earner's income	40.9	-11.6	-13.7	-13.4	-11.3
5. Wage earnings	7.5	-7.2	-7.8	-11.5	-44.1
6. Non-equity exemptions and tax credits	27.8	-7.6	-8.9	-9.7	-16.4
All	100.0	100.0	100.0	100.0	100.0

Pazos and associates (1994) attribute the change to the greater role of irregular incomes in 1988. We confirm the increased importance of this stage, which gains 10 percentage points in our explanation of the overall *HI*. But there are other factors. In the first place, the increase in *HI* is achieved in spite of a lessening of the importance of tax breaks not justified on equity grounds. In the second place, we observe that fixed family tax credits have a smaller correcting role in 1988 than in 1986. In the third place, the treatment of two-earner tax units is contributing very clearly to the increase in *HI* experienced in 1988.

To conclude our analysis of the structure of the IRPF by stages, we turn to the *VR,* the *RE,* the *REVE,* and the *SWC.* Columns (2) to (5) in Table 9 provide the percentage contribution of each stage to the corresponding totals. Starting with 1986, we observe that due to the small role of *HI the* percentage distribution of *VR* is essentially the same as the one for the *RE.* In agreement with *a priori* expectations, non-equity tax breaks have the greatest negative contribution to *RE,* followed by the favorable treatment of wage earners. As far as the *REVE* is concerned, non-equity tax breaks have also the greatest effect, followed by family tax credits and the policy measures related to wage earners. The net effect is that family tax credits and non-equity tax breaks, followed by the treatment of wage earners, have the greatest positive contributions to *SWC.* In 1988, the main difference is the increasing regressive role played by family tax credits and, above all, by the treatment of the second earner's income. On the contrary, the importance of non-equity tax breaks is reduced.

V. UNINTENDED INEQUALITY

As we said in the Introduction, there are several types of unintended *HI.* In the first place, there is the *HI* created because the tax schedule applies to unadjusted income while the evaluation is performed in terms of adjusted income. When the parameter X determining the extent of the economies of scale in consumption is sufficiently large, our discussion in Section IV.B leads us to expect that the *HI* will be negative. This is indeed the case when X = 90,000/120,000 in 1986/1988, respectively.

However, one may ask: what is the discrepancy between such values and the equivalence scale implicitly defined by the fiscal rules? The fiscal scale depends on family composition, as well as on tax unit size. However, on average, the fiscal scale is 17,427/22,308 pesetas in 1986/1988, respectively, a value well below our central X's. We have evaluated the IRPF using precisely the fiscal equivalence scale for each tax unit. The results are in Table 10, which contains also the estimates for the central case, as well as for the polar cases $X = 0$ and X = 120,000/200,000 in 1986 and 1988, respectively.

We observe that for both $X = 0$ and the fiscal scale, the *HI* attributable to the tax schedule becomes positive, as we indicated in Section IV.B it would be the case for sufficiently low values of X. Notice that the *HI* attributable to family deductions changes signs also. In all cases, the net impact of the schedule corrected by family

Table 10. Horizontal Inequality as a Function of *X*

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Stages *X:*	*0*		*Fiscal Scale*		*90,000*		*120,000*	
1. Tax schedule	2,337	-91.1	1,724	-63.7	-551	18.9	-923	33.8
2. Family tax credits	-657	25.6	-324	12.0	1,232	-42.4	1,653	-60.6
3. Irregular income	-670	26.1	-657	24.3	-598	20.6	-659	24.2
4. Second earner's inc.	-824	32.1	-761	28.1	-619	21.3	-518	19.0
5. Wage earnings	-300	11.7	-269	9.9	-284	9.8	-206	7.5
6. Non-equity items	-2,452	95.6	•2,420	89.5	•2,087	71.8	-2,073	76.0
HI	-2,566	100.0	-2,704	100.0	2,908	100.0	-2,727	100.0
HI/RE in %	1.68		1.77		1.89		1.77	

1988

Stages *X:*	*0*		*Fiscal Scale*		*120,000*		*200,000*	
1. Tax schedule	2,248	-26.0	1,038	-11.6	-1,505	18.0	-4,676	54.0
2. Family tax credits	-9,216	10.6	-346	3.9	1,957	-23.4	3,038	-35.1
3. Irregular income	-2,269	26.2	-2,276	25.5	-2,438	29.2	-2,362	27.3
4. Second earner's inc.	-4,800	55.5	^,742	53.1	-3,421	40.9	-2,533	29.3
5. Wage income	-82	9.5	-717	8.0	-632	7.5	-295	3.4
6. Non-equity items	-2,089	24	-1,888	21.1	-2,322	27.8	-1,825	21.1
HI	-8,653	100.0	-8,931	100.0	-8,361	100.0	-8,653	100.0
HI/RE in %	4.09		4.25		3.93		4.04	

tax credits contributes positively to the *RE*. This reflects the fact that, because we work with similars rather than exact equals, part of the impact of a progressive tariff is transmitted to the *HI* component of *RE*, rather than only to the *VR* component as it would have been desirable.

In the second place, the *HI* attributable to the correction for irregular income is obviously unintended by the fiscal authority. It seems reasonable that irregular components of income are taxed at a lower rate. Notice, however, that it is mainly the rich who benefit from this treatment.

In the third place, there is no reason in income distribution theory for treating wage earnings any different than other income sources. However, in a country where the evasion of non-wage earnings is known to be large, there seems to be reasons to grant wage earnings a favorable treatment.

Finally, let us consider the treatment of the second earner's income. Again, in income distribution theory one simply adds up income from all sources and all family members to arrive at the family total. However, the fiscal authority takes into account that, because the tax schedule is progressive, the gross tax of the sum is greater than the sum of the gross taxes of the parts. In both 1986 and 1988 in Spain, a variable deduction is granted to tax units with two earners. In addition, in 1988 the possibility of filling in separate returns is introduced.

Apparently, the fiscal authority reformed the variable deduction in 1988 with the aim of partially offsetting the consequences of the introduction of the separate returns system which it was feared would help mostly the rich. As we see in Table 10, tax credits in this stage are clearly regressive in both years, but much more so in 1988.

One could ask: does this new system contribute negatively to *HI*, *VR* and, therefore, to the *RE?* We have attempted to answer this question by estimating these effects in a situation in which the tax units which had decided to fill in separate returns are forced to make a joint return, benefiting of course from the corresponding variable deduction. The results are in Table 11.

Table 11. The Effects of the Separate Returns System and the Variable Deduction in 1988 on *HI*, *VR*, and *RE*

	Effects attributable to:		
	Variable Deduction and Separate Returns	*Variable Deduction Only*	*Separate Returns Only*
1. $H/_4$ = horizontal effect	-3,422	-2,519	-903
2. VR_4 = vertical redistribution	-25,705	-21,819	-3,886
$RE_4=HI_4 + VR_4$ = redistributive effect	-29,127	-24,338	-4,789

The conclusion is that both the new separate returns system and the variable deduction contribute to a negative HI_4, a negative VR_A, and hence to a negative RE_4. However, the issue is not completely settled. After all, the goal when introducing the possibility of separate returns was to improve *HI* among *individual earners,* not among tax units as defined in this and previous studies, where separate returns are added up in order to make possible the comparison with the results of the previous system.[25]

VI. CONCLUSIONS

In this chapter we have presented a social welfare model for the evaluation of the Spanish IRPF in 1986 and 1988. In these two years, the tax schedule was subject to important changes. In addition, in 1988 income earners of the same family were allowed the possibility of filling in separate returns.

The redistributive effect *(RE),* capturing the improvement in inequality, and the revenue effect *(REVE),* capturing the loss in mean disposable income as a consequence of the tax, are combined to produce a measure of social welfare change *(SWC).* Then, following Lambert and Ramos (1996) the *RE* is decomposed into a horizontal and a vertical contribution *(HI* and *VR,* respectively).

The IRPF implicitly adopts an absolute equivalence scale, depending on the demographic characteristics usually employed in income distribution theory to adjust income for non-income needs. In order to evaluate the tax system from a comparable standpoint, we adopt also an absolute framework which is seldom used in the empirical literature. In the absolute case, the class of social welfare functions which satisfies a number of desirable properties—including the additive separability condition necessary to implement the Lambert and Ramos approach to the measurement of *HI*—collapses into the Kolm-Pollak family of social welfare functions whose members are identified by an aversion to inequality parameter. Moreover, the *SWC* is seen to be equal to the *RE* plus the *REVE,* a convenient simplification.

The main global findings of the chapter are the following.

1. Let us separate the IRPF into two blocks, one consisting of the tax schedule on pre-tax income (after correcting for the treatment of irregular income), and another consisting of the rest of exemptions and all the tax credits. We find that in both years the second block contributes negatively to the *RE.* However, this is offset by the impact of the progressive tax schedule. Therefore, as documented in previous studies in a relative framework, we confirm that in both years there is a sizable $RE > 0$ for the IRPF as a whole.

2. The exemptions and tax credits represent about a third of the gross tax revenue collected in both years. This increase in disposable income is greater than its negative contribution to the *RE,* so that this block of measures generates a welfare gain. On the contrary, the negative *REVE* of the tax schedule offsets its positive *RE,* generating a welfare loss. We find that, prior to the public expenditure and transfers

made possible by the *REVE,* the system as a whole gives rise to a welfare loss of about 5/3 percent of pre-tax welfare in 1986/1988, respectively.

3. As in previous studies in Spain and other countries in a relative framework, we find that the *HI* of the IRPF is quantitatively small, of about 2/4 percent of the *RE* in each year. However, we confirm that the horizontal inequities detracts from the improvement in vertical inequality.

Perhaps the more interesting results are obtained when we break down the IRPF into separate stages. This lead us to the following conclusions:

4. In 1986, the more important component of the *HI* is attributable to the exemptions and tax credits unjustifiable on equity grounds. This is no longer the case in 1988, a year in which the overall *HI* is twice as large. The new treatment of the second earner's income after the change in the law, appears now as the more important cause of the *HI.*

5. If the tax schedule is applied to pre-tax unadjusted income and the evaluation exercise proceeds in terms of adjusted income, then there must appear///whenever the economies of scale in consumption are assumed small enough. Such (unintended) *HI* is meant to be corrected by family tax credits which recognize that larger tax units have greater needs. When the cost of a tax unit reference member is assumed to be equal to 90,000/120,000 pesetas, or about 15 percent of meander *capita* income in each year, this is exactly what we observe.

6. The cost of a reference member implicit in the fiscal equivalence scale is much smaller than the above figures, about 17,500/22,000 pesetas on average in 1986/1988, respectively. When we evaluate the system assuming the fiscal equivalence scale, the tax schedule creates *a positive HI* and the family tax credits create a *negative HI.* This is seen to be the consequence of a fundamental shortcoming of all procedures relying on the notion of similars rather that exact equals in adjusted income space. A progressive tax schedule reduces the absolute inequality both between subgroups of similars, captured by a positive *VR,* and within each subgroup of similars, giving rise also to a positive *HI.* When economies of scale are assumed to be very important (or the cost of a reference member is assumed to be very small), this effect weighs more than the effect referred to in point 6 above.

7. The fiscal authority grants exemptions and tax credits to avoid certain horizontal inequities which are not recognized in the equivalence scale used to define adjusted income. Therefore, these policy measures lead to (unintended) *HI.* In this chapter we have analyzed the following three cases: the favorable treatment of irregular income, the second earner's income, and wage earnings as opposed to other income sources. All of them generate negative *HI* and *VR* contributions, and hence a negative *RE.*

It should be emphasized that the global results on the *RE,* its breakdown into *HI* and *VR* contributions, and the *SWC* of the *IRPF* are little affected by different assumptions about the generosity of the equivalence scale. On the other hand, the greater the aversion to absolute inequality, the greater is the improvement in inequality captured by the *RE,* and the smaller the social welfare loss.

The above results are as good as the random samples of 10,993/12,030 tax units in 1986/1988 provided by the *Instituto de Estudios Fiscales* for this study. These are representative samples of the *Institute's* panel, consisting of approximately 200,000 tax returns. Perhaps the worse shortcoming of this chapter is the lack of statistical properties of our estimates. Future research should also take into account the following points:

(i) To establish intertemporal comparisons between 1986 and 1988, appropriate care must be taken of the differences in the unit of account in an absolute framework in which measurement instruments are not scale independent. This is in addition to the differences between the pre-tax income distributions expressed in real terms, and the role of exits and entries into the panel between these two years.

(ii) Previous studies have found that, in the relative case, the increase in *HI* in 1988 is a once and for all phenomenon. This should be investigated in an absolute framework. Furthermore, to determine the role of the introduction of the possibility of filling in separate returns as a cause of///before and after 1988, one should take into account that the Supreme Court ordered a change of the system in order to avoid horizontal inequities among individual income earners. This suggests a study of the distribution of individual tax returns, rather than the distribution in which couples filling in separate returns after 1988 are treated as a single tax unit.

(iii) There are a number of normative exercises worth pursuing. The first is the study of a tax system which applies the *IRPFXsx* schedule to income adjusted by family circumstances, rather than to unadjusted income plus a set of family tax credits. The second exercise, is the study of simpler tax systems which trade off flatter tax rates for fewer exemptions and tax credits.

APPENDIX

Let us denote *pre-tax family income* for tax unit *i* by *x'*. It consists of regular plus irregular income. Regular income is equal to wage or salary income, *W,* plus income from other regular sources, O^1, less expenditures necessary for the obtention of such income, *EXP'*. If we denote irregular income by *IRR',* then we have

$$x^i = (W^i + O^i - EXP^i) + IRR^i.$$

Taxable income,y, is equal to pre-tax income less a proportional deduction from wage income, *rW,* where $r = 0.02$ during the two years under study. In addition, in 1988 contributions to private pension funds, PEN^1, are also exempted. Therefore, we have:

$$y^i = x^i - rW^i - PEN^i.$$

Let us denote by *P(.)* the *tax schedule on regular income.* In both years, whenever irregular income is positive *IRR'* is divided in two parts: an annualized component, *ANNUAL',* and the rest of irregular income, *REST'.* The first component is taxed as

regular income, while the second component is taxed at a smaller rate $P^*(.)$. Therefore, the *gross tax* on regular and irregular taxable income, *GT,* is defined by:

$$GT(y^i) = P(y^i - REST^i) + P^*(REST^i).$$

Tax liability, V, is equal to the gross tax less a number of tax credits which differ considerably during the two periods. In 1986, we distinguish between four tax credits. In the first place, there is a tax credit for dependents, *DEP',* equal to a fixed deduction a_h for each dependent of type *h.* Thus, if d^i_h is the number of dependents of type *h* in tax unit *i,* we have

$$DEP^i = \Sigma_h\, a_h\, d^i_h.$$

In the second place, the following tax credits are allowed: a fixed allowance for every taxpayer, *GEN,* a fixed allowance if a spouse is present, *COUPLE;* a second allowance depending on the number of earners, *NEARN',* and a variable deduction, $V(x^i_1, x^i_2)$, depending on the vector of incomes of the first two wage earners, x^i_1 and x^i_2. In the third place, there is a fixed tax credit for wage earners, *WTC.* Finally, let *OTC* denote all other tax credits not justified on equity grounds. Therefore, in 1986 tax liability is defined by:

$$T^i = GT(y^i) - DEP^i - (GEN + COUPLE + NEARN^i + V(x^i_1, x^i_2)) - WTC - OTC^i.$$

In 1988, the main difference is that the possibility of separate returns is introduced, while the allowances *GEN* and *NEARN*[1] are eliminated. Tax units with a spouse but a single earner are allowed a fixed deduction *COUPLE* as before, so that

$$T^i = GT(y^i) - DEP^i - COUPLE - WTC - OTC^i.$$

Tax units with two earners are allowed to fill in either a joint return, or two separate returns. In the first case, they are given a tax credit equal to the maximum of *COUPLE* or a variable deduction $V(x^i_1, x'_2)$ depending again on the vector of incomes x^i_1 and x'_2. Therefore, we have

$$T^i = GT^i(y^i) - DEP^i - \text{Max}(COUPLE, V(x^i_1, x^i_2)) - WTC - OTC'.$$

Those choosing separate returns, had their incomes taxed separately but loose their right to *COUPLE* or $V(x^i_1, x_2)$. Therefore, we have

$$T^i = GT(y^i_1) + G(y^i_2) - DEP^i - WTC - OTC^i.$$

Of course, both in 1986 and 1988, after-tax income, v', is equal to pre-tax income less tax liability:

$$v^i = x^i - T^i.$$

In this chapter, we view the IRPF as consisting of six stages. Let us denote by *z\'(X)* the adjusted income after the tax schedule *P*(.) has been applied on pre-tax fnmilv innnmp That ic

$$z1^i(\lambda) = x^i(\lambda) - P(x^i).$$

The first stage takes us from *x(k)* = *(x^J(X),... ,x^A'(X))* to *z\(X)* = *(zl\X),...,z\^N(X))*.

For tax units receiving irregular income, *P(x')* would overestimate the tax due. Unfortunately, we have detailed information on the irregular income sources which may give rise to *ANNUAL'* > 0, but we can only estimate if *REST* is different from 0 due to other sources. Therefore, we cannot compute *P*(REST').* Our solution is to approximate the excess tax by *P(y) - GT(y').* If *z2'* denotes the income after the differential treatment of irregular income, then we have

$$z2^i(\lambda) = z1^i(\lambda) + [P(y^i) - GT(y^i)].$$

The second stage takes us fromzl(^.) *toz2(X)* = *(z2^J(X),..., z2^N(X)).*[26]

In the third place, the tax authority compensates tax units for the costs incurred by a spouse and/or dependents of different types. If we let z3' be the income after the family tax credits, that is,

$$z3^i(\lambda) = z2^i(\lambda) + COUPLE + DEM^i,$$

then the third stage takes us from *z2(X)* to *z3(X)* = (z3 \X),..., *z3^N(X)).*

Inthefourthplace,theIRPFtreatsdifferentlytheincomeearnedbythefirstor thesecond earner in the taxunit.Ifwe let ,SCX)bethecompensationtotaxunit/ on these grounds,then wehave, in 1986:

$$SCD^i = NEARN^i + V(x_1^i, x_2^i);$$

in 1988, joint returns:

$$SCD^i = [\text{Max}(COUPLE, V(x_1^i, x_2^i)] - COUPLE],$$

andin 1988,separatereturns:

$$SCD^i = [P(x^i) - P(x_1^i)) - P(x_2^i)) - COUPLE].$$

Let z4' be the income after this stage, that is,

$$z4^i(\lambda) = z3^i(\lambda) + SCD^i.$$

In this notation, the fourth stage takes us from *z3(X)* to*z4(X)* = *(z4\X),...,zA^N(X)).*

In the fifth place, let z5' be the income after correcting the tax bill for the favorable treatment of wage income; that is,

$$z5^i(\lambda) = z3^i(\lambda) + [P(y^i + rW^i) - P(y^i)] + WTC.$$

the fifth stage takes us from *z4(k)* to z5(A.) = (z5' *(k),..., z5^N(X))*.

Finally, there are all other tax credits, *OTC,* granted by the fiscal authority for other than equity reasons. Then we have that after-tax adjusted income *V(k)* should be equal to:

$$v^i(\lambda) = z5^i(\lambda) + [P(y^i + rW^i + PEN^i) - P(y^i + rW^i)]$$
$$+ [GT(y^i) - COUPLE - DEM^i - SCD^i - WTC - T^i]$$

The sixth stage takes us from *z5(X)* to *v(X) = (v\X), • • •, v^(X)).* Taking into account that *P(x) = P(y - rW^i - PEN^I),* it is easy to check that *v>(k) = x"(k) - t.*

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NOTES

1. Of course, this is before taking into account the impact on people's welfare of public expenditures and transfers made possible by the income tax revenues, an aspect which is beyond this chapter's scope.
2. This difficulty leads many authors to identify the maintenance of horizontal equity with the preservation of the ranking in the pre-tax distribution. See, for instance, Feldstein (1976), Atkinson (1980), Plotnick (1982, 1985), and King (1983).
3. For other authors using the notion of similars see, for instance, Berliant and Strauss (1985), Camarero and associates (1993), Aronson and associates (1994), and Pazos and associates (1994).
4. See Kolm (1976a, 1976b) and Blackorby and Donaldson (1980).
5. For other applications of this methodology, see Ruiz-Castillo (1995a, 1996) and, in an income tax context, Aronson and associates (1994).
6. See Castaner (1991 a, 1991 b), Jimenez and Salas (1991), Salas and Perez-Villacastin (1992), Lasheras and associates (1994), Pazos and associates (1994), Vargas (1995), and Lambert and Ramos (1996).
7. See Castaner (1991a), Jimenez and Salas (1991), Salas and Perez-Villacastin (1992), and Lasheras and associates (1994).
8. See Camarero and associates (1993), Pazos and associates (1994), and Lambert and Ramos (1996).
9. For a detailed treatment of these issues, including the extension to the relative case, see Ruiz-Castillo (1995b).

10. Namely, continuity, S-concavity, monotonicity along rays parallel to the line of equality, and population replication invariance.

11. For this approach see, for instance, Plotnick (1981) and King (1983). Jenkins (1994) contains a useful review and extensions of previous results.

12. In this we differ from those who use the indices of distributional change studied by Cowell (1980, 1985). Jenkins (1988) applies them to the unadjusted income in the ethically relevant partition, while Camarero and associates (1993) and Pazos and associates (1994) apply them to the partition by similars in unadjusted and adjusted income.

13. This last income source is measured as 3 or 2 percent, in 1986 and 1988, respectively, of the value of the housing stock, less mortgage interest.

14. Dependents are children under 18 years old, minors between 18 and 15 years old with earnings below a certain amount, handicapped children without income, and parents with incomes below a certain limit. Since 1988, a fixed allowance for people over 70 years old is also granted.

15. Whether some of these deductions can be given also a horizontal equity justification is, of course, a matter of opinion. However, we do not have microeconomic information to treat any of them outside of this residual group.

16. We include in this stage the general tax credit to every taxpayer, granted only in 1986. Of course, this leaves the RE_6 unchanged and affects the SWC_6 only through its positive impact on the $REVE_6$.

17. Of course, this is only guaranteed in a homogeneous world if and only if total tax liability is increasing with income. For the absolute case, see Moyes (1988).

18. See Camarero and associates (1993), Pazos and associates (1995), and Lambert and Ramos (1996).

19. The number of tax units with negative incomes, left out of the analysis, are 26 and 39 in 1986 and 1988, respectively.

20. It should be noticed that 147 tax units in 1986 and 1,590 in 1988 had both gross tax and tax liability equal toO. In 1988, this is mostly due to the fact that those tax units have pre-tax income below the legal minimum, which is 600,000 pesetas. The main reason for the remaining cases in 1988 and those of 1986 is that they receive irregular income.

21. Pre-tax welfare becomes negative for $y = \backslash E\sim$ and large values of X, which is the reason why no estimates are recorded in Table 6 for these cases.

22. For the relative case, Salas and Perez-Villacastin (1992) report a worsening of the progressive contribution of deductions during this period. Given that deductions raise tax units' income, even a moderate improvement in relative inequality can be compatible with a worsening of absolute inequality.

23. For previous results on these matters, see Argimon and Gonzalez-Paramo (1987), Jimenez and Salas (1991), and Lasheras and associates (1994).

24. Pazos and associates (1994) report the opposite result. They study two stages: the effect of the tax schedule on taxable income (i.e., pre-tax income less all allowable exemptions), and the effect of all tax credits as a whole. They find that the tax schedule on taxable income creates *HI*, but that the tax credits reduces it.

25. See Castaner (1991 b), Pazos and associates (1994), and Lambert and Ramos (1996).

26. The number of tax units for which we have direct information on irregular income, is 166 and 308 in 1986 and 1988, respectively. In addition, we estimate that another 159 and 67 units in each year should be classified in this group. The criteria is that the difference $P(y') - GT(y)$ is greater than a lower bound equal to 3,000 pesetas. Thus, 225 and 375 tax units, representing 3.0 and 3.1 percent of the sample in 1986 and 1988, respectively, qualify for the treatment of irregular income described above.

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