TAX PARAMETERS IN THE PORTUGUESE ECONOMY
PART II: DIRECT TAXES*

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In the second of two twin papers, we focus on direct taxes and formally discuss the correspondences between statutory and effective tax rates in the Portuguese economy. These correspondences depend on the details of the Portuguese tax law, on a wealth of data information, and on certain priors about the values of behavioral parameters in the economy. For each of the different tax margins, we choose a specification of the tax base that is standard in tax policy evaluation exercises, albeit necessarily only an approximation to the true tax base. In addition to the general correspondences, we present our own estimates of the effective tax rates at the different tax margins. More importantly, however, using the information in this paper, practitioners of tax policy evaluation can obtain their own estimates of the relevant tax parameters.

1. INTRODUCTION

The objective of this series of two papers is to establish the mapping between statutory and effective tax rates in the Portuguese economy. Ultimately, we address the question of how changes in statutory tax rates induce changes in effective tax rates. For the motivation, scope and qualifications of the analysis, see Pereira and Rodrigues (2001a), the first paper of the sequence.

Tax reform proposals are invariably framed in terms of changes in statutory tax rates. However, from the perspective of tax policy evaluation, statutory tax rates are practically irrelevant. This is because, for the analysis of the incentives to work, consume, save, and invest that are induced by the

tax code, what matters most is the agent's behavior at the margin. Therefore, tax reform proposals should be framed in terms of changes in marginal tax rates. However, because marginal tax rates are clearly difficult to obtain, effective tax rates are often used in tax policy evaluation as an approximation.

The effective tax rate that we denote by τ, can be simply defined as the ratio between total tax revenues, T, and the tax base from which they were obtained, B, i.e.,

$$\tau = \frac{T}{B}.$$

Observed tax revenues are, however, the result of a set of numerous tax rules. In reality, statutory tax rates, t, along with deductions, D, and tax credits, CR, are the instruments of tax legislation. A highly stylized description of how these three variables come together to determine tax revenues, in general, is:

$$T = t(B - D) - CR.$$

In this paper, we focus on direct taxes. The corporate income tax, employers' social security contributions, employees' social security contributions and the personal income tax are considered in great detail. We present several tables that document the technical details on the correspondence between statutory and effective tax rates at the different margins. We highlight not only the mathematical mapping but also the data information and the economic parameters necessary to establish such mappings. As such, the accompanying text is essentially a guided tour of the different tables complemented with a detailed reference to sources. For a comprehensive description of the Portuguese tax system, in legal terms, the reader is referred to CEF (1997) and KPMG (1997).

2. THE CORPORATE INCOME TAX

Under the Portuguese tax law (CIRC), the corporate income tax (CIT, hereafter) is known as the *imposto sobre o rendimento de pessoas colectivas*. We estimate that corporate income tax revenues, T_{CITd}, which also include municipal taxes called "derramas", averaged 3.1 per cent of GDP at market prices for the period between 1990 and 1998.

The CIRC determines that all types of resident enterprises such as corporations, quota companies and business partnerships are considered taxable entities. Resident enterprises are liable to CIT on their worldwide income and capital gains. Enterprises are considered resident if their head office or effective place of management is located within Portuguese territory, if any of their agents carry out business acts in Portugal for more than 120 days in a year, or if they have a permanent representation from which a commercial, agricultural or industrial activity is exercised.

2.1 The CIT tax base and its basic deductions

The CIT tax base consists of net profits for the year plus certain changes in equity minus allowable previous years' losses and tax incentives. Profit is defined in balance sheet terms as representing the difference in net equity at the beginning and the end of the accounting period, adjusted in accordance with CIRC rules.

In the definition of taxable profits, all costs associated with the normal activity of a company are deductible, subject to limitations, from the CIT base. The main allowable costs are fiscal depreciation allowances and total labor costs, i.e., gross wages plus employers' social security contributions. Other deductions include representation expenses, travel allowances, eligible donations, research and development expenditures, and provisions for irrecoverable debts.

Given the definition of profits as net equity changes, in a framework of individual tax accounting, the determination of the CIT base would require computing a firm's net capital gains as well as evaluating its inventory along with the other deductions mentioned above. Instead, working at a highly aggregated level, we choose to approximate the true tax base using macroeconomic data.

In most tax policy evaluation exercises the corporate income tax is modelled in a very stylized way. Evaluated at factor cost $\left(Y^{FC}\right)$, GDP as a whole is typically considered the tax base, and total labor costs, $\theta_L Y^{FC}$, along with fiscal depreciation allowances are the valid deductions thereto.[1] Fiscal depreciation allowances are determined as a fraction, α, of the private sector's investment spending, I^{FC}. Then, on this adjusted base, a tax at the effective rate of τ_{CITd} is levied. Finally, as a tax incentive, an investment tax credit, T_{ITC}, reduces the CIT burden by an amount that is proportional to the private sector's investment spending.

In reality, however, only corporate firms are liable to CIT. For this reason, a closer approximation of the actual tax base, deductions, and credits, demands that we focus on the incorporated sector. In this regard, we must determine the fraction of production, total economy-wide labor costs, and private investment spending that is carried out by the incorporated sector. Let ϕ_1, ϕ_2 and ϕ_3 represent these three fractions respectively. Note that ϕ_1 can be interpreted as the economy's coefficient of incorporation, and is easily parameterized after recognizing that the gross operating surplus for the incorporated sector is computed as $Y^{FC}\left(\phi_1 - \phi_2\theta_L\right)$. This variable as well as parameters ϕ_2 and ϕ_3 are determined directly from national account data (*INE, Contas Nacionais*).[2]

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(1)   It should be noted that, in addition to employers' social security contributions, total economy-wide labor costs encompass gross wages paid to dependent and self-employed workers, in the private as well in the public sector.

The CIT base after deductions is then subject to the corporate income tax at a statutory rate of $t_{CIT} = 0.34$, and surcharged with a municipal levy, or "*derrama*", at the statutory rate of $t_{der} = 0.10$. This yields the firms' pre-ITC corporate income tax liability, which we denote as Λ. Finally, through investment tax credits the CIT levy is reduced.

Table 1 summarizes the data and parameters related to the corporate income tax. Furthermore, it makes clear the distinction between statutory and effective terms, i.e., between our approximation of the way tax revenues are obtained in reality (equations 1 and 2), and how these are depicted in a standard tax policy evaluation model (equations 3 and 4). In addition, equations (5) and (6) show how a changes in the statutory tax rates induce changes in the effective tax rates.

Let us now see how fiscal depreciation allowances and investment tax credits are, in reality, determined.

2.2 Depreciation allowances

The CIRC contemplates fiscal depreciation allowances as valid deductions to a firm's taxable profits. In effect, it allows that a fraction of past and present capital expenditures be written off as a cost for tax purposes. Under the straight-line depreciation method over a number, *NDEP*, of periods, depreciation allowances are computed as

$$\left(I_t + I_{t-1} + \ldots + I_{t-NDEP+1} \right) / NDEP.$$

Assuming that corporate capital investment grows at an average rate of g, fiscal depreciation allowances simplify to a proportion, α, of the contemporaneous corporate investment, with given by:

$$\alpha = \left[1 - (1 + g)^{-NDEP} \right] / NDEP \left[1 - (1 + g)^{-1} \right].$$

This expression is the reduced form of the difference between two infinite geometric progression sums.[3] In computing CIT and "*derrama*" revenues in statutory terms (see equation 1 in Table 1) after plugging in all the known data and parameters, a value of $\alpha = 0.73477$ is determined residually. In turn, the solution to the above equation for α, after assuming that *NDEP*=16, is $g = 0.0449$. Since gross fixed capital formation for the economy as a whole grew an average of 4.87 per cent from 1990 to 1998 (DGEFA, 1999), the implicit value for g we estimate is very reasonable.

2.3 Investment tax credits

From 1990 through 1998, corporate income tax credits including investment tax credits and transitory regimes, T_{ITC}, averaged 0.09744 per cent of GDP at market prices (*Ministério das Finanças*, 1993, 1995, 1997, 1998).

Investment tax credits, or ITCs, are commonly used by tax authorities as an incentive for some firms to purchase certain capital goods. Clearly, a change in tax credits is important inasmuch as it alters the effective tax rate. This is so, even though the correspondence between statutory and effective tax rates is independent of tax credits.

With the exception of financial intermediaries – such as banks and insurance companies – all entities that are subject to the corporate income tax can apply for an ITC. In effect, by incurring in capital expenditures, with the exception of land (except for firms operating in the primary sector), buildings (except for factories), furniture and light automobiles, these non-financial firms have the opportunity of lowering their pre-ITC CIT liability.

Under the current tax code, a firm's ITC for a given year, is computed as a fraction, $t_{ITC} = 0.10$, of the eligible investment expenditure, measured at factor cost, up to a limit of thirty percent of its pre-ITC adjusted CIT liability. That is, the ITC can never exceed:

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(2) Unless otherwise noted, data and parameters concerning the incorporated sector refer to averages for the 1988 to 1995 period and make use of the latest available information (*INE, Contas Nacionais*).

(3) In this definition of the depreciation allowances we capture the depreciation corresponding to investments occurred in the past. While this is the relevant notion for tax purposes it should be pointed out that investment decisions are at the margin forward looking. This means that they are based on the future depreciations derived from such investment spending (King and Fullerton, 1984, and Jorgenson and Landau, 1993). If we assume that the past trend of growth or corporate investment, g, continues into the future, then historical depreciations will be a good guide for investment decisions at the margin around that trend.

Table 1

CORPORATE INCOME TAX AND INVESTMENT TAX CREDITS

In statutory terms

$$T_{CITd} = t_{CIT}\left(1 + t_{der}\right)\left\{\left(Y^{MP} - T_{VATET}\right)\left(\phi_1 - \phi_2\theta_L\right) - \alpha\phi_3\left(I^{MP} - T_{VATET,I}\right)\right\} - T_{ITC} \quad (1)$$

$$T_{ITC} = t_{ITC}.\varepsilon.\eta.\phi_3\left(I^{MP} - T_{VATET,I}\right).\beta \quad (2)$$

In effective terms

$$T_{CITd} = \tau_{CITd}\left\{Y^{FC}\left(1 - \theta_L\right) - \alpha I^{FC}\right\} - T_{ITC} \quad (3)$$

$$T_{ITC} = \tau_{ITC}I^{FC} \quad (4)$$

How a change in the statutory tax rate induces a change in the effective tax rate

$$\frac{\partial\tau_{CITd}}{\partial t_{CIT}} = \left(1 + t_{der}\right)\left\{Y^{FC}\left(\phi_1 - \phi_2\theta_L\right) - \alpha\phi_3 I^{FC}\right\} / \left\{Y^{FC}\left(1 - \theta_L\right) - \alpha I^{FC}\right\} \quad (5)$$

$$\frac{\partial\tau_{ITC}}{\partial\tau_{ITC}} = \varepsilon\eta\phi_3\beta = \frac{\tau_{ITC}}{t_{ITC}} \quad (6)$$

Data

$$T_{CIT} = 0.031Y^{MP}, T_{ITC} = 0.0009744Y^{MP}, T_{VATET} = 0.142Y^{MP}, \theta_L = 0.475,$$

$$T_{VATET,I} = 0.01841Y^{MP}, I^{MP} = 0.215Y^{MP}, t_{CIT} = 0.34, t_{der} = 0.10, t_{ITC} = 0.10,$$

Gross operating surplus for the incorporated sector $= Y^{FC}\left(\phi_1 - \phi_2\theta_L\right) = 0.17926Y^{MP}$

Parameters
$$\phi_1 = 0.51554, \phi_2 = 0.6454937, \phi_3 = 0.6491375, \alpha = 0.73477, \varepsilon = 0.35, \eta = 0.77728, \beta = 0.28067$$

The calculated effective tax rates

$$\tau_{CITd} = 0.10449, \quad \tau_{ITC} = 0.004957$$

The calculated differential effects

$$\frac{\partial\tau_{CITd}}{\partial t_{CIT}} = 0.30734, \quad \frac{\partial\tau_{ITC}}{\partial t_{ITC}} = 0.04957$$

Sources: DGEP (1999), *INE Contas Nacionais*, Authors' calculations.

$$\min\left\{0.3\Lambda; t_{ITC}I^{FC}_{Eligible}\right\}.$$

To proceed, let us begin by assuming that the thirty percent limit is not an active constraint for any firm. Then, ITCs are attributed according to $t_{ITC}I^{FC}_{Eligible}$.

From 1988 to 1995, non-financial corporations, the only kind that qualify for investment tax credits, carried out investment expenditures that to-

talled 10.848 per cent of GDP at market prices, only $\varepsilon = 0.35$ of which was eligible for ITCs (*INE, Contas Nacionais*, several issues). Evaluated at factor cost, non-financial corporate investment represents $\eta = 0.77728$ of all corporate investment, $\phi_3 I^{FC}$. Therefore, $I^{FC}_{Eligible} = \varepsilon.\eta.I^{FC}$, which corresponds to 3.472 per cent of GDP at market prices.

Data on the ITCs effectively attributed, however, suggest that only a fraction, $\beta = 0.28067$, of

the eligible investment spending is covered by the above formula. It follows that the value of the ITCs actually granted can be written as

$$T_{ITC} = t_{ITC} . \varepsilon . \eta . \phi_3 I^{FC} . \beta,$$

where β is a coverage coefficient residually determined using equation (2) in table 1.[4]

If all of the eligible non-financial corporate investment had been covered, the ITCs handed out would have reached an average of 0.347 per cent of GDP at market prices, from 1990 through 1998, around 3.5 times the value that was in reality attributed. Therefore, our calculations suggest that, in the recent past, most of the eligible non-financial corporate investment, i.e. around 2.5 per cent of GDP at market prices did not take advantage of this tax incentive.

These figures suggest that the ITC benefits are underutilized. What can explain this fact? If we reject, as we should, the hypothesis that entrepreneurs are unaware that such a tax incentive exists, the answer is that tax evasion may be a factor in the underutilization of ITCs.

Finally, given the aggregate nature of most tax policy evaluation models, it is custom to express ITCs as a fraction, τ_{ITC}, of total private investment, evaluated at factor cost, i.e.,

$$T_{ITC} = \tau_{ITC} I^{FC}.$$

Using the available data, the effective ITC rate is calculated at $\tau_{ITC} = 0.004957$.

The differential effect of a change in the statutory ITC rate on the associated effective rate is determined according to

$$\frac{\partial \tau_{ITC}}{\partial t_{ITC}} = \varepsilon \eta \phi_3 \beta = \frac{\tau_{ITC}}{t_{ITC}} = 0.04957.$$

3. SOCIAL SECURITY CONTRIBUTIONS

The Portuguese social security system operates on a pay-as-you-go basis in accordance with an intergenerational solidarity principle. Under the conventional taxonomy of the three pillars (see

World Bank, 1994, for example), only the first pillar – a state-operated regime with mandatory contributions – and the third pillar – an individual complementary regime with favorable tax treatment that is managed by pension funds – exist.

The state-operated social security comprises two systems: a general system for private sector workers and a civil servants' system. In addition to these two, a special system for banking employees exists that operates on a capitalization basis.

Within the general system, or *Regime Geral*, two sub-regimes exist – a general contributory regime funded by employers' and employees' contributions, and a non-contributory regime funded by Government transfers. The general contributory system grants pensions in substitution for lost income due to old age and other contingencies such as sickness, invalidity, death and unemployment. The non-contributory scheme provides a minimum protection to persons not covered and suffering from social and or economic hardships, with an income level below a certain threshold.

The public sector workers' scheme, or *Caixa Geral de Aposentações*, is financed by civil servants' contributions as well as by Government transfers. Contributors are covered for all the above-mentioned contingencies with the exception of unemployment.

3.1 Employers' social security contributions

We estimate that social security contributions from private sector employers, or *contribuições patronais para a segurança social*, T_{FSSC}, represent an average of 5 per cent of GDP at market prices for the period 1990-1998. Note that this value does *not* include contributions paid out by the public sector, as an employer, to the civil servants' social security fund. Also, social security contributions of the self-employed are accounted for under the employees' social security contributions.

More formally, private sector enterprises pay a statutory social security contribution rate of $t_{FSSC} = 0.2375$ on the gross wages paid out to their dependent workers. Gross wages for dependent workers in the private sector are obtained by netting out the civil servants' gross wages, $Wages_{PS}$, and gross self-employed workers' income, from economy-wide gross labor income, $\theta_L Y^{FC} - T_{FSSC}$. Data limitations regarding the share of the gross

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labor income that is absorbed by self-employed workers force us to use an approximation to the statutory tax base. We assume gross private-sector labor income as the relevant tax base to be adjusted by a parameter, ξ. That is, we use

$$\xi\left(\theta_L Y^{FC} - T_{FSSC} - Wages_{PS}\right)$$

as an approximation of the statutory tax base for employers' social security contributions (see equation 7 in Table 2). Note that, because self-employed workers' income is non-zero, a value of ξ below one is determined.[5]

Tax policy evaluation models do not generally distinguish between public and private sector employees, much less between dependent and self-employed workers. As presented by equation (8) in Table 2, firms' social security contributions, T_{FSSC}, are computed as a fraction, τ_{FSSC}, the effective firms' social security contributions rate, of the economy-wide gross labor income.

To determine how changes in the statutory tax rate, t_{FSSC}, induce changes in the effective tax rate, τ_{FSSC}, we factor out T_{FSSC} in equations (7) and (8) of table 2 to obtain expression (9) in table 2. This differential effect is computed according to:

$$\frac{\partial \tau_{FSSC}}{\partial t_{FSSC}} = \left(\frac{\partial T_{FSSC}}{\partial t_{FSSC}}\right)^{-1} \frac{\partial T_{FSSC}}{\partial \tau_{FSSC}}.$$

3.2 Employees' social security contributions

We estimate that employees' social security contributions, or *contribuições dos empregados para a segurança social*, T_{WSSC}, averaged 4.1 per cent of GDP at market prices over the period 1990-1998.

Dependent workers in all sectors, private and public, pay a statutory social security contributions rate of $t_{WSSC}^{dep} = 0.11$ on their gross labor income. Gross wages for dependent workers are computed as the sum of gross dependent labor income in the private sector, $\xi(\theta_L Y^{FC} - T_{FSSC} - Wages_{PS})$, and gross labor income in the public sector, $Wages_{PS}$.

Self-employed workers, however, whose contributions are included in T_{WSSC}, can choose their con-

tribution base – between 1 and 12 statutory minimum wages – as well as a statutory contribution rate of $t_{WSSC}^{se,min} = 0.254$ or $t_{WSSC}^{se,max} = 0.32$ – depending on whether they want a mandatory minimum or a broader coverage, respectively. This fact introduces a great degree of ambiguity in the definition of both the tax base and the tax rate for self-employed workers. All we can infer is that, on average for the 1990-1998 period, social contributions from self-employed workers, $t_{WSSC}^{se,min} B_{WSSC}^{se,min} + t_{WSSC}^{se,max} B_{WSSC}^{se,max}$, amount to 0.2624 per cent of GDP at market prices, approximately 6.5 per cent of all employees' social security contributions.[6]

Once again, as tax policy evaluation models are often highly aggregated, we write T_{WSSC} as a fraction, τ_{WSSC}, the effective social security contributions rate, of gross economy-wide labor income (see equation 11 in Table 3).

Finally, in computing the correspondence between statutory and effective tax rates we focus only on dependent workers because both the contribution base and the contribution rate for self-employed workers cannot be determined. The differential effect, by which changes in the statutory tax rate for dependent workers, t_{WSSC}^{dep}, induce changes in the effective tax rate, is easily determined as equation (12) in Table 3.

4. THE PERSONAL INCOME TAX

4.1 General aspects of the PIT base

Under the Portuguese tax legislation (CIRS) the personal income tax (PIT, hereafter) is designated by *imposto sobre o rendimento de pessoas* singulares, or IRS. We estimate that personal income tax revenues, T_{PIT}, averaged 6.1 per cent of GDP at market prices for the period 1990 to 1998.

The taxable unit is the family, which is composed of either a married couple living in a joint household with their dependent children, or separated persons, unmarried parents and their dependents. A married couple living in a single household is taxed according to an income splitting system which allows spouses to divide their

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(5) Our calculations imply that of the total gross labor income, civil servants, private dependent workers, and self-employed workers receive 38.64 per cent, 58.89 per cent, and 2.47 per cent, respectively.

(6) It is interesting to note that if all self-employed workers had opted for the maximum coverage, implying that $B_{WSSC}^{se,min} = 0$, then, on average, the contribution base chosen would have been equivalent to 93.35 per cent of their gross labor income.

Table 2

EMPLOYERS' SOCIAL SECURITY CONTRIBUTIONS

In statutory terms

$$T_{FSSC} = \xi.t_{FSSC}\left[\theta_L\left(Y^{MP} - T_{VATET}\right) - T_{FSSC} - Wages_{PS}\right] \tag{7}$$

In effective terms

$$T_{FSSC} = \tau_{FSSC}\left[\theta_L Y^{FC} - T_{FSSC}\right] \tag{8}$$

How a change in the statutory tax rate induces a change in the effective tax rate

$$\frac{\partial \tau_{FSSC}}{\partial t_{FSSC}} = \frac{\left(1 + \tau_{FSSC}\right)^2}{\theta_L Y^{FC}} \cdot \frac{\xi\left[\theta_L Y^{FC} - Wages_{PS}\right]}{\left(1 + \xi t_{FSSC}\right)^2} \tag{9}$$

Data

$T_{FSSC} = 0.05Y^{MP}, t_{FSSC} = 0.2375, Wages_{PS} = 0.13818Y^{MP}, T_{VATET} = 0.142Y^{MP} \; \theta_L = 0.475$

Parameters

$\xi = 0.959686$

The calculated effective tax rate

$\tau_{FSSC} = 0.139841$

The calculated differential effect

$\dfrac{\partial \tau_{FSSC}}{\partial t_{FSSC}} = 0.546565$

Sources: DGEP (1999), *INE Contas Nacionais,* Authors' calculations.

combined income to avoid a higher tax rate. Individuals are deemed to be residents if they remain within Portuguese territory for more than 183 days. Residents in Portugal are liable to IRS on their worldwide income. Non-residents are liable to IRS only on income derived in Portugal, subject to a myriad of bilateral international tax agreements.

In Portugal, the PIT is a levy on the family's entire income, irrespective of its source. In practice, though, capital and non-capital incomes are taxed quite differently. Capital income is paid out net of a flat tax immediately withheld at the source. Non-capital income, on the other hand, which is essentially comprised of labor and pension incomes, benefits from certain deductions that are contingent on the behavior and characteristics of the household, and is then subject to a progressive tax rate structure. Tax credits then effectively lower the family's tax burden. For these reasons we analyze the taxation of capital and non-incomes separately. It should be pointed out

that such a distinction is also common in tax policy evaluation models.

Until recently, the concept of income encompassed nine categories, which differed with respect to the source of income: employment income including fringe benefits, self-employment income, income from commerce and industry, income from agriculture, investment or capital income, real-estate income, capital gains, pensions including annuities and alimony payments, and other income which included proceeds from lotteries, gambling and other games of chance.[7]

Even though capital income is one of the nine income categories considered, the taxpayer can choose whether or not to report in his PIT return the capital income he has received and on which a rate of t_r was already levied (see section 4.3.). Nat-

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[7] As of 2001, the number of categories is reduced to six – basically, self-employed, commercial, industrial and agricultural income merge into a single category called business and professional income.

Table 3

EMPLOYEES' SOCIAL SECURITY CONTRIBUTIONS

In statutory terms

$$T_{WSSC} = t_{WSSC}^{dep} \left\{ \xi \left[\theta_L \left(Y^{MP} - T_{VATET} \right) - T_{FSSC} - Wages_{PS} \right] + Wages_{PS} \right\} + t_{WSSC}^{se,min} . B_{WSSC}^{se,min} + t_{WSSC}^{se,max} . B_{WSSC}^{se,max} \tag{10}$$

In effective terms

$$T_{WSSC} = \tau_{WSSC} \left[\theta_L Y^{FC} - T_{FSSC} \right] \tag{11}$$

How a change in the statutory tax rate induces a change in the effective tax rate

$$\frac{\partial \tau_{WSSC}}{\partial t_{wssc}^{dep}} = \frac{\xi \left(\theta_L Y^{FC} - T_{FSSC} - Wages_{PS} \right) + Wages_{PS}}{\theta_L Y^{FC} - T_{FSSC}} \tag{12}$$

Data

$T_{WSSC} = 0.041 Y^{MP}, t_{WSSC}^{dep} = 0.11, t_{WSSC}^{se,min} = 0.254, t_{WSSC}^{se,max} = 0.32,$

$T_{VATET} = 0.142 Y^{MP}, \qquad T_{FSSC} = 0.05 Y^{MP}, \qquad \theta_L = 0.475, \qquad Wages_{PS} = 0.13818 Y^{MP}$

Parameters

$\xi = 0.959686, t_{WSSC}^{se,min} . B_{WSSC}^{se,min} + t_{WSSC}^{se,max} . B_{WSSC}^{se,max} = 0.002624 Y^{MP}$

The calculated effective tax rate

$\tau_{WSSC} = 0.114669$

The calculated differential effect

$\dfrac{\partial \tau_{WSSC}}{\partial t_{wssc}^{dep}} = 0.975266$

Sources: DGEP (1999), Authors' calculations.

urally, he will only choose to report this income as long as the marginal tax rate he is subject to, on all of his personal income, is strictly smaller than t_r, in which case he is entitled to a rebate. As such, to simplify matters, we assume that capital income is only paid out to high-earning households, who would choose not to report their capital income in their PIT returns because doing so would entail paying higher taxes.

4.2 Non-capital income

We estimate that the PIT revenues corresponding to the taxation of non-capital income, T_{NCI}, averaged 3.224 per cent of GDP at market prices from 1990 to 1998. We base our calculation on the taxation of non-capital income on a tax calculator developed at the Ministry of Finance. A family's personal income levy is computed on the basis of the information annually reported to the tax authorities in the form of a tax return. DGITA (1999) is a 1997 database that contains 40000 of these in-

dividual tax records. This information is primarily used to build a tax calculator that performs tax policy analyses in a micro-simulation framework. By definition, the 1997 vintage of this instrument contains the mathematical formulas that the Treasury then used to determine how much personal income tax each person had to pay on the income received. In general, the tax calculator as a whole can be considered the expression of the PIT in statutory terms. On aggregate, such calculations allow us to compute the fraction, $\tau_{PIT,NCI}$, of the non-capital income reported that was paid in personal income tax.

Essentially, non-capital income comprises labor and taxable pension income, including dependent workers' and self-employed workers' income as well as business income from the non-incorporated sector. This suggests that we define the non-capital income base for PIT purposes as:

$$\left(1 - \tau_{WSSC}\right)\left(\theta_L Y^{FC} - T_{FSSC}\right) + \varphi\,TR,$$

where $\left(1 - \tau_{WSSC}\right)\left(\theta_L Y^{FC} - T_{FSSC}\right)$ is gross labor income net of employees' social security contributions, and TR represents old age, survivors', and disability pensions, only a fraction, φ, of which enters the PIT base. This fraction corresponds to the percentage of all pensions that exceed a multiple of the annual statutory minimum wage.[8]

In computing the net income of each income category, a percentage of expenses on activities directly related to generating such income is deductible. In 1997, these deductions included unreimbursed health-related expenditures, interest on health-related loans, compulsory pension payments, a part of home mortgage interest payments, a fraction of premiums paid on qualifying insurance policies, trade union dues, education expenses, housing and living expenses for the elderly, costs with the acquisition of equipment for producing renewable energy, and part of the contributions made to a complementary pension plan.[9]

After deducting certain expenses from total gross income, the resulting balance is the taxable base to which a progressive tax rate structure is applied. This is depicted by equation (13) of table 4, where net income, *RL*, that is total income minus specific deductions, is subject to a rising schedule of marginal tax rates, $t_{PIT,1} < \ldots < t_{PIT,4}$, one for each of the income brackets that have $E_0 < \ldots < E_3$ as their upper limits. See Table 4 for the parameterization of these variables in 1997.

It should be noted that reporting income for PIT purposes is only compulsory for households with gross annual incomes that exceed the threshold of fourteen times the monthly statutory minimum wage, that is E_0. The proportion of all non-capital income that is received by these households is $\Pr\left(RL < E_0\right) = 5.4\%$ (DETEFP 1997). For this reason, the DGITA (1999) income base had to be scaled up by dividing it by $1 - \Pr\left(RL < E_0\right)$.

Finally, a resident taxpayer may then credit against his final tax liability certain lump-sum amounts. This is the case of family credits, which increase with the number of dependents and depend on the marital status of the taxpayer. Also, if the tax payer received rent income, he can credit the lowest of the following two amounts: the municipal real estate tax, or *contribuição autárquica*, that was paid on the underlying real estate, and a fraction, the share of rent income in total non-capital income, of his pre-tax credits PIT levy.

With the effective tax rate, $\tau_{PIT,NCI}$, determined using the tax calculator, after plugging in values for all the known variables of equation (14) in Table 4, PIT revenues levied on non-capital income are estimated at 3.224 per cent for the 1990-1998 period.

A different statutory tax rate exists for each of the non-capital income brackets. Therefore, there are just as many correspondences between the statutory tax rates and the non-capital income effective tax rates. For illustration purposes we chose to present how a change in the statutory tax rate of the highest income bracket, $t_{PIT,4}$, would induce a change in the effective non-capital income tax rate, $\tau_{PIT,NCI}$. This is depicted by equation (15) in Table 4. Put simply, it means that a change in the statutory tax rate, $t_{PIT,4}$, only impacts the effec-

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(8) In 2000, with the monthly statutory minimum wage at PTE 63800, and the exemption limit for pensions set at PTE 1482000, this multiple was set at 1.6592.

(9) In 1999, for equity reasons, the expensing regime was changed. Certain expenses, such as unreimbursed health expenditures, insurance premiums, spending on old age and nursing homes, and real estate expenses, that used to be claimed as deductions to total income were then transformed into tax credits.

<div align="center">

Table 4

PERSONAL INCOME TAX: NON-CAPITAL INCOME

</div>

In statutory terms ... according to the tax calculator model

$$\tau_{PIT,NCI} = \left\{ \sum_{i=1}^{40,000} RL_i \left(RL_i \geq E_0 \right) \left[1 - \Pr\left(RL < E_0 \right) \right]^{-1} \right\}^{-1} \cdot$$

$$\cdot \left\{ t_{PIT,1} \left[\sum_{i=1}^{40,000} \left(E_1 - E_0 \right) 1\left(RL_i \geq E_1 \right) \right] + \right.$$

$$+ t_{PIT,2} \left[\sum_{i=1}^{40,000} \left(E_2 - E_1 \right) 1\left(RL_i \geq E_2 \right) \right] +$$

$$+ t_{PIT,2} \left[\sum_{i=1}^{40,000} \left(RL_i - E_1 \right) 1\left(E_2 > RL_i \geq E_1 \right) \right] +$$

$$+ t_{PIT,3} \left[\sum_{i=1}^{40,000} \left(E_3 - E_2 \right) 1\left(RL_i \geq E_3 \right) \right] +$$

$$+ t_{PIT,3} \left[\sum_{i=1}^{40,000} \left(RL_i - E_2 \right) 1\left(E_3 > RL_i \geq E_2 \right) \right] +$$

$$\left. + t_{PIT,4} \left[\sum_{i=1}^{40,000} \left(RL_i - E_3 \right) 1\left(RL_i \geq E_3 \right) \right] - Credits \right\} \tag{13}$$

In effective terms

$$T_{NCI} = \tau_{PIT,NCI} \left[\left(1 - \tau_{WSSC} \right) \left(\theta_L Y^{FC} - T_{FSSC} \right) + \varphi\, TR \right] \tag{14}$$

How a change in the highest statutory tax rate, $t_{PIT,4}$, induces a change in $\tau_{PIT,NCI}$

$$\frac{\partial \tau_{PIT,NCI}}{\partial t_{PIT,4}} = \sum_{i=1}^{40,000} \left(RL_i - E_3 \right) 1\left(RL_i > E_3 \right) \cdot$$

$$\cdot \left\{ \sum_{i=1}^{40,000} RL_i 1\left(RL_i \geq E_0 \right) \left[1 - \Pr\left(RL < E_0 \right) \right]^{-1} \right\}^{-1} \tag{15}$$

Data

$$T_{PIT} = T_{CI} + T_{NCI} = 0.061 Y^{MP}, \ \ TR = 0.093 Y^{MP}, \ \ \Pr\left(RL < E_0 \right) = 0.054,$$

$$\theta_L = 0.475, \ \ \varphi = 0.075, \ \ t_{PIT,1} = 0.15, \ \ t_{PIT,2} = 0.25, \ \ t_{PIT,3} = 0.35, \ \ t_{PIT,4} = 0.40,$$

$$\text{In 1997 } (PTE): E_0 = 793800, \ \ E_1 = 1050000, \ \ E_2 = 2435000, \ \ E_3 = 6150000,$$

Parameters

$$T_{NCI} = 0.03224 Y^{MP}$$

The calculated effective tax rate

$$\tau_{PIT,NCI} = 0.09964$$

The calculated differential effect for the tax rate associated with the highest income bracket

$$\frac{\partial \tau_{PIT,NCI}}{\partial t_{PIT,4}} = 0.07100$$

Sources: DETEFP (1997), DGEP (1999), DGITA (1999), Authors' calculations.

PERSONAL INCOME TAX: CAPITAL INCOME

In statutory terms

$$T_{CI} = t_r \left(r^{PD}PD + OII + \Gamma.\Pi \right) \tag{16}$$

In effective terms

$$T_{CI} = \tau_r \left(r^{PD}PD + OII + \Gamma.\Pi \right) \tag{17}$$

How a change in the statutory tax rate induces a change in the effective tax rate

$$\frac{\partial \tau_r}{\partial t_r} = 1 \tag{18}$$

Data

$$T_{PIT} = T_{NCI} + T_{CI} = 0.061Y^{MP}, \ t_r = 0.20, \ r^{PD} = 0.0525, \ PD = 0.6321Y^{MP}$$

Parameters

$$T_{CI} = 0.02876Y^{MP}, \ OII = 0.10851Y^{MP}, \ \Gamma.\Pi = 0.0021Y^{MP}$$

The calculated effective tax rate

$$\tau_r = t_r = 0.20$$

The calculated differential effect

$$\frac{\partial \tau_r}{\partial t_r} = 1$$

Sources: DGEP (1999), Authors' calculations.

tive tax rate by altering the tax liability of the households with the highest incomes.

4.3 Capital income

We estimate that personal income taxes levied on reported capital income, T_{CI}, averaged 2.876 per cent of GDP at market prices from 1990 to 1998.

According to the CIRS, capital income is subject to a flat tax, t_r the proceeds of which are withheld by the payer at the source and then handed to the Treasury. This means that capital income is paid out net of taxes.

At the PIT margin, three components make up the capital income base – interest received on national public bonds, $r^{PD}PD$, other interest income such as interest received on saving certificates and bank deposits, OII, and distributed profits, that are a fraction, Γ, of after-tax corporate profits, Π. It should be noted that the capital income that is paid out and reported to the tax authorities gener-

ally differs from the capital share in the economy, θ_K, because not all firms belong to the incorporated sector, these may choose to retain part of their earnings, and finally, some of the distributed profits will inevitably escape taxation. This suggests that we define capital income, reported for personal income tax purposes, as:

$$CI = r^{PD}PD + OII + \Gamma.\Pi.$$

Under the assumption that the average gross yield of a Treasury bond is 5.25 per cent in real terms, and knowing that public indebtedness averaged 63.21 per cent of GDP at market prices from 1990 to 1998 (DGEP, 1999), straightforward arithmetic suggests that other interest income plus distributed corporate profits, $OII + \Gamma.\Pi$, averaged 11.061 per cent of GDP at market prices from 1990 to 1998.

Finally, it should be noted that, because neither deductions nor tax credits are considered, capital

income taxation at the PIT margin is written in the same way both in statutory and in effective terms. Obviously then, the differential effect is unitary.

5. SOME CONCLUDING REMARKS

In this paper, we focus on direct taxes and we formally discuss the correspondences between statutory and effective tax rates in the Portuguese economy. The corporate income tax, employer's social security contributions, employees' social security contributions, and the personal income tax are considered in great detail. The correspondence between statutory and effective tax rates depends on the details of the Portuguese tax law, on a wealth of data information, as well as on certain priors about the values of behavioral parameters in the economy. In addition to the general correspondences, we present our own estimates of the effective tax rates at the different tax margins. In doing so, detailed tax information was organized in a systematic way and the main characteristics of the Portuguese tax system were sketched and parameterized.

The information in this paper was recently put to good use by Pereira and Rodrigues (2000a, 2000b), in the context of an ongoing research project on tax reform in Portugal. In the ambit of Social Security reform, see Pereira and Rodrigues (2001b). More importantly, however, using the technical information in this paper practitioners of tax policy evaluation can obtain their own estimates of the relevant tax parameters to be used in their own work.

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