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Questa è la Versione finale referata (Post print/Accepted manuscript) della seguente pubblicazione:

*Original Citation:*

The IRAP Module / R.Bardazzi; F. Gastaldi; M.G. Paziienza. - ELETTRONICO. - Deliverable 5.2:(2002), pp. 3-51.

*Availability:*

The webpage <https://hdl.handle.net/2158/777226> of the repository was last updated on

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DEVELOPMENT OF A SYTEM OF INDICATORS ON COMPETITIVENESS AND  
FISCAL IMPACT ON ENTERPRISES PERFORMANCE



*Università degli Studi di Firenze*

This activity falls within WP 5  
deliverable number 5.2

**Report describing country IT  
indirect tax base rules module**

**The IRAP Module**

by

Rossella Bardazzi, Francesca Gastaldi, and Maria Grazia Pazienza

## Deliverable 5.2 - Report describing Country IT indirect tax base rules module

# The IRAP module

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## **Preliminary Remarks**

*In building a microsimulation model for firms, the Unit at the University of Florence focused its work on indirect taxes paid by firms and on their impact on the performance of the latter (within Work Package 5), while the Unit at the University of Tor Vergata deals with corporate taxes (Work Package 6) . We have reviewed Value Added Tax (VAT) , social security contributions (SSC), excise taxes on production and IRAP (Imposta regionale sulle attività produttive – Regional Tax on Productive Activity).*

*To the best of our knowledge, microsimulation models of indirect taxes at firm level have never been built. Moreover, some of these taxes are applied in several EU countries and hence any research experience acquired in this field may be shared within the European Community. In fact, VAT plays a key role in the harmonized European fiscal system; excise taxes on energy products are becoming more and more a policy instrument not only with fiscal objectives but also with environmental purposes in many European countries; and social security contributions are often referred to in the debate on employment as a policy instrument for reducing labour cost.*

*Therefore, the challenge and the scientific interest in this project is very high.*

*On the basis of a detailed analysis of all data available (survey and balance sheet data), we have ranked indirect taxes in order of ‘modelling feasibility’ as follows:*

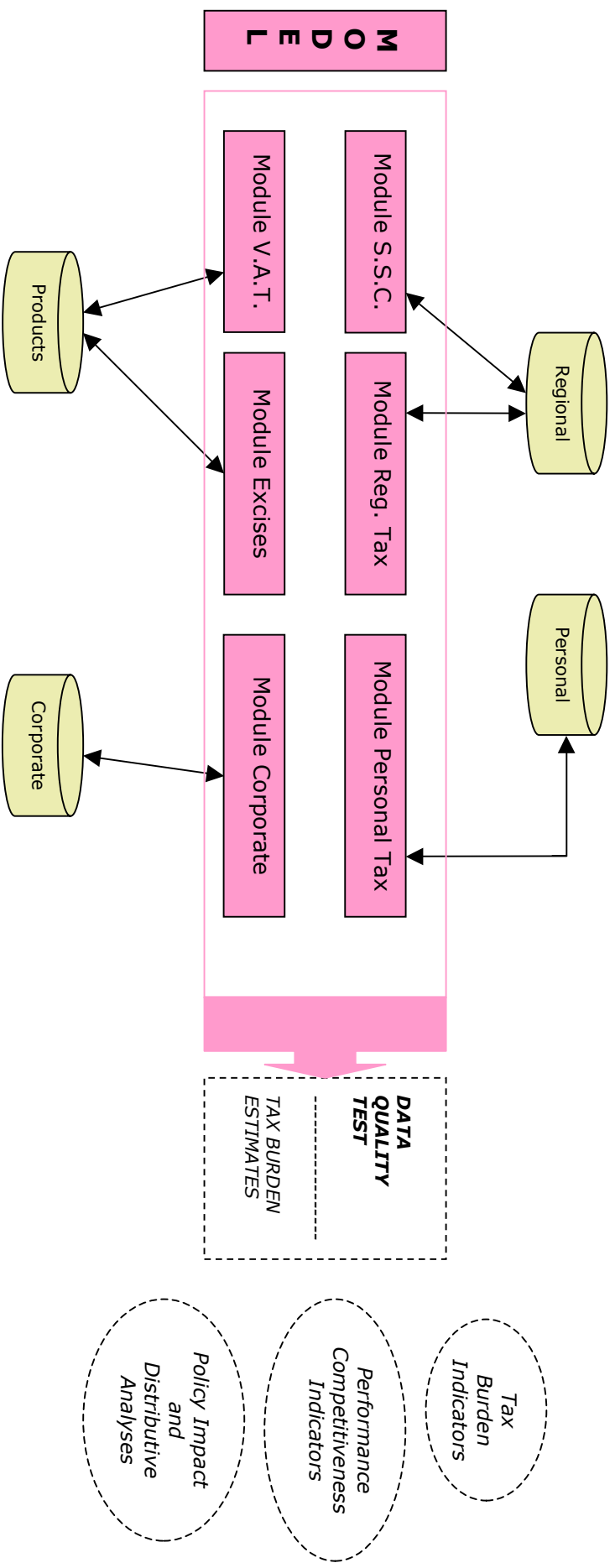
- 1. IRAP*
- 2. Social Security Contributions*
- 3. VAT*
- 4. Excise Taxes*

*For IRAP and SSC the tax base can basically be reconstructed by using the survey data (as explained in detail for IRAP in Section 3 of this deliverable), therefore the Regional Tax and Social Security Dataset has been built. On the other hand, for VAT and excise taxes modelling further data sources should be acquired and integrated.<sup>1</sup> An additional dataset (PRODUCTS) should be prepared as shown in Figure 1.*

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<sup>1</sup> This issue has been explained in our document “Problems in the definition of a final dataset”, presented in the meeting on the “Data needs for Indirect Taxes Modules: Integration Issues” held in Florence, 13 June 2002.

Figure 1 – The Microsimulation Model



Source: DIECOFIS, Deliverable 2.2, “Analysis of the Software” (2002).

## 1. The 1998 Fiscal Reform: the Introduction of IRAP

The 1998 reform represented the first time since 1973 that the regime underwent a wide restructuring. The production of norms and regulations as of 1996 turned to different areas, albeit with the similar main objective of achieving *neutrality* and *efficiency*. New norms have modified personal income, corporate income, income on capital, VAT and minor indirect taxes, local taxation, tax assessments, sanctioning penalties and litigation procedures. The tax reform affected all entities carrying out economic activity and established a substantial restructuring of revenue which regarded both the type of economic entities concerned as well as the level of government involved.

Focusing on matters which most affect levies on corporate income, it is opportune to highlight that the reform, that came into effect in 1998, was aimed at reaching certain specific objectives:

- ◇ simplifying of the system for taxpayers having productive activities;
- ◇ a movement towards decentralization and tax competition between regions;
- ◇ greater neutrality of the system in regard to choices of sources of financing and company input;
- ◇ decrease in the cost of labour as an impetus for increased employment;
- ◇ possible emergence of the tax base for companies that are structurally at a loss for income tax purposes.

In regard to the objective of *simplification* it may be recalled that the Irap tax substituted several other taxes and social contributions, that had been part of a system that was particularly confusing mostly due to the complex tax rate charts for health assistance contributions. This change gave way to the substitution of tax revenues of 90.000 billion Lire (46 billion Euros), according to the break down illustrated below in Table 1.

**Table 1 - Taxes eliminated with the 1998 reform (Billions of Euros)**

<b>Contributions to health system</b>	29.710
- private employers	11.719
- state employers	7.488
- hired employees and pensioners	3.111
- tax on health	6.165
- minor taxes	1.228
<b>ILOR tax</b>	11.301
<b>Tax on net equities</b>	3.615
<b>Tax on VAT number</b>	421
<b>Iciap tax and other concessions</b>	1.291
<b>Total</b>	46.338

In regard to *the move towards decentralization*, the new system of financing for local authorities centers on IRAP and the regional IRPEF surtax, taxes which are destined to become the focus of regional tax autonomy. The fact is, however, that for both these taxes it is not exactly accurate to refer to autonomy, even without obligations of allocation of revenue. As a matter of fact, for both IRAP and the IRPEF surtax, the decentralized institutions have the possibility of maneuvering the tax rates, albeit within quite restrictive limits, without any power to affect the setting of the tax bases. Indeed, for both taxes, local institutions are subject to effects of changes to tax bases established on a state level, a fact which has already manifested itself with the recent Finance Laws. In addition to the lack of autonomy in setting bases, it should also be noted that, in regard to IRAP, there has been much criticism over the fact that local authorities have been attributed a tax which has a highly disproportionate tax base on a national level and, moreover, which is characterized by substantial mobility. The choices of regional institutions, in setting different tax rates, might, on one hand, discord with regulations set by the central government, and on the other hand, be overly conditioned by horizontal tax competition (an attempt by regions to attract business by granting tax advantages). Furthermore, the existence of a tax with a highly disproportionate base needed to be coupled with the institution of a complicated interregional system for equalization.

Also the objectives of *neutrality and decreasing of the cost of labour* were pursued through the introduction of the new tax (further details to follow in subsequent paragraphs). It is, however, important to recall that the objective of progressively reducing tax discrimination between the different sources of financing, was also pursued through a dual taxation, known as *Dual Income Tax*, which changes the tax levy on corporate income tax (Irepeg) with the specific objective of favoring company savings.

Among the objectives that are not actually explicitly stated, the lowering of tax burden on companies must be added. The law provided for a revenue-neutral reform. However, the result of the enactment of the reform has shown lower revenue than what was expected, lower by

approximately 6,5 billion Euros. Moreover, this discrepancy is not deemed to have been entirely "unforeseen".<sup>2</sup>

To conclude this very brief overview, the Table below summarizes the main objectives and principles behind each change.

**Table 2 – The 1998 Fiscal reform: objectives and content**

Objectives	Regulation enacted	Content
Redistribution of tax burden	Leg. D. 446/97 and 466/97 establishing Irap and Dit	Reduction of tax rate calculated on company earnings from 53.2% to 41.25%.
	Restructuring of Irpef rates	Reduction of tax brackets from 7 to 5. Reduction of maximum rate from 51% to 46% and increase of minimum rate from 10% to 19%.
Gaining neutrality in regard to company investment and financing choices – incentives for company savings	Leg. D 466/97: Dit Leg. D. 9/00 Superdit  Leg. D. 461/97: readjustment of taxation on financial activity	Reasoning based on taxing of surplus profit Rendering taxation on financial activity homogeneous
Reduction of tax evasion	Leg. D. 446/97 establishing Irap	Extension of tax base
Reduction of tax evasion	Putting into operation of 'sector studies'	Effecting inductive verifications
Simplifying relations between Tax Authorities and tax payer	Leg. D. 471/97 + 472/97 – reform of penalty system and introduction of tax payment agreements  Telematic tax returns as of 1999.	Transparency Certainty Introduction of mechanisms for compensation of tax credit and tax debt  Use of telematic tools
Incentives for for investments in cash	L. 133/99 "Visco" law.	Reduction of tax burden

Source: Di Majo, Paziienza, Triberti (2002).

<sup>2</sup> For an analysis of differences in tax burden between two fiscal regimes see Lusignoli and Paziienza (2001), and Gavana, Majocchi, Marenzi (2001).

## 1.1 The characteristics of the tax

One of the factors that the reform was based on is without a doubt the establishment of the Regional Tax on Productive Activity (IRAP). In addition to helping the move towards tax decentralization, Irap was specifically meant to simplify and achieve greater neutrality in choices made by companies.

IRAP is a tax on the value added by the company net of amortizations and depreciations, with the exclusion therefore of deductibility of interest incurred and the cost of labour. Those who are subject to IRAP are companies that carry out an independently organized activity, directly aimed at the production or the trading of goods or the rendering of services. IRAP must be paid by individuals or entities who carry out this type of activity, including both private and public institutions, as well as state administrative institutions and bodies<sup>3</sup>.

Generally speaking, the IRAP tax base can be calculated, with a hypothetical calculation of production, by subtracting the sum of purchases for intermediary goods, service costs and amortization and depreciation from the total turnover. From a perspective of distribution of product, IRAP affects items with value added, such as salaries, earnings and earnings on capital (interest incurred)<sup>4</sup>. More specifically, the determination of this base is rather complicated and is also differentiated by type of production. In general, for public limited companies and commercial institutions (public and private) obligated to keep a graduated income statement, the base is determined (Table 3) by the difference between the value of production (letter A of the income statement - art. 2425 of the civil code) and the costs indicated in numbers 6, 7, 8, 10 let. a) and b), 11 and 14, except for any losses on receivables (art. 1, section 2, let. a), Leg. D. 176/1999, of let. B) of the income statement (art. 2425 of the civil code). Therefore, costs for personnel (hired employees and coordinated and continuative collaborators)<sup>5</sup>, devaluations and provisions are non-deductible.

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<sup>3</sup> Among taxpayers subject to IRAP are Irpeg taxpayers who include, in addition to public limited companies, organizations whose sole or main activity is commercial, non-commercial organizations and the public administration (including state bodies and administrative institutions exempt from Irpeg) and companies and organizations of any type that are not resident in Italy. Taxpayers subject to Irpef include private and individual partnerships carrying out commercial activity, individuals, general partnerships and equivalent companies carrying out free-lance activity; agricultural producers save for those exempt from VAT.

<sup>4</sup> For a proposal which, among other things, provided for a value added tax in the place of social contributions see Di Majo (1986).

<sup>5</sup> In actuality there are some lesser components in the cost of labour which may be deducted from the tax base, such as INAIL contributions, expenses for apprentice workers and 70% of costs for work training contracts. For more details on the determining of the tax base see, among others, Bosi and Guerra (2002).

**Table 3 - IRAP tax base for companies (non-finance institutions)**

<b>A) <u>PRODUCTION REVENUES</u></b>
1) <b>revenues from goods and services;</b>
2) <b>variation in work in progress, semi-finished products and finished goods;</b>
3) <b>variation in contract work in progress;</b>
4) <b>Increase on internal work capitalized under fixed assets;</b>
5) <b>other revenues and income, with separate itemization for contributions on accounts.</b>
<b>B) <u>PRODUCTION COSTS</u></b>
6) <b>raw materials, consumables and supplies;</b>
7) <b>services;</b>
8) <b>use of third party assets;</b>
9) <b>personnel expenses:</b>
a) wages and salaries;
b) social security contributions;
c) employee leaving entitlement;
d) pension and similar costs;
e) other costs;
10) <b>amortization and depreciation:</b>
a) <b>amortization of intangible fixed assets;</b>
b) <b>depreciation of tangible fixed assets;</b>
c) other write-downs of fixed assets;
d) <b>write-downs of receivables and liquid funds included under assets forming part of working capital;</b>
11) <b>variations in raw materials, consumables, supplies and goods;</b>
12) provision for contingencies;
13) other provisions;
14) <b>other operating costs.</b>

*Note:* For the determination of the tax base we refer only to the items in bold.

The new tax also affects the product of finance institutions, with necessary adjustments to the tax base. Net earnings from the spread on interest must be summed up (interest received minus interest paid) with the net earnings from commissions (commissions received minus commissions paid on intermediary activity) and the adjustments in value subtracted. For banks, the tax base for IRAP affects the cost of labour and profits but not the interest paid, which, for banks, is a main cost of production (likened to the cost of raw materials for an industrial company). Special determinations of the tax base are also provided for institutions belonging to the public administration. For these, the tax base refers to (consistent with as much established by national accounting policies) only the cost of labour<sup>6</sup>.

The decree implementing IRAP specifies that the tax must be paid to the region in which the value of production is actually produced. For companies which produce with local plants in several

<sup>6</sup> The 2001 Finance Bill subsequently excluded from the tax base scholarships, grants and similar concessions issued by local authorities and universities.

regions, the problem arises of *territorial division of the tax*. Generally, the criteria adopted is a criteria which considers the location of the labour input in the different territories. So, specifically, the net production value is considered produced in the territory of each region in a proportion that corresponds to the sum of the remuneration due to personnel (for any reason) in service consistently for a period of no less than three months. For financial intermediaries, the indicators used are those tied to specific activity of the sector such as the collection of deposits and premiums, whereas for agricultural industries it is the amount of land that is taken into consideration. This element of IRAP stirs up however some perplexities: it is deemed, in fact, that the decentralization of responsibility for expenses and the choice of resources will likely create competition between the different jurisdictions. The policy of attracting productive activity, through offers of services or lessening of tax burdens, will most certainly be an important factor in the future structure of regional economic policies. However, these provisions might risk assuming characteristics associated with stabilizing policies, which, generally, are associated by scholars to exclusively higher levels of government. This is why it becomes important to know exactly where, for example, in Tuscany companies have factories and plants - in spite of their having registered headquarters in Lombardy - and thus evaluate closely the effect this part of the production of regional value added tax has on variations to the tax burden. In fact, the condition that makes for the payment of the tax to region "A" rather than to the region of the fiscal domicile of the company paying the tax (region "B") is that a specific quantity of the work input – generally speaking – has been used consistently for more than three months also in region "A". This, however, does not mean that we are necessarily dealing with a stable presence which could be likened to an industrial plant and that therefore it must be taken into consideration in evaluating the future evolution of the regional tax base.

The IRAP rate is set at 4,25 per cent and as of 1 January 2000 each region has the power to vary the rate (be it an increase or a decrease) within a 1 percent margin, also differentiating between different productive sectors and different categories of taxpayers. In spite of this, a provisional regime has been adopted which sets a concessional rate for the agricultural sector (from 1,9% in 1998 to eventually reach 4,25%) and a higher rate for the financial sector (from 5,4% for the three year period between 1998-2000 to the standard regime in 2003).

Special regimes regard, among other things, companies relating to their location, the size of the business and the existence of new productive activity. As far as the location, to a substantial degree, the regulations absorbed tax relief provisions which were already in force: a special deduction was provided for companies located in southern Italy (in compensation for the benefits of exemption from social contributions) and the existing ten year exemptions for local income tax was upheld.

For small-sized companies (commonly known as *imprese minime*)<sup>7</sup> the determination of the tax base for IRAP is a flat rate figure obtained by adding labour costs and interest incurred to the flat rate income (obtained as a product of profits and certain standard coefficients which vary according to the activity carried out). Lastly, a reduction of 50% is provided for the first three years of the tax due for new productive activities (within the limit of 5 million per year). This is a case of a reduction of the tax burden in relation to the size of the company which is decided at a central level, that has an immediate effect on the resources available to the regions. Here one notes that, among other things, the possibility of adjusting the tax levy in relation to size is not explicitly recognized within the sphere of regional jurisdiction, given that, at article 16, it is determined that the regions have the right to vary the rate according to different productive sectors and ‘categories’ of tax payers.

Lastly it’s worth noting that a ‘taxpayer protection clause’ has been introduced for year 1998: taxpayers were subject to the payment of Irap only up to the maximum amount of taxes that they would have had to pay with the previous fiscal regime.

## 1.2 Recent IRAP changes

Given the importance of the novelties deriving from the introduction of IRAP in the structure of tax levies on companies, several corrective measures were needed which were aimed at better defining the items of the tax base and to eliminate inconsistencies found in initial determinations of tax bases. Some of these measures were limited in scope and aimed, in particular, at the items making up the cost of labour<sup>8</sup> which were deductible from the tax base, and at avoiding the so-called “third track” (the requirement that companies keep a special bookkeeping account exclusively for IRAP in addition to bookkeeping required by civil code and for IRPEG purposes).

A more substantial change was introduced with the 2001 Finance Law, which provides a deduction on the tax base for companies whose taxable income is no greater than 181.000 Euros, to be applied prior to any eventual division of the tax base. In particular, since 2000 a fixed deduction from the tax base has been provided as follows:

- Euro 5.164,57 if the tax base is lower than 180.759,91;

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<sup>7</sup> A ‘small sized company’ is defined as a company: whose turnover is under 20 million, that has not used instrumental goods worth over 20 million, that has not exported goods, and has not paid salaries and/or wages amounting to more than 70% of the total revenues.

<sup>8</sup> It was in fact clarified that income from continuative and coordinated collaboration may not be deducted in any event with regard to the determination of tax base, whereas contributions for work disability insurance, expenses for apprenticeship contracts and work training contracts may be deducted (up to 70%). The 2001 Finance Bill also subsequently included the possibility of deducting expenses for disabled workers.

- Euro 3.873,43 if the tax base is between 180.759,91 and 180.811,56;
- Euro 2.582,28 if the tax base is between 180,811.56 and 180.863,21;
- Euro 1.291,14 if the tax base is between 180.863,21 and 180.914,85.

Since 2001, extra-ordinary revenues and costs have been included in the tax base if said items are correlated to positive and negative elements of production revenues from other fiscal years, and, as already pointed out, expenditures undertaken by disabled people are fully deductible.

A new proposal submitted in December 2001 (not yet passed) suggests the gradually abolishing of IRAP, as a part of a more general proposal to reform the present way of taxing firms.

To this same regard, the Finance Law for 2003 (not yet passed) modifies some rules. The main aim is to reduce the share of labour costs on the total tax base. To this purpose, all costs borne to hire personnel with training contracts are fully deductible (presently only 70 per cent of these are deductible). Furthermore, amounts paid for scholarships and other funds not subject to personal income tax (Irpef) are no longer subject to Irap. And lastly, firms operating in the transport sector will be exempt from paying Irap on reimbursement/compensation to travelling personnel, if these costs are not part of their total income.

The fixed deduction will be increased to 7.500 Euros if the tax base is lower than 181.000 Euros. A new deduction of 2.000 Euros will also be introduced for small firms for each employee up to a maximum number of five.<sup>9</sup> Personnel with training contracts do not count for the threshold.

Finally, some Regions have varied the tax rate (standard rate is 4,25%). In Emilia-Romagna, non-profit organizations and cooperatives are taxed at 3,5 per cent. In Friuli-Venezia-Giulia, a tax credit has been introduced for firms and professional activities. Small firms, some professionals and some cooperatives are taxed at 3,5 per cent. In Lazio, the tax rate varies between 3,25 per cent and 5,25 per cent, depending on the sector of activity. In Lombardia, banks, insurance companies and other financial firms are taxed at 5,75 per cent, whereas travel agencies are taxed at 3,25 per cent. Non-profit organizations do not pay Irap. Moreover, in Marche, Irap will be increased to 5,15 per cent (with the exception of social cooperatives which will be taxed at 3.25 per cent). Banks, insurance companies and other financial activities will be temporarily taxed at 5,75 per cent. In Toscana, commercial activities of particular interest for mountain communities will be exempt from Irap.

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<sup>9</sup> This amount has to be modified if part-time contracts are involved.

### 1.3 Economic effects

In regard to whether the economic effects are in line with the initial objectives that the project set out to achieve, it may be said that the objectives were reached, albeit with some difficulty<sup>10</sup>, to set up a system having fewer compliancy costs and with less formalities. As we have mentioned, the IRAP tax replaced a series of other taxes and social contributions that together had comprised a complex tax regime, a complexity that was mainly due to the many categories of tax rates for health contributions.

In regard to other objectives, generally speaking, it can be said that greater neutrality has been reached, in that the extended tax base and the relatively low rate (4,25%) tend to reduce the taxation discrepancy as well as impetus for tax evasion. More specifically, IRAP is characterized by its ability to effect net production value regardless of the source of financing used by the company. Interest incurred (revenues for the lender of capital) are not deductible from the tax, just as revenues paid to suppliers of risk capital are not deductible. The source of financing "debt" comes at a higher cost compared to the prior regime, in that the non-deductibility of IRAP must be included. In the previous regime, the aggregate cost of the debt was given by the interest rate minus the corporate tax deduction, which created a tax wedge of nil<sup>11</sup>. In that case, one could hypothesize (not considering personal taxes) that the gross revenues needed to pay the rate requested by the market for debt capital was the same as the net earnings. With the introduction of IRAP it is necessary to hypothesize higher earnings in order to be able to pay investors a net earning equal to market earnings<sup>12</sup>; at the same time lower earnings become necessary to pay for financing with the issuing

<sup>10</sup> Some difficulties arose in regard to the previously mentioned 'third track'.

<sup>11</sup> The tax wedge is an indicator used to measure the discrepancy caused by a tax system. It is obtained by the difference between the total cost incurred by a company that purchases an item and the net remuneration gained by the entity who sells said item. If the difference between the two is not nil, the net remuneration of the item will tend to differentiate from its marginal productivity. The tax wedge is usually related to the remuneration of the item considered, thus obtaining the marginal effective tax rate. In general, the wedge on taxes may be covered by maximizing company earnings in light of taxes to be paid:

$$P = Q(K,L) - wL - iK - tg(Q(K,L) - wL - iK),$$

P equals 'profit', Q equals 'production value', L and K equal 'the quantity of input' and w and i 'their remuneration' (in a hypothesis of only third party capital) and tg is the rate of *corporation tax* (53,2% in the regime prior to the reform).

From the usual first order conditions we can say that:

$$PM_K = i \text{ and } PM_L = w$$

Also if there are taxes on profit the optimum conditions (the productive spread equals the remuneration of the input) do not change and the tax is deemed not discrepant. If, on the other hand, out of the remuneration of debt capital, deductible from *corporation tax*, remuneration of one's own  $\gamma$  capital is considered (for simplicity we consider an extreme hypothesis of a nil *leverage*) which is non-deductible from the tax on profit we obtain:

$$P = Q(K,L) - wL - \gamma K - tg(Q(K,L) - wL), \text{ with}$$

$PM_K = \gamma / (1 - tg)$  and  $PM_L = w$  thus the marginal productivity must be higher than the tax on ordinary remuneration of input, with a wedge of  $PM_K tg$ .

<sup>12</sup> With the introduction of IRAP the function of profit (not considering amortization and depreciation) becomes:

$$P = Q(K,L) - wL - iK - tg(Q(K,L) - wL - iK) - tr Q(K,L)$$

Where tr is the IRAP rate and the relevant items thus become:

$$PM_K = i(1 - tg)/(1 - tg - tr) \text{ and } PM_L = w(1 - tg)/(1 - tg - tr)$$

In the case of financing with only risk capital, by opportunely substituting the profit function  $\gamma K$  with  $iK$  we obtain

of shares or for the use of self-financing: the burden of non-deductibility in fact is reduced, given that the total rate in proportion to profits goes from 53,2% to 41,25%<sup>13</sup>. Indeed, the increase of the tax burden on debts, slightly higher than 7%, is much lower than the savings on the source of financing (more than 20%) and thus, with the standard rate considered thus far, a company need only have a leverage lower than 86% in order to achieve a markedly lower cost of financing and, consequently, the cost of the use of capital. This becomes even more accurate if the Dit effect is considered. The Dit effect lowers the nominal rate of levy on profits, contributing to lower the levy for both sources of financing. In conclusion IRAP, with the simultaneous doing away of Ilor and the property tax, providing for the non-deductibility of the interest incurred from the tax base, tends to lower the discrimination between sources of financing.

If the structure of the new system lowered the marked discrepancy in favor of debt, thanks to a levelling out of the tax burden on the sources of financing to companies, the same cannot be said for the choice between input. The tax base was in fact set up with a provision for full deductibility of amortization and depreciation, but not of the cost of labour (except for very negligible amounts). This creates a lack of homogeneity in the treatment of remuneration of input. For the use of capital input there is no substantial change in how the tax system influences the choice of the optimum amount of input<sup>14</sup>. However, a marked reduction is found in the cost of the use of capital due to a reduction of the costs assumed by financing sources and the lower rates on profit.

On the other hand, in regard to the labour input, a tax wedge has been introduced with non-deductibility of Irapp, which did not exist in the former system. The cost of labour is in fact categorized between the two regimes as such:

$$CL_v = w*(1+c_s+c_a) \quad (1)$$

$$CL_n = w*(1+c_a)+t_r*w*(1+c_a) \quad (2)$$

where  $w$  represents remuneration,  $c_s$  health system contributions and  $c_a$  contributions that remain in the new regime, and  $t_r$  the Irapp rate. Equation (2) adds to the accounting cost of labour

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PMK =  $\gamma / (1-tg-tr)$ .

For debt financing, hypothesizing a market rate of 5%, the gross earnings needed with the new regime must be equal to 5,4% with a full Irpeg rate (tg) and the Irapp rate (tr) of 4,25%.

<sup>13</sup> With the same hypotheses already used, it may be verified that the gross earnings needed to pay the suppliers of funds the 5% was greater by 10% prior to the reform (10,7% or 12,3% depending on whether one considers property tax) and becomes 8,5% with the new regulations if one still considers a top rate on profits (53,2% in the former system and 37% after the reform) and the Irapp (tr) rate of 4,25%.

<sup>14</sup> If, in the function of profit of the company, we consider also amortization and depreciation, which are deductible from the tax on profit and Irapp, also the optimum conditions must be reconsidered to include the economic depreciation of capital and fiscal coefficients of amortization, which, in general, do not coincide with the actual depreciation.

(remuneration and social contributions) also the part of Irap payments which may be attributed to the remuneration of input considered, also if the tax is not directly in proportion to the cost of labour.

However, it is not only the calculation of the cost of labour that changes between the two regimes. After the reform, the contractual cost of labour ( $w*(1+c_a)$ ) no longer coincides with the marginal product and thus, no longer represents the marginal cost: while in the former regime the marginal cost of labour  $xl_v$ , (or the minimum earnings on labour needed to pay a remuneration equal to  $w$ ) was equal to the cost of labour  $CL_v$ , with the new system we obtain:

$$xl_n = dP/dL = w*(1+c_a) + w* \frac{t_r * (1+c_a)}{(1-t_g - t_r)} \quad (3)$$

or also

$$xl_n = \frac{w * (1+c_a) * (1-t_g)}{(1-t_g - t_r)} \quad (4)$$

with  $xl_v > xl_n$  if

$$c_s > \frac{t_r * (1+c_a)}{(1-t_g - t_r)} \quad (5)$$

Therefore, it clearly arises how a new element of non-neutrality has inserted itself in the optimum choice of companies, or rather, the marginal cost of labour becomes a function of rates on income and on the value added by companies.

## 2. Modelling Features and Data

### 2.1 Micro vs Macrosimulation

Tax policy analysis and tax revenue forecasting can be carried out using either macro or micro models. Macro models are typically based on the use of aggregate data. Simulations of fiscal policy

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<sup>15</sup> From this item it is possible to calculate parametrically the variations to marginal costs of labour between the two regimes. If standard tax rates are considered, and the rates of contributions remaining  $c_a$  of 40%, the marginal cost of labour increases, in going from the former regime to the current regime, for a rate of health system contributions which previously were paid by companies ( $c_s$ ) at more than 10,1%; this value is rather high if one considers the vast spread of exemption of health payments in industries.

changes and revenue forecasting are therefore usually provided by modelling economic relationships among institutional sectors as well as by behavioural responses.

Micro models (MM) are usually accounting models based on the use of large datasets of disaggregated data, such as household budgets (or consumption) surveys and firm surveys. Furthermore, they typically imply a partial equilibrium setting.<sup>16</sup>

Another common distinction between these two categories of models - that macro models embody behavioural responses, whereas MM do not - is only partially true, as this refers to the common use of these models, rather than a technical obstacle to embody behavioural relationships in MM.

The availability of disaggregated data, instead, marks the possibility of using MM. These kind of data may come basically in three forms:

- a) cross-sectional data;
- b) panel data;
- c) time-series of cross-sectional data.

Cross-sectional data is the most common form of disaggregated data available. This data includes a certain number of observations at a given point in time. When cross-sectional data are available for a certain number of years, but either the composition or the size of the sample change over time, we have a time-series of cross-sections. If the same sample is observed for different years (e.g. the same firms or the same households), the dataset becomes a panel. Whatever form of disaggregated data is used, micro-simulation models may be successfully built and run. Obviously, different data may produce different results and the kind of analysis that an MM can perform.

The simplest difference is between static and dynamic MM. Moreover, static MM can be understood in two different ways: a) using only one cross-section, that is, without investigating the past and projecting the future; b) not including behavioural responses, that is, considering only the first-round impact of tax policies without investigating second-round effects. Dynamic MM can also be understood in two analogous ways: a) using either repeated cross-sectional data (time-series of cross-sections) or panels; b) considering agents' behavioural reactions (e.g. elasticities).

There are some basic reasons suggesting the use of MM in fiscal policy analysis:

- the first reason draws on the obvious possibility of having refined outcomes with respect to cases in which aggregated data are used. By having individual observations and large datasets, any policy can be analysed in great detail for every firm, by considering their own budget items.

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<sup>16</sup> In the last decade, the literature on microsimulation models has become quite extensive. There are, among others, some book length reviews such as Harding (1996), Gupta and Kapur (2000), Mitton, Sutherland and Weeks (2000), and Creedy (ed.) (2002). Some relevant articles are Merz (1991), Merz (1993), Merz(1994) and Creedy (2001).

Aggregating data may cause a loss of details. This aspect is particularly important if one considers the possibility that contradictory results may derive from using either aggregated or disaggregated data. For example, aggregating a budget item with positive and negative values may lead to a wrong interpretation (misleading ?) of the effect of a specific tax policy. Aggregated data are therefore only a partial tool for analysing the effects of public actions on firms;

- as a consequence, aggregate results may be recovered by disaggregated data, whereas the reverse is not true. For example, a detailed micro-simulation analysis may end up with results divided by sector of activity, firm size, firm location, and the like. In principle, provided that the available information is included in the original dataset, there is a considerable possibility of aggregation;
- a micro-simulation model makes it easier to standardise the analysis over time. The dynamic effects of a given tax policy may therefore be analysed in a consistent way. This avoids the common drawback of using different methodologies in different times which makes for confusing results due to the real effect of tax policy as well as to effects of changing the methodology;
- when repeated cross-sectional data are available, it becomes possible to disentangle the "pure" effect of tax policies from the effects of a sample composition. Aggregate data do not allow for this kind of analysis;
- statistical large sample properties tend to generate results with lower standard errors. Under certain hypotheses about the distribution of the variables, confidence intervals of results may also be calculated.

Although microsimulation models are becoming a widespread tool for public policy analysis, most of the available and running micromodels are referred to households. This is mostly due to data unavailability and to the need of a higher requirements for intertemporal and international comparisons. Therefore, the scientific challenge of building a microsimulation model for firms has this innovative aspect .

## **2.2 Building the specific dataset**

The simulation of IRAP rules is based on a dataset called "**R**egional **T**ax and **S**ocial **S**ecurity" (RTSS). Two ISTAT surveys are combined in this dataset: the Small and Medium Enterprises survey (PMI) carried out on firms with less than 100 workers and the survey on Large Enterprises

(SCI) with more than 100 workers<sup>17</sup>. The main characteristics of RTSS are described in deliverables of WP1 (“Integration of Cross-Section and Longitudinal microdata from surveys and/or administrative registers”) and WP2 (“Concept of IT framework issues and development of software for the creation of a multi-source database”). Here, some issues are explored concerning specific features and problems with IRAP modelling. These survey data are not completely adequate to build a model for the Regional Tax. In fact, some fiscal deductions cannot be computed using these data – too aggregate – and additional data sources are exploited.<sup>18</sup>

The Unit at University of Florence has worked on a subset of records of the original RTSS dataset available at ISTAT. The base year currently available is 1998, while a new database with the 1999 surveys is under construction. Due to Italian law n.675/96 protecting the confidentiality of individual responses and establishing precise rules for processing and disseminating confidential data, the microdata of these surveys cannot be released from the Statistical Office. Therefore, a prototype microsimulation model for IRAP has been built using a sample of 305 records from the RTSS dataset. The model has been built using the STATA software, therefore the original Excel data format has been translated into the appropriate STATA format.

The list of variables included in the RTSS dataset can be found at the end of this report as Annex 1. There, an identifying code and a description of the variables are listed. In the microsimulation model, each numeric code is substituted with a variable name and the description is stored in a variable label. Although most of the variables are collected both for small and large enterprises, some data are found in only one survey and are missing from the other. Therefore, a procedure to check and substitute missing values is undertaken and a preliminary consistency check is performed. Accounting consistency is a necessary step of our simulation model and not a cursory procedure. The reasons behind this need for consistency are manifold. First of all, the simulation of tax rules may require the use of some variables of the economic accounts which are neither subtotals nor balancing items but simply components of a side of the accounts. In this case, we need to preserve both disaggregated information and accounting consistency when some changes are applied. Moreover, it is of utmost importance to point out the impact of some fiscal reforms or some minor changes in the tax rules – as we have had in Italy in recent years and will have in the

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<sup>17</sup> The acronyms PMI and SCI stand respectively for the Italian “Piccole e Medie Imprese” and “Sistema dei Conti delle Imprese”.

<sup>18</sup> A detailed analysis of these problems is presented in the following paragraphs. For a general discussion on data requirements to build a microsimulation model for indirect taxes, see our documents “*Dataset Requirements for building the indirect tax model*”, presented at the *Preliminary DIECOFIS Meeting* held in Rome, 23 November 2001, and “*Problems in the definition of a final dataset*”, presented in the meeting on the “*Data needs for Indirect Taxes Modules: Integration Issues*” held in Florence, 13 June 2002.

near future – for different types of enterprises. Obviously, firms differ not only in the number of workers but also in many other characteristics that can be inferred from the microdata such as sources of produced income, cost structure, labour contracts, and financing sources. An appropriate analysis of the fiscal impact on the behaviour of enterprises needs to consider all these specific features and a microsimulation model is indeed the most adequate tool to give a comprehensive picture of this matter provided that the microdata are available and reliable at a disaggregated level. Therefore, the checking procedure must be accurate and the RTSS has been continuously revised to eliminate eventual mistakes and find the most appropriate final format for the database. However, because of the usual reporting problems of survey data, some items do not balance for all records. Consequently, a statistical discrepancy variable has been created and saved in the dataset whenever appropriate in order to fix inconsistencies and balance the accounts.<sup>19</sup>

### **3. The tax module**

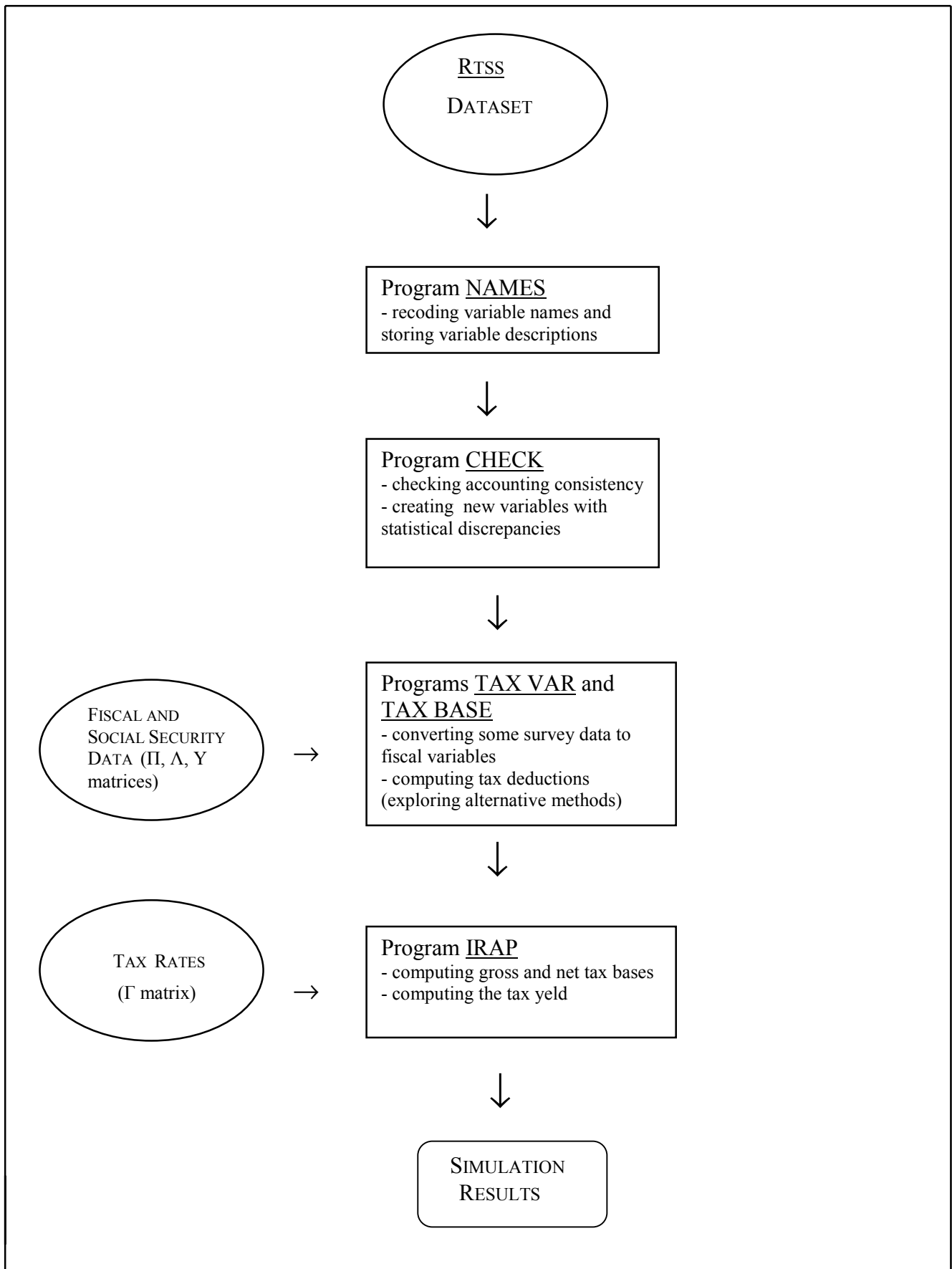
The IRAP prototype module consists of a set of STATA programs which can be executed either in separate steps or with a compact procedure. The rationale for this choice is that the complete procedure may be very useful to have the complete picture of the model and to run the model with a single command, while the step-by-step approach is recommended whenever debugging the model and testing eventual variations is necessary.

At the end of this deliverable, as Code Appendix, the STATA code to run the IRAP module is presented. The basic structure of the model is presented in the following chart.

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<sup>19</sup> All subsequent changes in the dataset due to checking, computing new variables, and simulating some tax rules are saved in files different from the original RTSS dataset where only the collected survey data are stored. *Ad-hoc* variable names have been assumed for new variables to be distinguished from the official statistical data.

Figure 1 – Module Structure



### 3.1 The tax base simulation

#### 3.1.1 The tax base: a general view

In Section 1 we have analysed the main characteristics of the Irap tax base, according to the Tax Code. Basically, we can describe the gross tax base as the value added of the firm, net of depreciations:

$$IGTB = \text{Value of Production} - \text{Purchases of Goods and Services} - \text{Depreciations} \quad (6)$$

These values can be found in the firm's balance sheet and are collected in the Regional Tax and Social Security Database. We have explored different proxies of each firm's tax base in order to best simulate the tax yield and obtain a good basis for incidence and more general economic analysis.

Building a tax base for 1998 is relatively straightforward, because no dimensional or sectoral allowances could be used in that year. The main problem is, therefore, the reconciliation of balance-sheet and fiscal values, that is, to reproduce in the model the changes that the Tax Authority requires for some items recorded in the balance-sheet. For an example of this matter, we can refer to the item "Consulting Expenses", a specific item of the Total Purchase of Goods and Services, that can be deducted from the Irap tax base. However, in this specific cost item firms have recorded, among other things, expenses for coordinated and continuative collaborators but, according to the Tax Code, this value cannot be deducted from the tax base. Differences between accounting and fiscal values can be found for many other items of the tax base, thus the Irap tax return includes a column for Balance sheet values and a column for the fiscal values, as shown in Table 4 for a sample firm.

**Table 4 - Section IQ of IRAP return (UNICO 1999) for a sample firm**

	Balance-sheet Values	Positive Variations	Negative Variations	Fiscal Values
Income from sales and services	15000	500	300	15200
Variations of stock	300	100	50	350
Variation in contract work in progress	1000	500		1500
Increase on internal work capitalized under fixed assets	0	0	0	0
Other income and earnings	1000	45	30	1015
Purchases of raw materials and goods	4539	100	1000	3639
Purchases of services (total)	10000	550	150	10400
Use of third party assets	1250	100	0	1350
Amortization of intangible fixed assets	1500	100	300	1300
Depreciation of tangible fixed assets	3500	500	200	3800
Variations of stock of raw materials and to resale	1000	0	300	700
Provisions	1000	100	0	1100
Other operating costs	950	50	300	1300

Therefore, we have explored alternative methods to deal with this problem, as described in the following paragraph.

Moreover, as described in Section 1, there are some labour cost components that can be deducted to obtain the net tax base. In 1998, deductible labour costs were<sup>20</sup>:

- expenses for work accident insurance (INAIL social contributions),
- total labour cost of apprentice workers,
- 70% of total labour costs for work training contracts,
- special allowance for social and labour cooperatives.

Therefore, the 1998 net tax base can be described as:

$$INTB = IGTB - \text{Labour cost deductions} \quad (7)$$

Lastly, it is worthwhile to recall that, from the perspective of product distribution, the incidence of Irap is on the value added components, such as labour costs, interest expenses and profits. For the purpose of economic analysis, one can define the tax base as an alternative of definition (6):

$$IGTB = \text{Labour costs} + \text{interest expenses} + \text{profit} \quad (8)$$

<sup>20</sup> In 1999, a special allowance for disabled workers was added.

However, the two definitions can lead to different results due to some income components which are not relevant for the tax base but are included in firm profits. Therefore, for operational purposes we conform to the Tax Code where definition (6) is prescribed.

### 3.1.2 Fiscal and accounting values

Tax Authority Data for returns submitted in 1999 (concerning income for 1998) are the basic information needed for a reconciliation module between balance sheet and fiscal values. Unfortunately, the data availability does not allow for an appropriate analysis of this difference for every type of firm, due to the fact that, as previously mentioned, we do not have fiscal microdata. In any case, looking at macrodata (Table 5), we can observe that there were over 4 million Irap taxpayers in 1998. 10% were corporations which produce over 60% of the total gross tax base (519 million Euros in 1998). In regard to the percentage stating a positive or negative tax base, the last column in the table shows that 13% of corporations posted losses in 1998, which drops to 3,1% considering all firms.

**Table 5 – Irap Tax Base and Taxpayers**

	<b>Number</b>	<b>Amount</b>	<b>Number (%)</b>	<b>Amount (%)</b>	<b>% declaring negative Tax Base</b>
<b>Corporations</b>	448.702	319.279	10,2	61,6	13,1
<b>Partnerships</b>	770.306	58.277	17,5	11,2	3,1
<b>Entrepreneurs</b>	3.109.411	75.185	70,5	14,5	1,7
<b>Other (*)</b>	83.130	65.859	1,9	12,7	3,3
<b>TOTAL</b>	4.411.549	518.600	100,0	100,0	3,1

(\*) General government and other bodies partially not included in the model.

Source: Tax Authority (2002).

In Table 6 the breakdown of gross tax base for economic activity is presented. We can see that sectors included in the dataset count for 80,8 per cent of the total tax base.

**Table 6 - Irap tax base for economic activity (1998) (Million of Euros)**

		%
<i>Products of agriculture, hunting and forestry</i>	12.057	2,3
<i>Fish, fishing products and ancillary services</i>	316	0,1
Mining of energy product	1.073	0,2
Mining of non-energy product	1.033	0,2
Food products, beverages and tobacco	12.054	2,3
Textile products and clothing	15.998	3,1
Leather and leather products	4.555	0,9
Products of wood	3.503	0,7
Pulp, paper and paper prod.; printing and publishing	10.512	2,0
Coke oven prod.; refined petroleum prod.; nuclear fuel	2.212	0,4
Basic chemicals; other chemicals; man-made fibres	12.811	2,5
Rubber and plastic products	7.479	1,4
Other non-metallic products	7.517	1,4
Fabricated metal products	24.679	4,8
Prod. and maint. of machinery and equipment	21.470	4,1
Electrical machineries and optical instruments	15.554	3,0
Transport equipment manufacturing	8.247	1,6
Other manufacturing	6.626	1,3
Electricity, town gas and water	14.576	2,8
Constructions	32.427	6,3
Sale, maint. and repair services of motor vehicles and motorcycles; fuel retail trade	9.236	1,8
Wholesale trade services (exc. motor - motorcycles); comm. brokerage	34.385	6,6
Retail trade services (exc. motor - motorcycles); repair services of household goods	24.799	4,8
Hotels and public facilities	11.560	2,2
Transport, storage and communication services	33.505	6,5
<i>Finance</i>	44.004	8,5
<i>Insurance</i>	3.684	0,7
<i>Other Finance activities</i>	4.707	0,9
Real estate services	50.760	9,8
<i>Public administration and defence; compulsory social security services</i>	20.409	3,9
Education services	3.431	0,7
Health and social services	21.179	4,1
Other public services (*)	14.484	2,8
<i>Private households with employed persons</i>	16	0,0
Not allocated activities	27.743	5,3
<b>TOTAL</b>	518.600	100,0
Sectors included in the model	418.924	80,8

Source: Tax Authority (2002).

Notes:

(\*) Partially included in the model.

In italics, sectors excluded from the model.

Unfortunately, accurate data on the incidence of fiscal correction on the tax base are available only for corporations.

Table 7 shows the tax base computed with accounting data, positive<sup>21</sup> and negative fiscal variations and the incidence of the net correction on the tax base. The net fiscal differences are positive for almost every sector (coke, other manufacturing products and transport are exceptions) with an average incidence of 8%.

**Table 7 – Tax Base and Fiscal Differences for Corporations (1998), (Millions of Euro)**

	Gross Tax Base (Balance sheet Values)	Positive fiscal changes	Negative fiscal changes	Net Fiscal Differences (+/-)	Fiscal Differences on Gross Tax Base
	(a)	(b)	(c)	(d=c-b)	(e=d/a)
Mining of energetics	935	114	81	33	3,5
Mining of non-energetics	740	127	35	93	12,5
Food products, beverages and tobacco	9.201	1.108	441	667	7,2
Textile products and clothing	10.808	1.599	345	1.254	11,6
Leather and leather products	2.761	397	64	333	12,1
Products of wood	1.644	228	37	191	11,6
Pulp, paper and paper prod.; printing and publishing	8.274	1.376	486	890	10,8
Coke oven prod.; refined petroleum prod.; nuclear fuel	2.412	237	358	-121	-5
Basic chemicals; other chemicals; man-made fibres	12.068	1.666	818	848	7
Rubber and plastic products	6.167	746	188	557	9
Other non-metallic products	6.266	715	283	432	6,9
Fabricated metal products	17.058	2.094	644	1.449	8,5
Prod. and maint. of machinery and equipment	18.088	2.113	614	1.499	8,3
Electrical machineries and optical instruments	12.916	1.618	625	993	7,7
Transport equipment manufacturing	8.322	888	689	198	2,4
Other manufacturing	4.820	609	943	-334	-6,9
Electricity, town gas and water	13.116	581	435	145	1,1
Constructions	17.081	3.520	1.589	1.931	11,3
Sale, maint. and repair services of motor vehicles and motorcycles; fuel retail trade	4.316	853	398	456	10,6
Wholesale trade services (exc. motor - motorcycles); comm. Brokerage	18.877	4.627	762	3.865	20,5
Retail trade services (exc. motor - motorcycles); repair services of household goods	9.731	1.277	315	962	9,9
Hotels and public facilities	4.856	548	110	438	9
Transport, storage and communication services	30.218	3.174	3.903	-729	-2,4
Real estate services	21.264	5.530	1.753	3.778	17,8
Other public services	5.899	1.285	1.590	-306	-5,2
Not allocated activities	429	117	31	86	19,9
<b>TOTAL</b>	<b>248.267</b>	<b>37.147</b>	<b>17.537</b>	<b>19.608</b>	<b>7,9</b>

Source: Tax Authority (2002).

<sup>21</sup> Positive variations occur when accounting values are smaller than fiscal ones.

These data show the relevance of fiscal corrections in corporate tax base computation. This is why we have built a specific module of the model, the TAXVAR program (see Figure 2), to transform accounting values into fiscal values. This program uses specific coefficients  $\Pi_{jk}$ , calculated from Tax Authority Data on sectoral ( $j$ ) and dimensional bases ( $k$ ), applied to the survey data to obtain an estimation of the fiscal values for each firm  $i$ .

$$\text{Fiscal Values}_{ijk} = \text{Survey data}_{ijk} * \Pi_{jk} \quad (9)$$

All coefficients  $\Pi$  are stored in a matrix – specific for firm types – read by the program. The matrix is filled with data from input files which can eventually be modified without interfering with the program code.

The gross tax base is computed according to definition (6), but every item is converted on a fiscal basis. However, this method of estimation could be inadequate for smaller and unincorporated firms. Tax Authority data, although not adequate, seem to suggest that signs and relevance of fiscal variations can be very different for partnerships and entrepreneurs. This is the reason why we have computed a Gross Tax Base on balance sheet data too, without any specific fiscal correction.

### 3.1.3 Computing labour cost deductions

As already explained, in 1998 labour cost deductions were linked to Social Insurance contributions, apprentice workers and work training contracts. We have explored different sources of data to deal with these aspects. First of all, the RTSS dataset contains some information on these items but not for all enterprises<sup>22</sup> and, as a result of preliminary checks, their reliability is still in doubt.

Secondly, we have computed the implicit INAIL contribution rate as contributions paid by firms on total wages (Table 8)<sup>23</sup>. The first component of labour cost deductions can be computed applying these implicit rates to total wages and salaries collected in the dataset.

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<sup>22</sup> Some items are collected for Small and Medium but not for Large Enterprises and viceversa.

<sup>23</sup> Details on social contributions will be given in the next deliverable.

**Table 8 - Implicit Insurance Contribution rates (percentage values), (1998)**

Mining	7,10
Food products, beverages and tobacco	3,70
Textile products and clothing	2,00
Leather and leather products	2,30
Products of wood	9,70
Pulp, paper and paper prod.; printing and publishing	2,20
Coke oven prod.; refined petroleum prod.; nuclear fuel	1,90
Basic chemicals; other chemicals; man-made fibres	1,80
Rubber and plastic products	3,20
Other non-metallic products	7,10
Fabricated metal products	5,50
Prod. and maint. of machinery and equipment	3,10
Electrical machineries and optical instruments	1,90
Transport equipment manufacturing	3,10
Other manufacturing	4,50
Electricity, town gas and water	1,90
Constructions	10,20
Sale, maint. and repair services of motor vehicles and motorcycles; fuel retail trade	4,20
Wholesale trade services (exc. motor - motorcycles); comm. brokerage	2,10
Retail trade services (exc. motor - motorcycles); repair services of household goods	1,70
Hotels and public facilities	2,00
Transport, storage and communication services	3,30
Real estate services	1,40
Other public services	2,20
Not allocated activities	8,80
Total	3,9

*Source:* Authors' computation on INAIL Data.

Additional information can be found in Tax Authority data. The following table shows that total labour cost deductions reached 13 million Euros. At the aggregate level, the most significant variable is “expenses for training worker contracts”, although for selected manufacturing sectors “Insurance contributions” are higher due to riskiness disparities.

**Table 9 - Labour cost deductions (1998), (Millions of Euros)**

	Social Insurance Contribution	Expenses for Apprentice workers	Expenses for training workers contract	Total
Mining of energetics	5	0	3	9
Mining of non-energetics	48	2	8	58
Food products, beverages and tobacco	168	101	120	388
Textile products and clothing	139	229	188	556
Leather and leather products	47	101	52	200
Products of wood	110	73	45	227
Pulp, paper and paper prod.; printing and publishing	91	59	88	238
Coke oven prod.; refined petroleum prod.; nuclear fuel	14	0	11	25
Basic chemicals; other chemicals; man-made fibres	97	13	106	216
Rubber and plastic products	106	55	105	266
Other non-metallic products	293	50	71	414
Fabricated metal products	534	308	364	1.207
Prod. and maint. of machinery and equipment	299	126	248	673
Electrical machineries and optical instruments	129	118	202	449
Transport equipment manufacturing	150	24	122	296
Other manufacturing	122	116	95	333
Electricity, town gas and water	103	1	17	120
Constructions	921	455	368	1.745
Sale, maint. and repair services of motor vehicles and motorcycles; fuel retail trade	115	141	117	373
Wholesale trade services (exc. motor - motorcycles); comm. brokerage	217	111	274	602
Retail trade services (exc. motor - motorcycles); repair services of household goods	188	283	402	873
Hotels and public facilities	111	208	144	463
Transport, storage and communication services	366	30	871	1.267
Real estate services	213	147	1.012	1.373
Other public services	116	168	342	625
Not allocated activities	36	29	57	122
<b>Total</b>	<b>4738</b>	<b>2948</b>	<b>5432</b>	<b>13118</b>

Source: Tax Authority (2002).

We have weighted these figures both on total labour cost and on gross tax base – from Tax Authority Data – thus to obtain two matrices of coefficients to be used for fiscal deduction purposes. We have decided to construct and test these alternative sets of coefficients (with total labour cost ( $\Lambda_{jk}$ ) and gross tax base ( $Y_{ijk}$ ) as denominator) because, on the one hand, the gross tax base could be unstable, and, on the other hand, total labour cost recorded on tax returns is in some cases unreliable. However, after our preliminary simulations, we have verified that the two matrices give similar results. Moreover, for the social insurance component, the estimation by implicit rates (Table 8) or by Tax Authority data lead to equivalent outcomes.

Therefore, labour cost deductions are computed for each firm as:

$$LABDED_{ijk} = Total\ Labour\ cost_{ijk} * \Lambda_{1jk} + Total\ Labour\ cost_{ijk} * \Lambda_{2jk} + Total\ Labour\ cost_{ijk} * \Lambda_{3jk} \quad (10)$$

where  $\Lambda_{1jk}$   $\Lambda_{2jk}$   $\Lambda_{3jk}$  are the coefficients calculated on sectoral ( $j$ ) and dimensional bases ( $k$ ) applied to the total labour cost collected in the RTSS dataset to obtain an estimation of the deduction for the  $i$ -th firm. Obviously, these deductions are applied only in the event that the firm is entitled.<sup>24</sup>

The computed net tax base for each firm becomes:

$$INTB_i = IGTB_i - LABDED_i \quad (11)$$

### 3.2 The tax yield

In 1998 the Irap tax rate was 4,25% for all sectors and regions considered in the model. Therefore, the computation of the tax due by each firm is :

$$TAX_i = INTB_i * 0,0425 \quad (12)$$

However, the program code contains a specific tax rates matrix  $\Gamma$ , with regional and sectoral details. This feature allows for a flexible revision of the model for the regional autonomy of manoeuvring tax rates applied from 2000 onwards.

### 3.3 Very preliminary results

Unfortunately the unavailability of the complete RTSS dataset did not allow us to run the model on the overall sample. Therefore, we have tested the procedure on the subset of 305 records (203 Small and Medium Enterprises and 102 Large Enterprises) and we cannot compare our results with the fiscal revenue.

For 1998 Irap total revenue reached 24 billion Euros, net of ‘taxpayer protection clause’ deductions. The protection clause was used by 25 thousands taxpayers (of which 50% were entrepreneurs), but his incidence was less than 1 per cent of the total tax due.

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<sup>24</sup> In the program, we turn to the RTSS dataset to inspect if the firm has declared the presence of apprentices and work training contracts.

**Table 10 - Irap Total revenue by type of taxpayer - 1998 (Million of Euros)**

	Tax Due	Taxpayer protection clause (Frequencies)	Taxpayer protection clause (Amounts)
<b>Entrepreneurs</b>	3.045	17.558	11
<b>Partnerships</b>	2.427	12.060	13
<b>Corporations</b>	14.017	4.383	15
<b>Other (*)</b>	5.305	629	3
<b>TOTAL</b>	24.794	34.630	41

(\*) General government and other bodies partially not included in the model

Source: Tax Authority (2002).

**Table 11 - Irap Total revenue by sector – 1998 (Million of Euros)**

	Tax Due	Taxpayer protection clause (Amounts)
Mining of energy product	45	0
Mining of non-energy product	43	0
Food products, beverages and tobacco	499	1
Textile products and clothing	674	1
Leather and leather products	190	0
Products of wood	148	0
Pulp, paper and paper prod.; printing and publishing	447	1
Coke oven prod.; refined petroleum prod.; nuclear fuel	89	0
Basic chemicals; other chemicals; man-made fibres	536	0
Rubber and plastic products	314	0
Other non-metallic products	315	0
Fabricated metal products	1.036	2
Prod. and maint. of machinery and equipment	909	1
Electrical machineries and optical instruments	651	1
Transport equipment manufacturing	336	0
Other manufacturing	284	0
Electricity, town gas and water	678	1
Constructions	1.379	4
Sale, maint. and repair services of motor vehicles and motorcycles; fuel retail trade	393	1
Wholesale trade services (exc. motor - motorcycles); comm. brokerage	1.465	3
Retail trade services (exc. motor - motorcycles); repair services of household goods	1.082	4
Hotels and public facilities	499	1
Transport, storage and communication services	1.422	2
Real estate services	2.228	8
Other public services	690	2
Not allocated activities	2.231	2
<b>TOTAL</b>	18.583	35

Source: Tax Authority (2002).

For PMI, the 1998 questionnaire asks the amount of IRAP paid, thus we have checked our estimates with this figure. Both specifications of the tax base (with the balance sheet values and with the fiscal adjusted values) overestimate the total PMI IRAP as declared in the survey. The error of the balance sheet computation method is about 9,3 per cent of the total declared amount while the difference in the fiscal computation method is around 29,7 per cent. This is can be only partially imputed to the ‘taxpayer protection clause’ because the average incidence of the clause is less than 1 per cent (as shown in Table 10).

**Table 12 – Tax estimation for a sample of PMI firms**

	All sample (a)		Non zero respondents (b)	
	Amounts	Differences	Amounts	Differences
Irap_1 (c)	56.170.253	29,7%	49.138.821	13,5%
Irap_survey (d)	43.306.938	0,0%	43.306.938	0,0%
Irap_2 (e)	47.345.749	9,3%	42.048.569	-2,9%

*Notes:*

(a) All Sample: 203 Pmi

(b) Non zero respondents: 168 Pmi

(c) Irap\_1 : Tax estimation with fiscal adjustments

(d) Irap\_survey : Tax paid as recorded in the survey

(e) Irap\_2 : Tax estimation without fiscal adjustments (balance-sheet values)

However, some suspicious zero values (possibly misreporting) in the survey data should be further inspected: this could help to explain part of the different amount of tax. When we do not consider those firms with zero values, these results change dramatically. The balance sheet procedure underestimates the tax revenue by about 2,9% while the fiscal computation method overestimates by 13,5 per cent. In all cases, therefore, the balance sheet estimation performs better: this is consistent with our findings in paragraph 3.1.2, where we noted that the fiscal correction for small firms was not as relevant as for bigger corporations.

The model fit can be verified only when the complete dataset will be available. In that situation, we will estimate the tax revenue on the overall sample and refer to the official data from the Tax Authority to validate our results.<sup>25</sup> In the meantime, some possible improvements could be implemented. First of all, we could diversify the fiscal correction for small and unincorporated

<sup>25</sup> In the PMI survey, each firm is assigned a weight (grossing-up factor) representing the number of firms in the whole population corresponding to that particular unit. As the survey for Large Enterprises is exhaustive, the whole universe of firms can be represented.

firms (although more reliable data for this issue should be found). An hopefully likely result of this refinement is that the fiscal computation method becomes more reliable as estimation procedure of the tax revenue. Moreover, as we are developing the social contributions module, we will draw from this analysis some more detailed information to be used in computing the labour cost deductions for Irap.

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## ANNEX 1

### RTSS DATABASE

Survey code	Variable name	DESCRIPTION
cod11100	ric_tot	Income from sales and Services
cod11101	ric_vpi	Sales of firm products
cod11102	ric_vmnt	Sales of goods
cod11103	ric_let	Works on behalf of third parties
cod11104	ric_lot	Works and industrial services on orders of third parties
cod11105	ric_ai	Brokerage activities
cod11106	ric_tra	Income of transport enterprises
cod11107	ric_pst	Services to third parties
cod11200	ric_vr_tot	Variations of the stocks of finished and semi-finished products
cod11201	ric_vr_pf	Variations of the stocks of products
cod11202	ric_vr_pcl	Variations of the stocks of under-processing products
cod11300	ric_vl_co	Variation in contract work in progress
cod11400	ric_ini_li	Increase on internal work capitalized under fixed assets
cod11500	ric_alpro	Other income and earnings (neither financial, nor extraordinary)

### **Production Costs**

cod12100	acq_beni_tot	Purchases
cod12101	acq_matp	Raw materials
cod12102	acq_ener	Energy products
cod12103	acq_mriv	Goods for resale
cod12200	acq_serv_tot	Services (Total)
cod12201	acq_lavter	Works made by third parties
cod12202	acq_allav	Other works
cod12203	acq_trasp	Transport
cod12204	acq_altr_sci	Other Transport (SCI)
cod12205	acq_intmd	Brokerages
cod12206	acq_pubbli	Advertising
cod12207	acq_risv	Research and Development
cod12208	acq_consul	Consulting
cod12209	acq_inform	Informatics
cod12210	acq_prassi	Insurance premiums
cod12211	acq_licuso	Licences
cod12212	acq_smrif	Waste disposal
cod12213	acq_alser	Other services
cod12214	acq_banc	Bank services
cod12300	acq_gdbt_tot	Use of third party assets
cod12301	acq_fitpa	Rent charges for capital goods
cod12302	acq_leasing	Leasing expenses
cod12303	acq_alfitpa_sci	Other rents from buildings (SCI)
cod12304	acq_canlo	Other rents
cod12305	acq_leasstr_sci	Leasing expenses for instrumental goods (SCI)
cod44000	acq_pers_tot	Personnel Expenses (Total)

cod12500	acq_amm_tot	Depreciation and Amortization
cod12510	acq_amm_imi	Depreciation of intangible fixed assets
cod12520	acq_amm_imm	Depreciation of tangible fixed assets
cod12530	acq_svimm_sci	Other write-downs of fixed assets (SCI)
cod12540	acq_sver_sci	Write-downs of current credits (SCI)
cod12600	acq_vr_tot	Variations of stocks of raw materials and to resale (Tot)
cod12601	acq_vr_mp	Variations of stocks of raw materials
cod12602	acq_vr_r	Variations of stocks to resale
cod12700	acq_accant	Provisions
cod12800	acq_alacc_sci	Other provisions (SCI)
cod12900	acq_ondiv_tot	Other operating costs (Total)
cod12901	acq_forper	Personnel training expenses
cod12902	acq_onamm	Managers rewards
cod12903	acq_aodg	Other operating charges
cod12904	acq_impfab_sci	Excises taxes on production (SCI)
cod12905	acq_imp_ind	Indirect taxes on products
cod12906	acq_alimp_sci	Other indirect taxes (SCI)

## Personnel Costs

cod41110	acq_ret_dirig	Wages and salaries: Executives, Employees
cod42110	acq_ret_alcat	Wages and salaries: Workers (SCI)
cod42111	acq_ret_oppmi	Wages and salaries: Workers (PMI)
cod42112	acq_ret_appmi	Wages and salaries: Trainees (PMI)
cod42113	acq_ret_ldpmi	Wages and salaries: At-home Workers (PMI)
cod42121	acq_cs	Social security contributions (Total)
cod42131	acq_qtfr	Employee leaving entitlement (Total)
cod43000	acq_prpers	Other personnel costs
cod45000	acq_indlic	Indemnities for dismissals

### For SCI 1998 we have some more detailed items:

cod41120	acq_csdir_sci	Social security contributions: Executives, Employees (SCI)
cod42120	acq_csal_sci	Social security contributions: Workers (SCI)
cod41130	acq_tfrdir_sci	Employee leaving entitlement: Executives, Employees (SCI)
cod42130	acq_tfral_sci	Employee leaving entitlement: Workers (SCI)

cod13000	cost_prod_tot	Costs of production
cod12000	val_prod_tot	Value of production
cod13999	mol	Gross operating surplus
cod14200	int_att	Interest receivable
cod14300	int_pas	Interest payable
cod15000	pr_onfin_sci	Interest receivable e payable Total (SCI)
cod16000	ret_valaf_sci	Adjustment for financial assets Total (SCI)
cod17000	pr_onstr_sci	Extraordinary proceeds and costs Total (SCI)
cod17999	utile_lor_sci	Gross Profit (loss) for the financial year (SCI)
cod18100	imp_reddito	Income taxes
cod18500***	imp_irap	IRAP (PMI)
cod19000	utile_netto	Net Profit (loss) for the financial year

cod22100	sp_im_im	Intangible fixed assets
cod22200	sp_im_man	Tangible fixed assets (Net of depreciation funds)
cod22300	sp_im_fi	Financial fixed assets
cod23110	sp_rim_mp	Current assets: raw materials, ancillars and consumables
cod23120	sp_rim_ps	Current assets: under-processing and semifinished products
cod23130	sp_rim_lc	Current assets: works in process under contracts
cod23140	sp_rim_pf	Current assets: finished products and goods
cod23141	sp_rim_riv	Current assets: goods for resale
cod23260	sp_cre_bs	Current assets: short term credits
cod23270	sp_cre_ls	Current assets: medium-long term credits
cod23400	sp_liq	Current assets: cash
cod26000	sp_foro	Liabilities: funds for risks and charges (total)
cod27000	sp_tfr	Liabilities: funds for employee leaving entitlement
cod28140	sp_deb_bs	Liabilities: short term debts
cod28150	sp_deb_ls	Liabilities: medium-long term debts

**For SCI 1998 we have some more detailed items:**

cod23200	sp_cretot_sci	Total credits (SCI)
cod28000	sp_debtot_sci	Total Liabilities (SCI)

**Workers**

cod31100	occ_imco_tot	Entrepreneurs and Family assistants: total
cod31101	occ_imco_f	Entrepreneurs and Family assistants: women
cod31110	occ_imptot_pmi	Entrepreneurs: total (PMI)
cod31111	occ_impf_pmi	Entrepreneurs: women (PMI)
cod31120	occ_coftot_pmi	Family assistants: total (PMI)
cod31121	occ_coff_pmi	Family assistants: women (PMI)
cod31122	occ_cofore_pmi	Family assistants: hours (PMI)
cod31200	occ_dir_tot	Executives: total
cod31201	occ_dir_f	Executives: women
cod31202	occ_dir_ore	Executives: hours
cod31300	occ_opap_tot	Workers and Trainees: total
cod31301	occ_opap_f	Workers and Trainees: women
cod31302	occ_opap_ore	Workers and Trainees: hours
cod31310	occ_optot_pmi	Workers: total (PMI)
cod31311	occ_opf_pmi	Workers: women (PMI)
cod31312	occ_opore_pmi	Workers: hours (PMI)
cod31320	occ_aptot_pmi	Trainees: total (PMI)
cod31321	occ_apf_pmi	Trainees: women (PMI)
cod31322	occ_apore_pmi	Trainees: hours (PMI)
cod31400	occ_ld_tot	At-home workers: total
cod31401	occ_ld_f	At-home workers: women
cod31402	occ_ld_ore	At-home workers: hours
cod31000	occ_tot	Total employed staff
cod31001	occ_tot_f	Total employed women
cod31002	occ_tot_ore	Total worked hours
cod30100	occ_td_tot	Short-term contracts: total
cod30101	occ_td_f	Short-term contracts: women
cod30102	occ_td_ore	Short-term contracts: hours

cod30200	occ_tp_tot	Part-time contracts: total
cod30201	occ_tp_f	Part-time contracts: women
cod30202	occ_tp_ore	Part-time contracts: hours
cod30300	occ_fltot_pmi	Training contracts: total (PMI)
cod30301	occ_flf_pmi	Training contracts: women (PMI)
cod30302	occ_flore_pmi	Training contracts: hours (PMI)
cod32100	occ_cig_tot	Ordinary lay-off (CIG) hours used

**For SCI 1998 we have some more detailed items:**

cod31500	occ_aptot_sci	Trainees: total (SCI)
cod31502	occ_apore_sci	Trainees: hours (SCI)
cod32110	occ_cigor_sci	Ordinary lay-off (CIG) hours used (SCI)
cod32120	occ_cigst_sci	Extra-ordinary lay-off (CIG) hours used (SCI)

cod53000	im_acq_tot	Purchase of Fixed assets (total)
cod53001	im_acq_new	Purchase of Fixed assets: New
cod53002	im_acq_us	Purchase of Fixed assets: Second-hand
cod51110	im_acqter	Purchase of Land
cod51120	im_cost_tot	Purchase of Constructions (total)
cod51121	im_cost_new	Purchase of Constructions: New
cod51122	im_cost_us	Purchase of Constructions: Second-hand
cod51200	im_mac_tot	Purchase of Machinery (total)
cod51201	im_mac_new	Purchase of machinery: New
cod51202	im_mac_us	Purchase of machinery: Second-hand
cod51410	im_att_tot	Purchase of Data equipment (total)
cod51411	im_att_new	Purchase of data-equipment: New
cod51412	im_att_us	Purchase of data-equipment: Second-hand
cod51420	im_mob_tot	Purchase of Furniture (total)
cod51421	im_mob_new	Purchase of Furniture: New
cod51422	im_mob_us	Purchase of Furniture: Second-hand
cod51430	im_tras_tot	Purchase of Means of transport (total)
cod51431	im_tras_new	Purchase of Means of transport: New
cod51432	im_tras_us	Purchase of Means of transport: Second-hand
cod51440	im_bval_tot	Purchase of Valuable assets (total)
cod51441	im_bval_new	Purchase of Valuable assets: New
cod51442	im_bval_us	Purchase of Valuable assets: Second-hand
cod52200	im_art_tot	Purchase of Artistic assets (total)
cod52201	im_art_new	Purchase of Artistic assets: New
cod52202	im_art_us	Purchase of Artistic assets: Second-hand
cod52400	im_sof_tot	Purchase of Softwares (total)
cod52401	im_sof_new	Purchase of softwares: New
cod52402	im_sof_us	Purchase of softwares: Second-hand

**Other Data**

cod60040	exp_ue	Export sales (EU countries)
cod60050	exp_eue	Export sales (Extra-EU countries)
cod60070	imp_ue	Import sales (EU countries)
cod60080	imp_eue	Import sales (Extra-EU countries)
cod61110	ind_ass	Insurance compensations
cod61120	fitti_att	Income from rents

cod61130	royal	Revenue from Royalties, patents and similar
cod61140	cont_ese	General Government allowances on working/operating account
cod61230	manord	Routine buildings maintenance
cod61240	v_cap_us	Sales of second-hand capital goods
cod61250	k_leasing	Value of capital in leasing contracts of the financial year
cod61260	q_leasing	Share of financial leasing for the financial year
cod61280	fatt_ed	Turnover of construction enterprises (for building)
cod61290	fatt_cost	Turnover of construction enterprises (for engineering)
cod61300	pers_int	Personnel expenses for workers from temp agencies
cod61310	inv_amb	Investments in equipment for the protection of the environment
cod60010	iva_cli	VAT from customers
cod60020	iva_for	VAT to suppliers
cod61150	contr_k	General Government capital allowances
cod61160	contr_i	General Government allowances on interest account
cod61200	imp_dir	Direct taxes paid in the fiscal year
cod61265	imp_ind	Indirect taxes on production

## Regions

cod70011	add_01	Annual workers average (Piemonte)
cod70012	cper_01	Personnel costs (Piemonte)
cod70021	add_02	Annual workers average (Valle d'Aosta)
cod70022	cper_02	Personnel costs (Valle d'Aosta)
cod70031	add_03	Annual workers average (Lombardia)
cod70032	cper_03	Personnel costs (Lombardia)
cod70051	add_04	Annual workers average (Veneto)
cod70052	cper_04	Personnel costs (Veneto)
cod70061	add_05	Annual workers average (Friuli-Venezia Giulia)
cod70062	cper_05	Personnel costs (Friuli-Venezia Giulia)
cod70071	add_06	Annual workers average (Liguria)
cod70072	cper_06	Personnel costs (Liguria)
cod70081	add_07	Annual workers average (Emilia-Romagna)
cod70082	cper_07	Personnel costs (Emilia-Romagna)
cod70091	add_08	Annual workers average (Toscana)
cod70092	cper_08	Personnel costs (Toscana)
cod70101	add_09	Annual workers average (Umbria)
cod70102	cper_09	Personnel costs (Umbria)
cod70111	add_10	Annual workers average (Marche)
cod70112	cper_10	Personnel costs (Marche)
cod70121	add_11	Annual workers average (Lazio)
cod70122	cper_11	Personnel costs (Lazio)
cod70131	add_12	Annual workers average (Abruzzo)
cod70132	cper_12	Personnel costs (Abruzzo)
cod70141	add_13	Annual workers average (Molise)
cod70142	cper_13	Personnel costs (Molise)
cod70151	add_14	Annual workers average (Campania)
cod70152	cper_14	Personnel costs (Campania)
cod70161	add_15	Annual workers average (Puglia)
cod70162	cper_15	Personnel costs (Puglia)
cod70171	add_16	Annual workers average (Basilicata)
cod70172	cper_16	Personnel costs (Basilicata)
cod70181	add_17	Annual workers average (Calabria)
cod70182	cper_17	Personnel costs (Calabria)
cod70191	add_18	Annual workers average (Sicilia)
cod70192	cper_18	Personnel costs (Sicilia)

cod70201	add_19	Annual workers average (Sardegna)
cod70202	cper_19	Personnel costs (Sardegna)
cod70211	add_20	Annual workers average (Bolzano)
cod70212	cper_20	Personnel costs (Bolzano)
cod70221	add_21	Annual workers average (Trento)
cod70222	cper_21	Personnel costs (Trento)
cod77231	add_est_sci	Annual workers average (Foreign Countries) (SCI)
cod77232	cper_est_sci	Personnel costs (Foreign Countries) (SCI)
cod77241	add_noloc_sci	Annual workers average (Not imputable) (SCI)
cod77242	cper_noloc_sci	Personnel costs (Not imputable) (SCI)

## CODE APPENDIX

In the pages that follow, the program used to construct the prototype model of Italian Regional Tax (IRAP) from ISTAT data is presented. These programs are included in the deliverable to provide “templates” for other countries’ users, rather than a set of programs that can be immediately executed as such to estimate a similar tax in a given country. Each survey is at least slightly different from the other, so that the code that follows would, at a minimum, have to be modified for each country to take into account differences in structure of the questionnaire as well as to give due consideration to each country’s unique circumstances and institutions, types of data collected in the survey, etc. An attempt has been made to add enough comments to the code to make it broadly comprehensible and to aid those who wish to translate it into languages other than STATA. The code given here is the code that was actually used to produce some preliminary results on the sub sample of our dataset. Further improvements may derive from the future application of the procedure to the whole dataset.

The programs are written in STATA version 7 Special Edition.

Since STATA is case sensitive, original survey data are labelled with lowercase names, while computed and modified data are saved with capitalized first letters. Total variables are indicated as <\*\_tot> and statistical discrepancies as <\*\_dis>.

The complete IRAP procedure may be run by executing the following master program:

```
/****** MASTER.DO *****/
file master with all <*.do> files to compute IRAP yield */

display "Executing NAMES ....."
qui do names

display "CHECKing variables in the dataset ....."
qui do check

display "Preparing TAX VARIables ....."
do taxvar

display "Computing the IRAP tax base and yield ....."
qui do irap

display "***** END OF IRAP ROUTINES *****/"
```

All routines called in MASTER.DO are presented in the following pages and may be run separately.

```

*****
* NAMES.DO
** PROGRAM to define variable names and store descriptions**

use rtscp_surv98_new, clear

gen ateco5= real(ateco)
gen ateco2= real(l_ateco2)
gen form_giur=real(forma_giur)
gen cod_prov=real(codice_provincia)

drop ateco
drop l_ateco2
drop codice_provincia
drop forma_giur

order codice ateco5 ateco2 l_ateco areag regione cod_prov

format %15.0fc cod*
set dp comma

*dataset VALPROD
rename cod11100 ric_tot
rename cod11101 ric_vpi
rename cod11102 ric_vmnt
.
.
.
rename cod77242 cper_noloc_sci

* DESCRIPTION LABELS

label variable codice "Codice impresa"
label variable ateco5 "Ateco impresa a 5 cifre"
label variable l_ateco "Ateco impresa lettera"
.
.
.
label variable cper_noloc_sci "Personnel costs (Not imputable) (SCI)"

label data "RTSS Official Dataset, 1998"
save dati98, replace

```

```

*****
*          CHECK.DO          *
*****
* N.B. execute typing: do check
* checking totals and subtotals
* new variables (<variablename>_dis) are computed when accounting consistency is
violated
* new total variables (in Section "Stato Patrimoniale") are computed when
necessary

capture program drop check
program define check
version 7

/* substituting missing values with zeros */
quietly mvencode _all, mv(0)override

*** CONTO ECONOMICO ***

*****
* VALORE DELLA PRODUZIONE*
*****
tempvar tottric totvr totvalpro
gen `tottric' = ric_vpi + ric_vmnt + ric_lct + ric_lot + ric_ai + ric_tra +
ric_pst
gen ric_dis = ric_tot - `tottric'

gen `totvr' = ric_vr_pf + ric_vr_pcl
gen ric_vr_dis = ric_vr_tot - `totvr'

gen `totvalpro' = ric_tot + ric_vr_tot + ric_vl_co + ric_ini_li + ric_alpro
gen val_prod_dis = val_prod_tot - `totvalpro'
*compare val_prod_tot `totvalpro'
*pause

*****
* COSTI DELLA PRODUZIONE *
*****
tempvar totacqui totservi totgdbt  totpers totamm totvar totondiv totcostprod
totmol totutile totcostpers
gen `totacqui' = acq_matp + acq_ener + acq_mriv
gen acq_beni_dis = acq_beni_tot - `totacqui'

gen `totservi' = acq_lavter + acq_allav + acq_trasp + acq_intmd + acq_pubbli +
acq_risv + /*
                */ acq_consul + acq_inform + acq_prassi + acq_licuso + acq_smrif +
acq_alser +/*
                */ acq_banc +acq_altr_sci
gen acq_serv_dis = acq_serv_tot - `totservi'

*compare acq_serv_tot `totservi'
*pause

gen `totgdbt' = acq_fitpa + acq_leasing + acq_canlo + acq_alfitpa_sci +
acq_leasstr_sci
gen acq_gdbt_dis = acq_gdbt_tot - `totgdbt'
*compare acq_gdbt_tot `totgdbt'
*pause

gen `totpers' = acq_ret_dirig + acq_ret_alcat + acq_cs + acq_qtfr + acq_prpers

/**** where, for PMI: acq_ret_alcat = acq_ret_oppmi +acq_ret_appmi +
acq_ret_ldpmi

```

```

and for SCI: acq_cs = acq_csdire_sci + acq_csal_sci
              acq_qtfr = acq_tfrdire_sci + acq_tfral_sci ****/

gen acq_pers_dis = acq_pers_tot - `totpers'

*compare acq_pers_tot `totpers'
*pause

gen `totamm' = acq_amm_imi + acq_amm_imm + acq_svimm_sci + acq_svcr_sci
gen acq_amm_dis = acq_amm_tot - `totamm'
*compare acq_amm_tot `totamm'
*pause
  gen `totvar' = acq_vr_mp + acq_vr_r
gen acq_vr_dis = acq_vr_tot - `totvar'

gen acq_accant_tot = acq_accant + acq_alacc_sci

gen `totondiv' = acq_forper + acq_onamm + acq_aodg + acq_imp_ind +
acq_impfab_sci + acq_alimp_sci
gen acq_ondiv_dis = acq_ondiv_tot - `totondiv'
*compare acq_ondiv_tot `totondiv'
*pause

gen `totcostprod' = acq_beni_tot + acq_serv_tot + acq_gdbt_tot + acq_pers_tot +
acq_amm_tot + /*
                */ acq_vr_tot + acq_accant + acq_alacc_sci + acq_ondiv_tot
gen cost_prod_dis = cost_prod_tot - `totcostprod'

*compare cost_prod_tot `totcostprod'
*pause

*****
* MARGINE OPERATIVO LORDO *
*****

gen `totmol' = val_prod_tot - cost_prod_tot
*compare `totmol' mol
*pause

gen `totutile' = mol + int_att - int_pas

*****
* OCCUPAZIONE E DATI REGIONALI *
*****
tempvar totocc totoccreg totpersreg
gen `totocc' = occ_dir_tot + occ_imcotot_sci + occ_opaptot_sci + occ_aptot_sci
*+ occ_ld_tot
/* where for PMI
occ_imcotot_sci = occ_imptot_pmi + occ_coftot_pmi
occ_opaptot_sci = occ_optot_pmi + occ_apptot_pmi
*/

compare `totocc' occ_tot
pause
gen `totoccreg' =
add_01+add_02+add_03+add_04+add_05+add_06+add_07+add_08+add_09+add_10+/*
                */+add_11+add_12+add_13+add_14+add_15+add_16+add_17+add_18+add_19+add_20+ad
d_21

```

```

gen `totpersreg' =
cper_01+cper_02+cper_03+cper_04+cper_05+cper_06+cper_07+cper_08+cper_09+cper_10+
/*
*/cper_11+cper_12+cper_13+cper_14+cper_15+cper_16+cper_17+cper_18+cper_19+
cper_20+cper_21

*compare `totoccreg' occ_tot
*pause
*compare `totpersreg' acq_pers_tot
*pause

*compare `totoccreg' `totoccc'

*****
* STATO PATRIMONIALE *
*****
*** ATTIVO
***Immobilizzazioni***

gen sp_imm_tot=sp_im_im + sp_im_man + sp_im_fi
**Rimanenze
gen sp_rima_tot =sp_rim_mp + sp_rim_ps + sp_rim_lc + sp_rim_pf + sp_rim_riv
***crediti
gen sp_cred_tot = sp_cre_bs + sp_cre_ls

***DEBITI
gen sp_deb_tot= sp_deb_bs + sp_deb_ls
end
*****END OF PROGRAM CHECK
*****

use dati98, clear
*pause on
check
format %15.0fc *dis *tot
set dp comma
label data "RTSS Checked Database, 1998"
save dati98_ch, replace

```

```

/*****
*   TAXVAR   *
*****/
initial program to build the fiscal variables for IRAP */

use c:\diecofis\programmi\dati98_ch, clear

/* generating variables to be modified with parameters in order to obtain
'fiscal' variables
labeled with the capital letter */

gen Ric_tot = ric_tot
gen Ric_vr_tot =ric_vr_tot
gen Ric_vl_co = ric_vl_co
gen Ric_ini_li =ric_ini_li
gen Ric_alpro = ric_alpro
gen Acq_beni_tot = acq_beni_tot
gen Acq_serv_tot = acq_serv_tot
gen Acq_gdbt_tot = acq_gdbt_tot
gen Acq_amm_imm = acq_amm_imm
gen Acq_amm_imi = acq_amm_imi
gen Acq_vr_tot = acq_vr_tot
gen Acq_accant_tot = acq_accant_tot
gen Acq_ondiv_tot = acq_ondiv_tot

gen Ded_inail_base = 0
gen Ded_inail_cl = 0
gen Ded_app_base = 0
gen Ded_app_cl = 0
gen Ded_fl_base = 0
gen Ded_fl_cl = 0

format %15.0fc *tot Ric_vl_co Ric_ini_li Ric_alpro Acq_amm_imm Acq_amm_imi Ded*
set dp comma
save dati98_ch1, replace

/* calling program TAXBASE where fiscal variables and deductions are computed*/
do taxbase

```

```

/*****
 * TAXBASE *
 *****/
program to compute fiscal variables and deductions for IRAP
Here included: program CIVTOFIS
                subroutines FISCAL, DEDUC1, DEDUC2
*/

capture program drop _all
program define civtofis
/* routine to convert some administrative values into fiscal values to compute
the tax base */

version 7
args numfile namefile

/* reading the fiscal parameters from file */
use c:\diecofis\programmi\celle`numfile', clear
set more off

/* setting the parameters in matrix Pesi */
mkmat ateco2d pesiq* pdedla* clariciq, matrix(Pesi)

*matrix list Pesi

/*reading the Regional (checked) dataset */
use c:\diecofis\programmi\dati98_`namefile', clear

/* checking the income classes */
if Pesi[1,21] == 1 {
    global cla1=0
    global cla2=5000000000
}
if Pesi[1,21] == 2 {
    global cla1=5000000000
    global cla2=25000000000
}
if Pesi[1,21] == 3 {
    global cla1=25000000000
    global cla2=100000000000
}
if Pesi[1,21] == 4 {
    global cla1=100000000000
    global cla2=500000000000
}
if Pesi[1,21] == 5 {
    global cla1=500000000000
    global cla2=1000000000000
}
if Pesi[1,21] == 5 {
    global cla1=1000000000000
    global cla2=10000000000000
}

/* for debugging
display "The lower income boundary is $cla1"
display "The upper income boundary is $cla2"
*/

global n_obs = _N

/* calling subroutine FISCAL */
fiscal

```

```

/* generating fiscal variables as in Section IV Quadro IQ */
gen Comp_pos_tot = Ric_tot + Ric_vr_tot + Ric_vl_co + Ric_ini_li + Ric_alpro
gen Comp_neg_tot = Acq_beni_tot + Acq_serv_tot + Acq_gdbt_tot + Acq_amm_imm +
Acq_amm_imi + /*
      */Acq_vr_tot + Acq_accant_tot + Acq_ondiv_tot
gen Base_irap_lorda = Comp_pos_tot - Comp_neg_tot

/* calling subroutine DEDUC */
deduc1
deduc2
drop Comp_pos_tot Comp_neg_tot Base_irap_lorda

/*saving the modified Dataset including the fiscal variables and deductions for
IRAP */
label data "Modified Fiscal RTSS Dataset, 1998"
save c:\diecofis\programmi\dati98_fis, replace
end

***** SUBROUTINE FISCAL *****
/* program to compute fiscal variables for IRAP using a weighting scheme */

program define fiscal

/*for debugging
display "The lower income boundary in FISCAL is $cla1"
display "The upper income boundary in FISCAL is $cla2"
*/

/* defining two arrays with ordered variables to be modified and parameters to
be used */
local array1 "Ric_tot Ric_vr_tot Ric_vl_co Ric_ini_li Ric_alpro Acq_beni_tot
Acq_serv_tot Acq_gdbt_tot Acq_amm_imm Acq_amm_imi Acq_vr_tot Acq_accant_tot
Acq_ondiv_tot"
local array2 "pesiq01 pesiq02 pesiq03 pesiq04 pesiq05 pesiq06 pesiq07 pesiq08
pesiq09 pesiq10 pesiq11 pesiq12 pesiq13"

/* ncoef is the number of rows in matrix Pesì
nc is the column number of ateco categories
nc1 is the column number of parameters used in the loop */
local ncoef = rowsof(Pesì)
local nc = colnumb(Pesì,"ateco2d")
local k =1
local nvar : word count `array1'

/*top of external loop for all variables */
while `k' <= `nvar' {
    local var1 : word `k' of `array1'
    local var2 : word `k' of `array2'
    local nc1 = colnumb(Pesì,"`var2'")

    /* for debugging
display "The variable is `var1'"
display "The weight is `var2'"
display "The column number of parameters is `nc1'"
*/

    local i=1
    /*top of inner loop for all observations */
    while `i' <= $n_obs {
        if ric_tot[`i'] > $cla1 & ric_tot[`i'] <= $cla2 {
            local m=1
            while `m' <= `ncoef' {

```

```

                quietly replace `var1'=`var1'[`i']*Pesi[`m',`nc1'] if
ateco2[`i']==Pesi[`m',`nc'] in `i'
                local m = `m'+1
            }
            *display "executed record `i'"
            local i = `i'+1
        }
    else {
        *display "NOT executed record `i'"
        local i = `i'+1
    }
}
/*end of inner loop */
local k = `k' +1
}
/*end of external loop*/

end

***** END OF FISCAL *****

***** SUBROUTINE DEDUC1 *****
/* program to compute fiscal deductions for IRAP using weights over the GROSS
TAX BASE */
program define deduc1

/* defining two arrays with ordered variables to be modified and parameters to
be used */
local array1 "Ded_inail_base Ded_app_base Ded_fl_base"
local array2 "pdedla1b pdedla2b pdedla3b"

/* ncoef is the number of rows in matrix Pesi
nc is the column number of ateco categories
nc1 is the column number of parameters used in the loop */
local ncoef = rowsof(Pesi)
local nc = colnumb(Pesi,"ateco2d")

local k =1
local nvar : word count `array1'

/*top of external loop for all variables */
while `k' <= `nvar' {
    local var1 : word `k' of `array1'
    local var2 : word `k' of `array2'
    local nc1 = colnumb(Pesi,"`var2'")

    /* for debugging
display "The variable is `var1'"
display "The weight is `var2'"
display "The column number of parameters is `nc1'"
*/

    local i=1
    /*top of inner loop for all observations */
    while `i' <= $n_obs {
        if ric_tot[`i']> $cla1 & ric_tot[`i']<= $cla2 {
            local m=1
            while `m' <= `ncoef' {
                quietly replace
`var1'=Base_irap_lorda[`i']*Pesi[`m',`nc1'] if ateco2[`i']==Pesi[`m',`nc'] in
`i'
                    local m = `m'+1
            }
        }
    }
}

```

```

                *display "executed record `i'"
                local i = `i'+1
            }
        else {
            *display "NOT executed record `i'"
            local i = `i'+1
        }
    }
    /*end of inner loop */
    local k = `k' +1
}
/*end of external loop*/
end

***** END OF DEDUC1 *****

***** SUBROUTINE DEDUC2 *****
/* program to compute fiscal deductions for IRAP using weights over the
PERSONNEL TOTAL COST */
program define deduc2

/* defining two arrays with ordered variables to be modified and parameters to
be used */
local array1 "Ded_inail_cl Ded_app_cl Ded_fl_cl"
local array2 "pdedla1c pdedla2c pdedla3c"

/* ncoef is the number of rows in matrix Pesu
nc is the column number of ateco categories
nc1 is the column number of parameters used in the loop */
local ncoef = rowsof(Pesu)
local nc = colnumb(Pesu,"ateco2d")

local k =1
local nvar : word count `array1'
while `k' <= `nvar' { local var1 : word `k' of `array1'
local var2 : word `k' of `array2'
local nc1 = colnumb(Pesu,"`var2'")

/* for debugging
display "The variable is `var1'"
display "The weight is `var2'"
display "The column number of parameters is `nc1'"
*/

local i=1
/*top of inner loop for all observations */
while `i' <= $n_obs {
    if ric_tot[`i']> $cla1 & ric_tot[`i']<= $cla2 {
        local m=1
        while `m' <= `ncoef' {
            quietly replace `var1'=acq_pers_tot[`i']*Pesu[`m',`nc1']
if ateco2[`i']==Pesu[`m',`nc'] in `i'
                local m = `m'+1
            }
            *display "executed record `i'"
            local i = `i'+1
        }
    else {
        *display "NOT executed record `i'"
        local i = `i'+1
    }
}
/*end of inner loop */

```

```
        local k = `k' +1
    }
/*end of external loop*/
end
```

```
***** END OF DEDUC2 *****
```

```
/* executing program civtofis with (6) files for (6) income classes */
display "Computing the TAX BASE components for income class 1....."
civtofis 1 chl
display "Computing the TAX BASE components for income class 2....."
civtofis 2 fis
display "Computing the TAX BASE components for income class 3....."
civtofis 3 fis
display "Computing the TAX BASE components for income class 4....."
civtofis 4 fis
display "Computing the TAX BASE components for income class 5....."
civtofis 5 fis
display "Computing the TAX BASE components for income class 6....."
civtofis 6 fis
```

```

/*****
* IRAP.DO *
*****/
program to compute the tax base and the tax yield */

use c:\diecofis\programmi\dati98_fis, clear

/* generating fiscal variables as in Section IV Quadro IQ of IRAP form */
gen Comp_pos_tot = Ric_tot + Ric_vr_tot + Ric_vl_co + Ric_ini_li + Ric_alpro
gen Comp_neg_tot = Acq_beni_tot + Acq_serv_tot + Acq_gdbt_tot + Acq_amm_imm +
Acq_amm_imi + /*
                */Acq_vr_tot + Acq_accant_tot + Acq_ondiv_tot

/* computing the gross tax base*/
gen Base_irap_lorda = Comp_pos_tot - Comp_neg_tot

/* computing the tax base deductions */
/* fixing work deductions for apprendisti and for formazione lavoro */
local i=1
while `i' <= _N {
    if pmi[`i']==1{
        quietly replace Ded_app_base=0 if occ_aptot_pmi[`i']==0 in `i'
        quietly replace Ded_app_cl=0 if occ_aptot_pmi[`i']==0 in `i'
        quietly replace Ded_fl_base=0 if occ_fl_tot[`i']==0 in `i'
        quietly replace Ded_fl_cl=0 if occ_fl_tot[`i']==0 in `i'
        local i = `i'+1
    }
    else{
        quietly replace Ded_app_base=0 if occ_aptot_sci[`i']==0 in `i'
        quietly replace Ded_app_cl=0 if occ_aptot_sci[`i']==0 in `i'
        local i = `i'+1
    }
}

/* computing deductions in two alternative ways */
gen Ded_lav_b_tot = Ded_inail_base + Ded_app_base + Ded_fl_base
gen Ded_lav_cl_tot = Ded_inail_cl + Ded_app_cl + Ded_fl_cl

/* additional buffer variable for deductions*/
gen Ded_irap_altre=0

/* computing two alternative net tax bases */
gen Base_irap_netta_1 = Base_irap_lorda - Ded_lav_b_tot - Ded_irap_altre
gen Base_irap_netta_2 = Base_irap_lorda - Ded_lav_cl_tot - Ded_irap_altre

/* defining the tax rate: unique for all regions in 1998 */
local Aliq_irap=0.0425
display "Aliq_irap = `Aliq_irap'"

/* computing the IRAP yield */
gen Irap1 = `Aliq_irap' * Base_irap_netta_1
gen Irap2 = `Aliq_irap' * Base_irap_netta_2

format %15.0fc *tot Base* Irap*
set dp comma
label data "Results and data for IRAP, 1998"
save c:\diecofis\programmi\irap_out, replace

```