

Modelling direct and indirect taxes on firms: a policy simulation

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Abstract: In this paper we develop a microsimulation model for the business sector. The model is based upon an integrated dataset built at ISTAT (Italian Institute of Statistics). This dataset combines survey data and published account data for corporations. The model reproduces the Italian tax system on firms (corporate tax, regional tax on economic activity and social contributions) from the year 1998 onwards. We run the model to study the effects of the fiscal changes established in recent years by the Italian government. For this purpose we estimate *ex-post implicit tax rates* and consider two policy scenarios: the first analyses the impact of the tax changes approved in the period 1998-2001, while the second scenario analyses the effects of the tax reform recently introduced by the government. Simulation output includes tax due for every firm both in the baseline scenario and under the reformed regime as well as estimates of effective tax rates disaggregated by sectors, size and other characteristics.

Zusammenfassung: Das Manuskript beschreibt ein Modell für Mikro-Simulationen im Unternehmensbereich. Die Datenbasis der Simulationen ist ein integrierter Datenbestand, der am ISTAT erstellt wurde und in dem Daten aus statistischen Erhebungen und veröffentlichte Unternehmensdaten von Kapitalgesellschaften zusammengeführt sind. Das Simulationsmodell stellt die seit 1998 gültige Besteuerung (Steuern auf Kapitalgesellschaften, regionale Unternehmenssteuer, Sozialabgaben) von italienischen Unternehmen dar. Wir verwenden das Modell, um Auswirkungen der Änderungen im Steuersystem zu untersuchen, die in den letzten Jahren vorgenommen wurden. Dazu schätzen wir implizite Steuersätze auf Basis zweier Szenarios: Das erste analysiert die Effekte der Änderungen, die zwischen 1998 und 2001 wirksam wurden, das zweite die in jüngster Zeit vorgenommene Steuer-Reform. Die Ergebnisse der Simulationen umfassen die von den Unternehmen sowohl im ursprünglichen Szenario als auch nach der Steuer-Reform zu bezahlenden Steuern sowie Schätzungen der effektiven Steuersätze für einzelne Sektoren, für unterschiedliche Unternehmensgrößen und disaggregiert nach anderen Charakteristika.

Keywords: microsimulation, business taxes, social contributions.

1 Introduction

This paper presents a microsimulation model for enterprises to perform simulations of the impact that different fiscal policies have on firms.¹ Tax policy analysis and tax revenue forecasting can be carried out by using either macro or micro models. Macro models are typically based on the use of aggregate data. Therefore, simulations of fiscal policy changes and revenue forecasting are usually obtained by modelling economic relationships among different institutional sectors as well as their behavioural responses. Microsimulation models (MM), on the other hand, are usually accounting models based on the use of large datasets of disaggregated data, such as household budget (or consumption) surveys and firm surveys. These models estimate tax liabilities of individual units (households or firms) and their microeconomic results can be aggregated to the macro level to produce estimates of the tax revenue for the economy. Obviously, the availability of disaggregated data marks the possibility of building a MM. In fact, as households survey data has become more and more accessible, households MM have been developed and are in use in many countries to study the effects of existing tax legislation and fiscal policy reforms.² On the other hand, microsimulation models for firms are less widespread or well known. The main reason is that enterprise microdata are still quite difficult to access. Moreover, each survey is shaped by a specific purpose and collected information is much segmented. Therefore, most economic models rely upon macro and meso – sectoral and territorial – data. Finally, as some MM for firms have been built at the national level they are usually limited to corporations both because of data availability and of the relevance of these companies in the European framework.³

This paper aims at making an original contribution in presenting a microsimulation model for the Italian firms to analyze the effects of the recent fiscal reforms. This analysis is very innovative as far as very small enterprises are concerned due to the fact that scarcity of data had previously hampered empirical work in this field. The

¹ This model was developed by the authors of this paper as part of the DIECOFIS (Development of a System of Indicators on Competitiveness and Fiscal Impact on Enterprise Performance) project financed by the *Information Society Technologies Programme* (IST-2000-31125) of the European Commission. The IRAP and social security contribution modules were built by Rossella Bardazzi and Maria Grazia Pazienza, the corporate tax module by Valentino Parisi. The authors are grateful to Manuela Coromaldi and Mariangela Zoli for their contribution to the construction of the corporate tax module, and to Giuliana Zito for her valuable help on the microsimulation model. Thanks are due to participants at the Conference *Public Finance and Financial Markets, 59th International Institute of Public Finance Congress*, which took place in Prague in August 2003, where part of the empirical results discussed in this paper were presented, and to participants at the International Workshop on *Data Integration and Record Matching* in Vienna, November 13/14, 2003. The model was run at the Italian National Institute of Statistics (ISTAT) where data are produced. The authors are grateful to Filippo Oropallo who gave up his scarce time to contribute to this work. ISTAT bears no responsibility for analysis or interpretation of the data. The usual disclaimer applies.

² 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), Creedy (ed.) (2002). Some relevant articles are Merz (1991), Merz (1993), Merz (1994), Creedy (2001) and Sutherland (1995).

³ For a short description of some existing corporate MM see Ahmed *et al.* (2003).

development of a microsimulation prototype for the business sector presented here is an important step, in particular for its potential to show the impact that fiscal policy has on company choices concerning financial policy, localization, investments and input allocation. This microsimulation model is based upon an integrated dataset built at ISTAT combining survey data and published balance sheets for corporations. Data quality in terms of population representation has proven to be very high. The model simulates: the corporation income tax – IRPEG is the Italian acronym –, the social security contributions paid by employers, and the regional tax on economic activity (acronym IRAP). As any economic model at its early stage of development, the microsimulation model presented here has some limits. Firstly, the model is static because the dataset available at present is just one cross-section for the year 1998. Then it does not include yet firms' behavioural responses considering only the first-round impact of tax policies without investigating second-round effects. Future developments of the MM will be aimed at removing both these limitations.

The paper is organized as follows. In section 2 the dataset and the structure of the model are presented along with a brief description of the specific tax modules and the main methodological aspects concerning the model construction. Then, the two scenarios considered in the simulation analysis are described (section 3). Specifically, a different legislation for modelled taxes is applied on the 1998 data in order to reproduce the base-case scenario. Next, the reformed scenario is simulated to evaluate the effects of the tax reform proposed by the current Italian government for 2004. Simulation output includes revenue estimates in both scenarios by different firms categories: geographical area, activity sectors and size. Section 4 is devoted to a more detailed investigation of the reform impact on medium and large firms. For this purpose we estimate *ex-post implicit tax rates* (EPITR), computed as the ratio between taxes actually paid and a reference economic aggregate (turn-over). The final section summarizes our main empirical findings.

2 The model

2.1 Building the specific dataset

The model is based on a dataset called “Regional Tax and Social Security” (RTSS).⁴ Two ISTAT (Italian Institute of Statistics) surveys are combined in the RTSS: the Small and Medium Sized Enterprises survey (PMI) carried out on private firms with less than

⁴ The dataset is fully described in a paper of this journal written by Oropallo and Inglese. Here we just remind the key features of the microdata.

100 workers and the survey on Large Enterprises (SCI) with more than 99 employees.⁵ At present, the base year of these data is 1998.⁶ The reference unit of the dataset is the enterprise defined as “the organisation of an economic activity conducted in a professional manner with the intent of producing market goods or providing market services. The enterprise can either be of a single-location type or of the multi-location type.”⁷ In this work, we will refer to this definition when using both ‘firm’ and ‘enterprise’.

These survey data are not completely adequate to build a model for the main taxes paid by firms. In fact, some computations cannot be performed using the data (in that they are too aggregate to do so)⁸ and therefore additional data sources are used. In particular, although the survey data covers the company balance sheet in some detail, we need to match information from our dataset against published accounts in which some variables are recorded at a more disaggregated level. Therefore, for a selection of firms in the RTSS dataset the survey data are integrated with balance sheets data. This integrated dataset is specifically well suited for simulating corporate tax rules. ISTAT has a statistical business register which files all active enterprises (acronym ASIA). In Table 1, a comparison between the model dataset and the population in the ASIA archive for firms of different legal status is presented. These figures show that the dataset is very good in terms of representativeness of the population of enterprises by legal status included in the business register.

⁵ The acronyms PMI and SCI stand respectively for the Italian “Piccole e Medie Imprese” (Small and Medium Sized Enterprises, SME) and “Sistema dei Conti delle Imprese” (Large Enterprises, LE). Exhaustive information is available for large enterprises that have at least 100 workers, while for small and medium sized firms data are collected from a sample of enterprises. From the population of SMEs (including firms with no employees) a theoretical stratified sample is selected accounting for roughly 3% of the population. Then, the methodology for the inference about the population is based on bounded weighting estimators.

⁶ The surveys are carried out every year, thus new datasets for 1999 and 2000 should soon become available. However, the SME sample changes over time thus a time-series of cross-sectional data will be built, while for large enterprises the dataset will become a panel.

⁷ The survey data are collected in fulfilment of the European legislation on “Structural Business Statistics” regulated by Council Regulation n.58/97. For details on national methodologies to collect these data see Eurostat (2001).

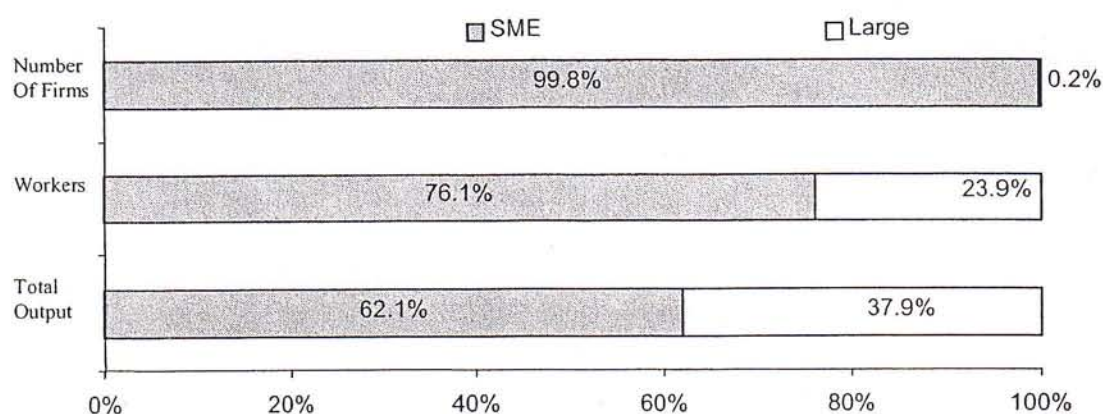
⁸ More details on the specific use of additional data sources can be found in paragraph 2.3 where the tax modules are described. However, some examples may be cited: some personnel cost components for large enterprises are joined in one single variable and must be divided to compute wages and salaries as tax base for social contributions; some components of the corporate tax base must be detailed to compute the tax yield; data on employees by type of contract are too aggregate as far as special contracts are concerned – short term contracts, apprentices, work training contracts -- and additional sources are used to detail this statistical information.

Table 1: Comparison between the model dataset and the population: breakdown by legal status of non-financial and non- agricultural firms - 1998

	Number of firms in the dataset	% in Model Dataset	% in Asia archive
Sole Entrepreneurships	2.607.031	66,3	66,7
Partnerships	854.897	21,8	20,1
Corporations	421.262	10,7	11,6
Co-operatives and others	46.925	1,2	1,6
Total	3.930.115	100,0	100,0

Source: Authors' estimates

From the following figure, we observe that in terms of output, the SMEs – enterprises with less than 100 employees – produce 62% of the total. We also see that 25% of workers are employed in large enterprises (LE), in spite of these representing only 0.2% of total enterprises.



Source : Denk, Oropallo (2002).

Figure 1: Some characteristics of the population of Italian Enterprises (RTSS dataset), 1998

The dataset covers almost all sectors of economic activity (NACE classification): Mining (C); Manufacturing (D); Energy (E); Constructions (F); Trade (G); Hotels (H); Communications (I); Other services (K); Education (M); Health (N) and other social services (O except division 91). The dataset excludes Agriculture and Fishing (AB) and Financial Services (J).

2.2 The model structure

In general, there are some basic reasons for using a microsimulation model in fiscal policy analysis.⁹ The first reason draws on the clear possibility of having a more refined outcome than one would achieve if aggregated data were used. Through individual observations and large datasets, any policy can be analysed in great detail for every firm by considering the individual budget items of each. Aggregating data could cause a loss of details. This aspect is particularly important if one considers 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 of the effect of a specific tax policy. As a consequence, aggregated results can be gained by disaggregated data, whereas the reverse is not true. The analysis of the impacts of a specific policy on some variables – such as the number of taxpayers with negative tax base – can only be performed in a meaningful way on the basis of microdata. Then a microsimulation model makes it easier to standardise the analysis over time. The dynamic effect of a given tax policy may therefore be analysed in a consistent way. Furthermore, statistical properties of large samples tend to generate results with lower standard errors and, under certain hypothesis about the distribution of the variables, confidence interval of results may also be calculated.

The microsimulation model used in this paper is at its early stage of development. As the dataset available at present is just one cross-section, the model is static. In the simulation scenarios presented here, we consider only the direct impact of policy changes not including firms' behavioural responses. The basic structure of the model is presented in the following chart (Figure 2).¹⁰ Firstly, a procedure to check and substitute missing values is undertaken and a preliminary consistency check is performed.¹¹ Subsequently, the social contributions are modelled and their revenue is estimated. As a third step, the IRAP tax base is computed and the tax yield is estimated as some labour deductions from the IRAP base are calculated in the SC module. Finally, the IRPEG module is run to estimate the corporate tax on a selection of the overall dataset.

Logically, some important interactions are implemented in the model. For example, some deductible labour costs for IRAP are computed in the social contributions module and are therefore endogenous to the model. Moreover, social contributions are, as a component of labour cost, deductible from the corporation tax base. With all modules

⁹ These considerations are drawn from Bardazzi, Gastaldi and Pazienza (2002).

¹⁰ The model consists of a set of STATA programs which can be executed either in separate steps or with a compact procedure.

¹¹ With this procedure we check the internal consistency of the accounts collected in the microdata. 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. Moreover, tax rules simulation 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 the impact of some fiscal reforms or some minor changes in the tax rules are simulated. A microsimulation model is indeed the most adequate tool to give a comprehensive picture of this matter provided that microdata are available and reliable at a disaggregated level. Therefore, the checking procedure must be accurate and our dataset has been continuously revised to eliminate eventual internal inconsistencies.

working together, an interaction between labour cost policy (specifically a change in social security contribution rates) and IRPEG due from a firm can be estimated.

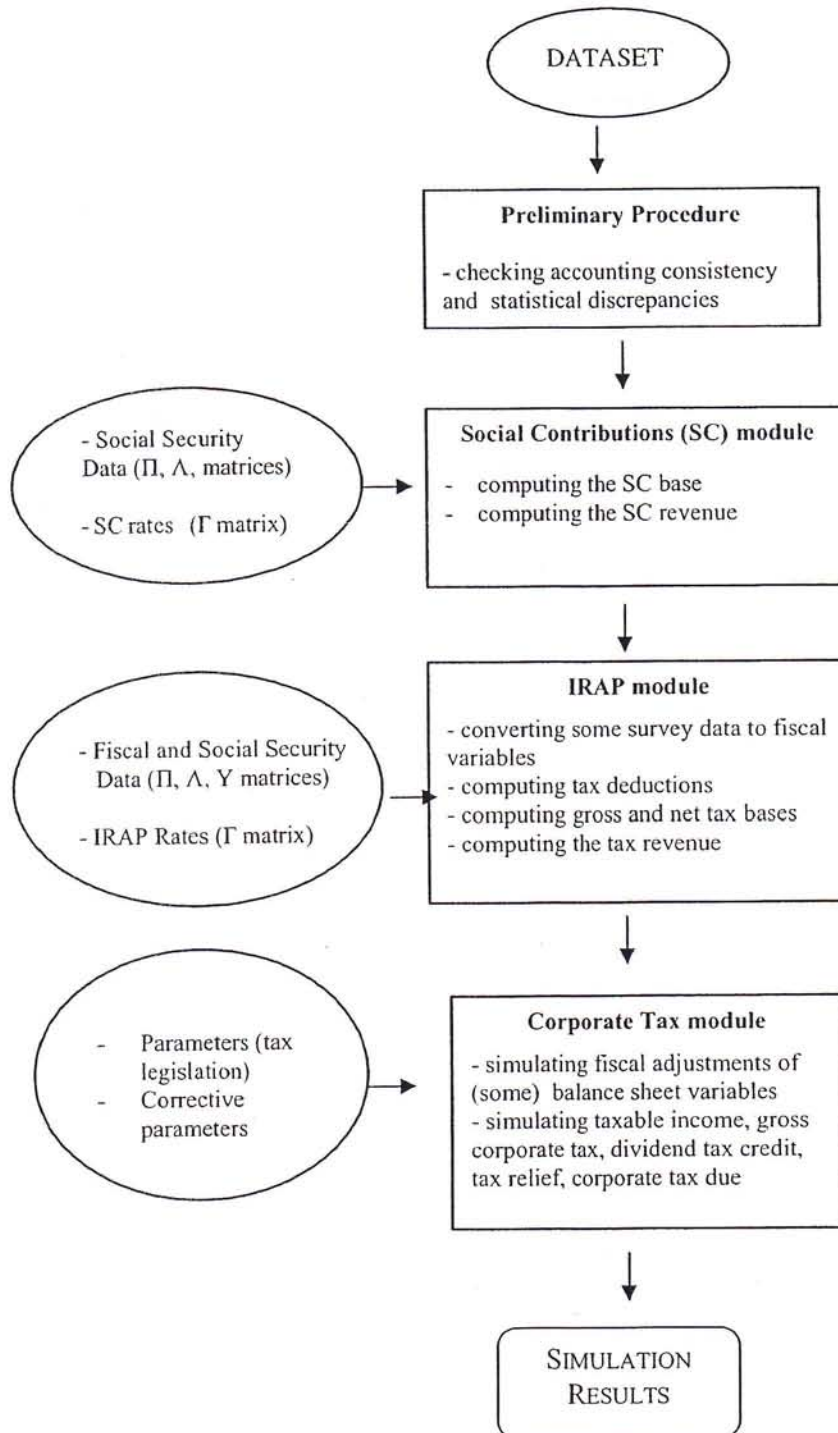


Figure 2: The Model Structure

2.3 Taxes and Social Contributions Modules

Social Contributions. At present, our analysis refers to social contributions paid by employers¹² for hired workers classified in our dataset as executives, white-collar workers, manual workers and apprentices. For these categories, it is possible, despite some difficulties, to reconstruct the tax base using the data available in the dataset with some additional information and assumptions, as described below. The rules for social contributions are fairly complex with specific rates for each sector of activity, firm size, type of contract and contribution. Given the large number of social contribution types considered, for the purpose of readability the contributions have been aggregated into four groups:

- IVS - old-age, survivors pension scheme (IVS- INPS and INPDAI contributions);
- Miscellaneous (sickness, maternity, family benefits, ordinary unemployment benefit);
- CIG part time unemployment: ordinary earnings complement (CIGO- *Cassa integrazione guadagni ordinaria*) and extraordinary earnings complement (CIGS- *Cassa integrazione guadagni straordinaria*);
- INAIL employment injuries and occupational diseases (INAIL contributions).

The main rationale of this module has been that of designing a flexible procedure in order to implement the 1998 rules in detail and, at the same time, to make the introduction of changes for the following years quite straightforward. As an example, data on wages and salaries by worker categories are too aggregate and therefore are not very suitable to compute the contribution tax base: the INPS source¹³ was used for data on *average* wages and salaries by sector of activity to estimate the total earnings by firm for executives, white-collar workers, manual workers and apprentices. Data on average wages by type of worker (k) and by activity (j) are stored in matrix Λ and multiplied by the number of employed persons in each firm (i).¹⁴ The SC due for employers for each i -th firm and for each type of employee (k) is computed as:

$$SC_{ink} = [\text{Workers}_{ijk} \times \Lambda_{jk}] \times \Gamma_{jm}^k \quad (1)$$

where m denotes several types of social contributions and Γ is a matrix with contribution rates for each contribution type by activity (j).¹⁵ Finally, total employers'

¹² The social contributions (SC) borne by Italian employees and employers differ in their functions and scope. Workers with special contracts – such as apprenticeship and work training contracts – pay different social contributions from full time workers. Our aim is to model the effects of all contributions distinguished by type, rate, type of contract, firm size, activity sector and so on. For a more detailed description of the Social Contributions module, see Bardazzi and Paziienza (2003).

¹³ Istituto Nazionale di Previdenza Sociale (National Institute for Social Security).

¹⁴ The value of k is 4 in relation to the categories of workers considered in the model (executives, white-collar workers, manual workers and apprentices). The value of j is 57, referring to the NACE 2 digits categories excluding Agriculture and Fishing, as well as Financial Services.

¹⁵ Contribution rates by types of worker (k) are stored in different matrices Γ which are filled in outside the program and therefore may be easily updated.

social contributions are computed for every firm¹⁶ as total sum of each type of contribution for each type of worker.

The model's fit can be considered very satisfactory in terms of total contribution receipts for the base year (1998). On average, the SC module overestimates the contribution receipts by 4 per cent.

Regional Tax on Economic Activity (IRAP). Basically, we can describe the IRAP gross tax base as the value added of the firm, net of depreciations:

$$\text{Gross Tax Base} = \text{Value of Production} - \text{Purchases of Goods and Services} - \text{Depreciations} \quad (2)$$

These values can be found in the firm's balance sheet and are collected in the RTSS database, but a major problem is the reconciliation of balance-sheet values with fiscal values. This means that the model must reproduce the changes that the Tax Authority regulations require for some items on the balance sheet. In particular, we transform the accounting values into fiscal values using Tax Authority data for returns submitted in 1999 (Ministero delle Finanze, 2002a, concerning income for 1998) which provide the basic information needed in order to create a reconciliation module between balance sheet and fiscal values.

This procedure uses specific coefficients Π_{jk} , calculated from Tax Authority data on a sectoral (j) and dimensional basis (k), applied to the survey data to estimate the fiscal values for each firm i .¹⁷

$$\text{Fiscal Values}_{ijk} = \text{Survey data}_{ijk} \times \Pi_{jk} \quad (3)$$

The gross tax base is computed according to definition (2), but every item is converted on a fiscal basis. In order to obtain the net tax base, there are some labour cost components that firms can deduct.¹⁸ Thus, the tax due by each firm is given by:

$$\text{IRAP}_i = \text{Net Tax Base}_i \times \Gamma_{ij} \quad (4)$$

Where matrix Γ contains specific tax rates with regional and sectoral details for every year. This feature allows for a flexible revision of the model for the regional autonomy of manoeuvring tax rates applied from 2000 onwards.¹⁹

¹⁶ IRAP is a tax on the company value added net of amortizations and depreciations, with the exclusion therefore of deductibility of interest incurred and the cost of labour. This tax was introduced in the Italian system in 1998 and was meant to become the focus of regional tax autonomy. The decentralized institutions have the possibility of manoeuvring the tax rates, albeit within quite restrictive limits, without any power to affect the setting of the tax bases. The IRAP module is fully described in Bardazzi, Gastaldi and Paziienza (2002).

¹⁷ The value of j is 57, that is the NACE 2 digits categories excluding Agriculture and Fishing, and Financial Services. As for k (firm dimension categories) we consider 6 income classes.

¹⁸ Deductible labour costs are: expenses for employment injuries insurance (INAIL social contributions); total labour cost of apprentices, work training contracts and disabled (from 2001); a specific allowance for social and labour co-operatives. In 1998, total labour cost deductions reached 13 million Euros.

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 (2):

$$\text{Gross Tax Base (alternative)} = \text{Labour costs} + \text{interest expenses} + \text{profit} \quad (5)$$

The response in terms of government revenue is very satisfactory: the model underestimates IRAP revenue by 0.2 per cent and has a good fit for corporations, entrepreneurship and partnerships, while for co-operatives and firms of other legal status, a larger difference is found.²⁰

The Corporate Tax (IRPEG). The Corporate Tax Module (CTM hereinafter) is built following a modular structure. The order in which the sub-modules are implemented in the model is logically a reflection of the structure of the corporation tax rules. The main building blocks of the CTM are the Fiscal Adjustment, Corporate Income, and Corporate Tax routines which run sequentially. Each module uses other programs basically to simulate tax instruments used in the main routines which represent specific provisions allowed or provided by the tax legislation (the DIT system²¹, tax allowances, losses from the previous periods than can be carried forward, tax credits, tax reliefs and so on). The corporate tax base is obtained from the profit (loss) resulting from the company balance sheet adjusted for tax purposes. Fiscal adjustments of balance sheet variables that cannot be modelled are entered using parameters calculated on the basis of corporate tax returns published by the Tax Authority, as in the IRAP case.²²

¹⁹ It's worthwhile to stress that in the RTSS dataset the regional distribution of employment and labour cost is included for every multilocalized firm. Thanks to this feature a reliable regional tax base has been built.

²⁰ Moreover, we wish to highlight that the model is adequate also with regard to the distribution of taxpayers between a positive and negative tax base.

²¹ The Dual Income Tax (DIT) system was introduced in 1998 for the general purpose of reducing both the discrimination against equity finance and the company tax rate. In this system profits are divided in two components: the first component represents the ordinary income or normal profits, that is, the opportunity cost of new financing with equity capital compared to other forms of capital investments; the residual component is the extra-profit. Ordinary income is calculated by applying an assigned nominal rate of capital return to the annual capital increases evaluated with reference to the value of capital stock at the date 31/09/96. The nominal rate is set yearly by the government. Ordinary profits are taxed at the preferential rate of 19% while remaining profits, the second component of corporate income, are taxed at the ordinary rate. Formally, the total corporate tax amount (T_C) can be expressed as follows:

$$T_C = t(\Pi - r\Delta K_{96}) + t' r\Delta K_{96}$$

where Π represents total taxable profits, r is the imputed nominal rate, t the ordinary corporate tax rate, t' the preferential tax rate (19%), and ΔK_{96} net capital increases evaluated with reference to 1996, as explained above. Therefore, under the DIT system, the "effective" statutory rate ranges between t and t' , depending on the amount of profits eligible for the benefit (ΔK_{96}).

²² Although for the large enterprises dataset on which the corporate tax module is run there are no available fiscal data that can be used to validate modelled tax yield, a preliminary analysis shows that the model overestimates corporate tax revenue and that this result is consistent with overestimation of profits for firms of the dataset. For a more detailed description of the corporate tax module and estimated results see Parisi (2003).

3 A policy simulation

In this section we discuss the effects of the main changes introduced and planned in the 1998-2004 period. For this purpose, we divide the whole period into two sub-periods and we consider two different scenarios, the legislation in force in the year 2001 and the new fiscal reform that is in force since January 2004 (the so called Tremonti reform, after the name of the Minister who introduced it). The first scenario basically considers the policy changes brought in by the previous government before the new one came into effect (2001), while the second scenario (hereafter Reform Scenario) considers the reform recently approved by the current government. Results of the simulations are first presented for the whole dataset mainly in terms of tax revenue changes, eventually distinguished by enterprise legal status and localisation. Finally, the effects of these reforms on the firms' tax burden are considered for medium and large sized enterprises. It is worthwhile to stress that all scenarios' results are hypothetical in the sense that are based on the 1998 base year dataset under the assumption of different tax regimes.

3.1 The 2001 Scenario

For the 2001 scenario, the new provisions and rules concerning IRAP, social contributions and the corporation tax are implemented on the 1998 base year dataset.

Regarding **IRAP**, since the year 2000, regions are allowed to change the tax rates and to introduce allowances and exemptions for specific sectors of activity. During the same period, some social **contribution** rates have changed as a consequence of a nominal adjustment (as for apprenticeships) or as a double dividend effect of the Carbon Tax introduced in 1999 (a reduction of some SC rates was financed through the new green tax). Moreover, in the Finance Law for 2001 the previous government introduced two changes aimed at mitigating the labour cost as a component of the IRAP tax base; a full deduction of personnel costs for employed disabled people is allowed as well as a specific deduction for small enterprises linked to the tax base (only firms with IRAP taxable income no greater than 181.000 Euros are eligible to this deduction).²³

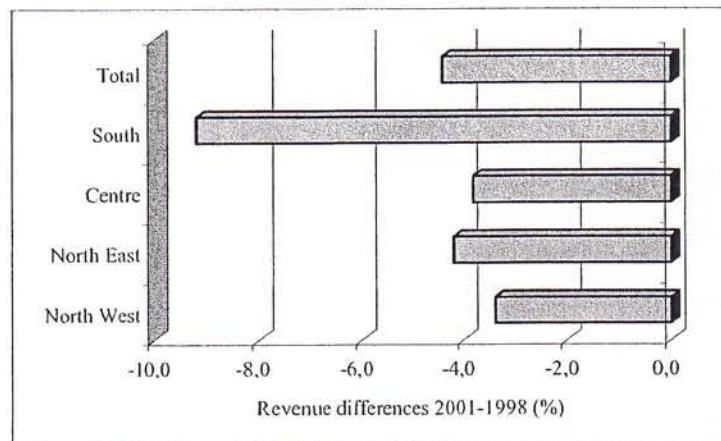
The implementation of the 2001 legislation on the 1998 dataset gives a revenue effect of -765 million Euros for IRAP, mainly concentrated on very small firms, sole entrepreneurs and partnerships which show a reduction in the tax due, on average, of 17,8% and 6,7% compared to 1998. It is worthwhile to note, however, that the new deduction linked to the tax base represents 95% of the revenue difference and benefits 92% of firms. Firms with a negative tax base (4,04% in 1998) rise to 15,8% in 2001. Over 80% of these firms are sole entrepreneurs, and more than 25% of Southern firms

²³ According to law n.68/99, firms are obliged to employ disabled people in relation to their size:

- from 15 to 35 workers: 1 disabled person;
- from 36 to 50 workers: 2 disabled persons;
- more than 50 workers: 7% of total workers must be disabled.

However, according to an unofficial and qualitative appraisal of the situation, firms show a very low compliance with the law. As no statistical information on this matter can be found in the dataset, we assume that disabled people are employed in firms as manual workers for 50% of the law requirements.

have, after the new deductions, a negative tax base. The IRAP revenue reduction by firm localisation is shown in Figure 3.



Source: Authors' estimates

Legenda: **North West**: Valle d'Aosta, Liguria, Lombardia, Piemonte; **Nord East**: Trentino Alto Adige, Friuli Venezia Giulia, Veneto, Emilia Romagna; **Centre**: Toscana, Umbria, Lazio, Marche; **South**: Abruzzo, Molise, Campania, Puglia, Basilicata, Calabria, Sicilia, Sardegna.

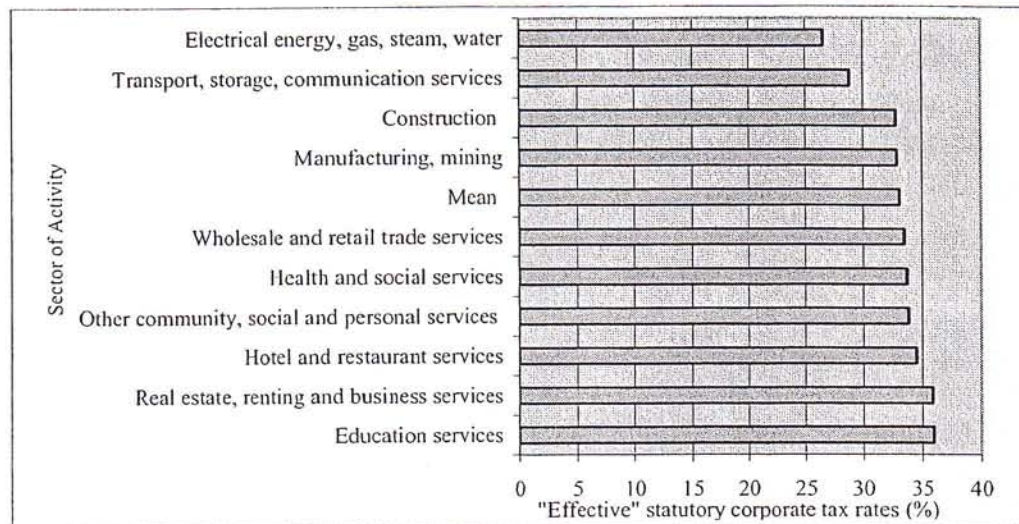
Figure 3: IRAP: Revenue differences 2001-1998 by localisation of firms

Concerning the **corporation tax**, in the 2001 scenario the structure of the DIT allowance corresponds to its last version before this system was practically abolished by the new government. Specifically, in 2001, some changes were introduced in order to speed up the DIT system. We also call to mind that in 2001 the statutory corporate tax rate is reduced from 37% to 36%. Therefore, under the dual rate system the "effective" corporate statutory rate ranges between the preferential rate (19%) and the statutory rate (36%), depending on the amount of profits eligible for the allowance.

As for the corporate tax system, we estimate the "effective" statutory tax rates for firms of each activity sector due to the DIT system.²⁴ Such estimates are obtained from the base year dataset using external information (aggregated data from Centrale dei Bilanci,

²⁴ Basically, as compared to the first version of the DIT system described in footnote 21, according to these changes allowable profits are increased by 40% by applying a multiplier (1,4) to their amount when computing the tax due. Seemingly, the idea behind these changes was to extend the DIT system from the incremental regime, where allowable profits are computed on the basis of capital (retained earnings and subscriptions) increases, to a final regime where such profits are calculated on the basis of the entire company capital stock. Although the DIT system was completely abolished in January 2004, in June 2001 the new government introduced modifications to the DIT allowance mechanism basically aimed at lessening the effects of this system. In the simulation we do not consider the effects of these (temporary) modifications.

2002) on equity capital changes.²⁵ The results show that, in 2001, the estimated mean “effective” statutory corporate tax rate is 33,1%, about 3 percentage points lower than the statutory corporate rate of taxation set by the legislation (36%). The DIT allowance favours, in particular, enterprises in the ‘electrical, energy, gas, steam, and water’ sector and in the ‘transport and communication’ sector, which exhibit “effective” statutory rates respectively of about 6 and 4 percentage points lower than the mean rate (Figure 4). On the contrary, firms in the ‘educational services’ sector do not seem to benefit a great deal from the dual rate system.²⁶



Source: Authors' estimates

Figure 4: "Effective" statutory corporate tax rates (%) by activity sector (NACE letter classification); 2001 Scenario

²⁵ To fully estimate the effects of the DIT system, ideally, the 2001 scenario simulation should be run using data updated to the same year. This is generally true for all simulations referring to tax legislation of different years where balance sheets of the same years are to be used. The other possibility could be to update balance sheet variables. This procedure however would inevitably be imprecise and would present strong biases. Therefore, as already explained in this paper, analyses are performed using 1998 balance sheets in all scenarios. However, the updating issue is particularly relevant regarding the DIT system given that using 1998 balance sheet variables would underestimate allowable DIT profits, while we expect the amount of allowable profits to be potentially higher due to greater capital increases undertaken by the companies up to the year 2001. Therefore, in computing the “effective” statutory rates we update all variables relevant to simulate the DIT allowance, as well as gross company profits, to year 2001. This procedure uses parameters computed from the Centrale dei Bilanci (2002) which reports company accounts for various years. “Effective” statutory rates are calculated using profits as denominator.

²⁶ It is noteworthy that, according to our estimations, benefits of the DIT system are higher for large enterprises (with more than 250 employees), that display “effective” statutory rates ranging from 0,5 to about 1 percentage point lower than the average rate, and 4 percentage points lower than the statutory rate.

3.2 The tax reform scenario

At the end of 2001, the Italian Government approved a Bill containing guidelines for a comprehensive tax reform affecting both direct and indirect taxation. The Italian Parliament subsequently delegated²⁷ the Italian Government to implement a tax reform in compliance with the principles set out in the Enabling Law and a first step of the reform came into force at the beginning of 2004.²⁸

The new tax system will be structured around five types of taxes (personal income tax, corporate income tax, VAT, tax on services and excise duties) all of which are governed by a consolidated tax code. The main characteristics of the new system for firms are:

- the abolition of the DIT system and, gradually, of IRAP;
- a general tax exemption of corporate dividends and distributed capital gains and the abolition of the dividend tax credit and other measures regarding the tax treatment of capital gains and losses;
- the introduction of an optional consolidated tax return for groups that can be extended to foreign subsidiaries.

The reform provides for the abolition of the dual rate system and sets a uniform corporate tax rate of 33%. One of the most important innovations is the introduction of a consolidated tax regime for Italian corporate groups. The second important innovation is the introduction of a participation exemption regime under which inter-corporate capital gains are exempted from taxation, and which provides for the exemption of dividends²⁹ along with the abolition of the full imputation dividend tax relief.³⁰

Currently, Italy does not have any thin capitalisation regulations. In the new system, a debt-equity ratio is introduced in order to prevent thin capitalisation of companies. When financial debts (such as loans, money deposits, etc.) granted or secured by the shareholders owning at least a 10% stake in the company and by related companies exceed this threshold, interest costs are classed as paid dividends and cannot be deducted from the tax base.

As previously mentioned, under the new framework IRAP will be completely eliminated. However, as this tax still represents the basic financial source for the Regions and the National Health System, its abolition will be gradual. Article 8 of the Enabling Law provides that priority will be given to abolishing the non-deductibility of

²⁷ Law April 7, 2003 (Enabling Law).

²⁸ Legislative Decree December 2003 n.344.

²⁹ Specifically, dividends paid by the company (either resident or non-resident) to its shareholders are excluded from the corporate tax base to the extent of 95% of their amount, while, when dealing in a consolidated fiscal unity, a 100% exemption is granted. Along the same lines, capital losses are not deductible for tax purposes if the requirements cited above are met.

³⁰ The general reason underlying these rules, that do not apply to unincorporated enterprises for which dividends and capital gains must be partially included in the tax base, relates to avoiding double taxation of inter-corporate income (both capital gains as well as dividends) and, concerning dividend taxation, relates to international issues such as the imputation system's tendency to favour domestic taxpayers over non-residents (Giannini, 2003, Keen, 2002).

personnel costs and, as an example, suggests that 20 per cent of personnel costs be deductible from the IRAP tax base.

Before the Enabling Law was passed, the 2003 Finance Law introduced some changes with the general aim of reducing the share of labour costs on the total tax base.³¹

In the *Reform scenario*, as regards IRAP we simulate the effects of: i) the specific deduction for small firms and the deduction aimed at lessening the labour cost tax wedge, both introduced with the Finance Law for 2003; ii) the general reduction of 20% of labour cost from the tax base, as a possible path towards the IRAP abolition proposed by the Enabling Law. The estimated revenue effect of these changes is -2,5 billion Euros (80% of which comes from the 20% reduction of IRAP tax base), with an impact scattered among firms, since this general reduction does not discriminate by size but is specifically linked to personnel costs (Table 2).³²

Table 2: IRAP: revenue and loss position by firm size in the Reform and 2001 scenarios (*)

Employees Classes	Revenue Difference Reform-2001 (thousand of Euros)	Revenue Differences Reform- 2001 (%)	(%)	(%)	Companies that pay NO IRAP (absolute difference) Reform-2001
			Companies that pay NO IRAP (negative tax base) 2001 Scenario	Companies that pay NO IRAP (negative tax base) Reform Scenario	
0 to 49	-1.357.351	-18,00	15,88	23,74	307.609
50 to 250	-446.631	-18,41	0,77	1,69	163
Above 250	-780.847	-19,40	0,95	1,54	15
Total	-2.584.828	-18,47	15,8	23,63	307.787

(*) 2001 and Reform scenarios are simulated on the 1998 base year dataset

Source: Authors' estimates

Regarding the corporation tax, we simulate³³ the impact of: i) the abolition of the DIT allowance and the introduction of a uniform tax rate system with a rate of 33%, ii) the exemption of capital gains on shares (owned for at least one year and recorded as long term assets) in other corporations carrying out a commercial activity (and not-residing in tax haven countries) and the likewise non-deductibility of capital losses if the same requirements are met, iii) the introduction of thin capitalisation rules limiting the

³¹ For this purpose, all costs borne to hire personnel with training contracts are fully deductible (until 2002 only 70 per cent of these were deductible). Furthermore, amounts paid for scholarships and other funds not subject to the personal income tax (IRPEF) are no longer subject to IRAP. The fixed deduction introduced in 2001 was increased to 7.500 Euros if the tax base is lower than 181.000 Euros. A new deduction of 2.000 Euros was introduced for small firms for each employee up to a maximum number of five.

³² On the contrary, the effects of the special deduction are concentrated, as expected, on small and unincorporated firms with a large impact on the distribution of firms between positive and negative tax base. It is important to stress that all reductions linked to labour cost have relative less impact on very small firms as they usually do not have regular employees.

³³ Information available in our dataset is not detailed enough to model all the proposed changes to the corporate tax system. Therefore, while it is not possible to identify companies belonging to the same group, the incidence of capital gains/losses potentially eligible for the exemption/non-deductibility rule or of interest costs potentially subject to the thin capitalisation rule are computed using data provided by the Technical Report on the Tax Reform presented in Parliament.

amount of paid interest that can be deducted and iv) the exemption of 95% of dividends and the abolition of the dividend tax relief.

As regards the corporate tax revenue change, the simulations show a slight increase of about 2 percentage points, while the sectoral effects of the reform are mainly linked to the difference between the new statutory tax rate (33%) and the "effective" tax rates provided by the previous DIT regime. Additional results in terms of tax indicators are presented and discussed in the following section.

4 A more detailed analysis on medium and large firms

In order to perform a more detailed analysis of the effects of the tax reform discussed in the previous section, we estimate ex-post implicit tax rates in the two policy scenarios. Implicit rates are computed as the ratio between taxes actually paid and turnover³⁴ by running the integrated model on the subset of medium and large corporations (8.279 firms with more than 99 employees).

Table 3 and Table 4 display the EPITRs, for both the dimensional and the sectoral breakdown, in the 2001, the baseline and Reform scenarios. These tables also provide the absolute differences of EPITRs, both for the overall tax burden (IRAP and IRPEG) and, separately, for IRAP and the corporation tax (IRPEG). In both scenarios, EPITRs highlight some differences in the tax burden for firms of different size. Although companies in the subset are subject to the same general tax structure (IRPEG and IRAP), specific characteristics of the enterprise (production function) and features of the tax law (sectoral, depreciation rates, allowances and tax credits) result in different rates with firm size and for activity sector of the enterprise: tax rates decrease with the firm size (Table 3) in both scenarios.

Table 3: EPITRs for different scenarios: size breakdown

Classes of employees	Firm frequencies (%)	EPITRs (taxes on turnover*100)			Absolute differences (Reform -2001)		
		Baseline 1998	2001 Scenario	Reform Scenario	Overall	<i>Irap</i>	<i>Corporation tax</i>
100-199	58,6	4,44	4,18	3,85	-0,33	-0,36	0,03
200-249	10,8	4,60	4,31	3,93	-0,37	-0,35	-0,02
250-499	18,8	4,92	4,6	4,2	-0,40	-0,38	-0,02
500-1000	7,3	4,35	4,08	3,74	-0,34	-0,38	0,04
Above 1000	4,5	3,95	3,69	3,34	-0,35	-0,38	0,03
Total	100,00	4,52	4,24	3,89	-0,35	-0,37	0,02

(*) 2001 and Reform scenarios are simulated on the 1998 base year dataset

Source: Authors' estimates

³⁴ For more about this choice see Gastaldi and Paziienza (2004), Nicodeme (2002), and Collins and Shackelford (1995). With EPITRs we look for evidence of discrimination between firms operating in different sectors or having different size. The drawback of the use of turnover as denominator is that it implicitly assumes that the true profit margins are constant across sectors and size.

The tax changes implemented in 2001 by the previous government show a reduction of 0,28 percentage points of the average implicit tax rate (from 4,52 to 4,24), with a widespread and generally homogeneous effect across firms of different size.

The full reform proposed by the current government results in a reduction of 0,35 percentage points of the average implicit tax rate. This reduction is however mostly due to the 20% labour cost deduction provided by the IRAP revision (-0,37 percentage points) and not by the corporation tax reform. We also find that greater benefits are gained from the IRAP changes by larger firms due to the fact that labour cost generally increases with the firm size. Regarding the modelled corporate tax reform, results show a slight increase of the mean implicit rate (0,02 percentage points). This aspect is discussed in more details below. Here we observe that an increase in implicit rates occurs in all classes except for companies of the second and third class.

Table 4 shows that the sectoral rates are not homogenous in all scenarios. Highly taxed firms are those in the 'hotels and restaurants', 'transport and communication', 'real estate and business activities', 'health', and 'other service activities' sectors, which experience implicit rates higher than the mean rate, sectors that, on average, had a small gain from the DIT system.

As for the effects of the full reform, the simulations show some interesting findings. Firstly, the reform causes the implicit rate to drop in all sectors except the 'electricity, gas and water supply' sector which records an implicit rate increase of 0,07 per cent mainly due to the corporation tax reform. This is a somewhat expected finding as, according to our simulations, this is the sector where (large) firms seem to have been most favoured by the DIT system.³⁵ On the whole, drops in implicit rates are greater for companies in the 'commerce' and the 'services' sector.

The effects of the corporation tax reform for each sector, in short, depend both on changes in the tax base and on the (uniform) statutory rate of taxation as compared to the "effective" rate prevailing in the 2001 scenario where a dual rate system is present. As a total result, firms in the 'real estate and business activities', 'hotels and restaurants', 'education', and 'other service activities' sectors would gain from the corporation tax side of the reform, while companies in all other sectors would record a rise in the implicit tax rate.

³⁵ Indeed, this sector had the lowest "effective" statutory rate in 2001 (see Figure 4).

Table 4: EPITRs for different scenarios: sectoral breakdown

Sector of Activity	Firm frequencies (%)	EPITRs (taxes on turnover*100)			Absolute differences (Reform – 2001)		
		Baseline 1998	2001 Scenario	Reform Scenario	Overall	Irapp	Corporation tax
<i>Manufacturing, mining</i>	57,72	4,13	3,84	3,62	-0,21	-	0,00
<i>Electrical energy, gas, steam, water</i>	1,22	2,79	2,36	2,43	0,07	-	0,31
<i>Construction</i>	3,89	3,39	3,19	3,00	-0,18	-	0,11
<i>Wholesale and retail trade services</i>	8,50	2,37	2,22	2,13	-0,09	-	0,03
<i>Hotel and restaurant services</i>	2,31	4,77	4,60	4,07	-0,53	-	-0,08
<i>Transport, storage, communication services</i>	7,68	6,79	6,24	5,76	-0,49	-	0,32
<i>Real estate, renting and business services</i>	11,94	6,00	5,88	4,89	-0,99	-	-0,19
<i>Education services</i>	0,12	4,50	4,47	2,82	-1,65	-	-0,13
<i>Health and social services</i>	4,39	6,32	6,09	5,35	-0,74	-	0,08
<i>Other community, social and personal services</i>	2,23	6,05	5,71	5,26	-0,44	-	-0,04
Total	100	4,52	4,24	3,89	-0,35	-	0,02

(*)2001 and Reform scenarios are simulated on the 1998 base year dataset

Source: Authors' estimates

5 Concluding remarks

In this paper we have presented a microsimulation model for Italian enterprises to perform tax policy analysis for the business sector. The model discussed here reproduces the main indirect taxes (IRAP and social security contributions) on firms and the corporation tax (IRPEG). As regards data, for tax modelling purposes it is necessary to move from single survey data, or single accounts data, to a comprehensive system of 'integrated and systematised' datasets on enterprises. For this purpose, the model uses a specific integrated dataset which combines survey data on enterprises and company accounts for the year 1998, built at ISTAT (Italian Institute of Statistics) within the DIECOFIS project. This integrated dataset allows for a complete representation of the tax rules for Italian corporations and validation results show that the performance of the integrated model in reproducing the tax system on corporations is good.

In this paper we run the model to analyse the effects of the fiscal reform designed by the Enabling Law. In the empirical analysis we consider two scenarios. The first, 2001, considers the structure of the tax system existing just before the new government came into effect. The second scenario, the reform scenario, introduces a deduction of 20% of labour costs from the IRAP tax base as a first step towards the (future) abolition of this tax. Moreover, in this scenario, the new corporation tax system moves back to a uniform tax rate (33%), as the Dual Income Tax system is abolished, and brings in some changes to the determining of the tax base.

Simulations show that the full reform reduces the overall (IRAP and IRPEG) ex-post implicit tax rate from 4,24% (2001) to 3,89% (reform scenario), therefore by 0,35 percentage points. One important conclusion we can draw from this analysis is that the reduction of rates found in the full reform scenario is mainly due to the large cut in the IRAP tax base with the abatement of 20% of labour costs, while the corporation tax changes should produce a slight increase in the tax burden. Firms operating in sectors which benefited most from the DIT allowance are those that will bear most of the reform cost in terms of a higher implicit rate (i.e. 'electricity, gas and water supply'). The simulated reform does not show relevant overall revenue effects.³⁶ However, gainers and losers can be detected if one looks at the simulation results in terms of firm size, localisation, and sector of activity.

³⁶ In evaluating the simulation results, we would like to remind that some features of the reform, such as the consolidated group taxation (which could contribute to reduce the tax burden), cannot be simulated.

LIST OF ACRONYMS

ISTAT	Istituto Nazionale di Statistica (Italian Institute of Statistics)
MM	Microsimulation Models
IRPEG	Imposta sul Reddito delle Persone Giuridiche (Corporation Tax)
IRAP	Imposta Regionale sulle Attività Produttive (Regional Tax on Economic Activity)
EPITR	Ex-post Implicit Tax Rates
RTSS	Regional Tax and Social Security
PMI	Piccole e Medie Imprese
SCI	Sistema dei Conti delle Imprese
ASIA	Archivio Statistico delle Imprese Attive
SME	Small and Medium Enterprises
LE	Large Enterprises
SC	Social Contributions
IVS	Invalidità – Vecchiaia – Superstiti
INPS	Istituto Nazionale della Previdenza Sociale (National Institute for Social Security)
INPDAI	Istituto Nazionale di Previdenza per i Dirigenti di Aziende Industriali
CIG	Cassa Integrazione Guadagni Ordinaria
CIGS	Cassa Integrazione Guadagni Straordinaria
INAIL	Istituto Nazionale per l'Assicurazione contro gli Infortuni sul Lavoro.
DIT	Dual Income Tax
VAT	Value Added Tax

References

- S. Ahmed, H. Immervoll, P. Kattuman and H. Sutherland. Multi-country microsimulation modelling of corporate tax policies: prospects and problems. *Diecofis Deliverable 8.1*. University of Cambridge, 2003.
- R. Bardazzi and M.G Paziienza. The Social Contributions (SC) module: Development and Results of the IRAP-SC Italian Model. *Diecofis Deliverable 5.1*. University of Florence, 2003.
- R. Bardazzi, F. Gastaldi, M.G. Paziienza. The IRAP module. *DIECOFIS Deliverable 5.2*. University of Florence. 2002. Available on the website <http://istat.it/diecofis>. Centrale dei Bilanci, *Archivi dati*, 2002.
- J. Collins and D. Shackelford. Corporate Domicile and Average Effective Tax Rates: The Cases of Canada, Japan, the United Kingdom, and the United States. *International Tax and Public Finance*. 2:55-83, 1995.
- J. Creedy .Tax Modelling, *The Economic Record*, vol.77, (237), 189-202, 2001.
- J. Creedy. (ed) *Microsimulation Modelling of Taxation and the Labour Market*. Elgar, London, 2002.
- M. Denk and F. Oropallo. Overview of the Issues in Longitudinal and Cross-Sectional Multi-Source Databases. *DIECOFIS Deliverable 1.1*. ISTAT, Rome. 2002. Available on the website <http://istat.it/diecofis>.
- EUROSTAT. *Structural Business Statistics, National Methodologies, Theme 4, Industry, Trade and Services*, 2001.
- F. Gastaldi and M.G Paziienza. Do multinationals Pay less?. in "International Institutions and Multinational Enterprises", for "International Institutions and Global Governance Series" edited by John-ren CHEN and David SAPSFORD, Eward Elgar., 2004.
- S. Giannini. *La nuova tassazione dei redditi di impresa: verso un sistema più efficiente e competitivo?*, mimeo, 2003. Available on the website <http://www.capp.unimo.it>
- A. Gupta and V. Kapur (eds). *Microsimulation in Government Policy and Forecasting, Contributions to Economic Analysis.247*, North Holland, Amsterdam, 2002.
- A. Harding. *Microsimulation and Public Policy, Contributions to Economic Analysis.232*, North Holland, Amsterdam, 1996.
- M. Keen. The German Tax Reform of 2000. *International Tax and Public Finance*, Vol. 9 n.5, 2002

- J. Merz. Microsimulation. A Survey of Principles Developments and Applications. *International Journal of Forecasting*, vol.7, 77-104, 1991.
- J. Merz. Microsimulation as an Instrument to Evaluate Economic and Social Programmes. *FFB Discussion Paper* n.5. University of Lueneburg, 1993.
- J. Merz. Microsimulation. A Survey of Methods and Applications for Analysing Economic and Social Policy. *FFB Discussion Paper* n.9. University of Lueneburg, 1994.
- Ministero delle Finanze. IRAP – Imposta Regionale sulle Attività Produttive, Anno d'imposta 1998. Rome, 2002a.
- Ministero delle Finanze. Le Società di Capitali e gli Enti Commerciali, Anno d'imposta 1998. Rome, 2002b.
- L. Mitton, H. Sutherland and M. Weeks. *Microsimulation Modelling for Policy Analysis*. Cambridge University Press, Cambridge, 2000.
- G. Nicodème. Sector and size effects on effective corporate taxation. *Economic papers* n. 153, European Commission, Directorate-General for Economic and Financial Affairs Oecd (2000), *Revenue Statistics*, Oecd, Paris, 2002.
- V. Parisi. Modelling the Corporation Tax for Italian enterprises: methodological aspects and preliminary results. *Quaderni di Ricerca*. Dipartimento Economia e Territorio, Università di Cassino, n. 7. 2003. Available on the website <http://www.eco.unicas.it/dipet>
- H. Sutherland. Static microsimulation models in Europe: a survey. *Microsimulation Unit Discussion Paper* MU9503, Department of Applied Economics, University of Cambridge.

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