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*Antonella Caiumi, Lorenzo Di Biagio*



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## **Istat Working Papers**

Corporate Effective Taxation in Italy using a new Microsimulation model: Istat-MATIS

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# Corporate Effective Taxation in Italy using a new microsimulation model: Istat–MATIS<sup>1</sup>

Antonella Caiumi<sup>2</sup>, Lorenzo Di Biagio<sup>3</sup>

## Sommario

*In questo lavoro presentiamo un nuovo modello di microsimulazione (Istat–MATIS) fondato sui dati delle dichiarazioni dei redditi e forniamo una ampia analisi delle implicazioni delle recenti riforme dell'imposizione societaria sulla distribuzione del carico tributario effettivo sulle società italiane. Il nostro database copre l'universo delle società di capitali pertanto consente di valutare l'impatto delle modifiche fiscali sul gettito per lo Stato. Le misure prese in esame comprendono la riforma delle perdite, la completa deducibilità dell'IRAP sul costo del lavoro dall'IRES e il nuovo Aiuto alla Crescita Economica (ACE). Nel 2014 l'impatto della riforma delle perdite è limitato, mentre la riforma della deduzione IRAP e l'introduzione dell'ACE riducono l'aliquota media di prelievo per oltre metà delle imprese (57,3%). Tra queste, circa un terzo beneficia di entrambi i provvedimenti. Il nuovo ACE riduce l'aliquota media di tassazione in misura crescente. La percentuale di beneficiari cresce con la dimensione d'impresa, ma l'abbattimento dell'aliquota di prelievo è più elevata per le piccole rispetto alle grandi imprese. L'analisi mostra che le imprese con elevata profittabilità, basso indebitamento e bassa intensità di capitale sono favorite dall'attuale sistema d'imposta. Al contrario, il carico fiscale effettivo sulle imprese con elevato indebitamento è relativamente più elevato.*

**Parole Chiave:** Trattamento fiscale delle perdite; Aiuto alla crescita economica; Tassazione societaria; Microsimulazioni

## Abstract

*In this paper we present a new microsimulation model (Istat–MATIS) founded on corporate tax return data and we provide a comprehensive analysis on the implications of recent corporate tax reforms on the effective tax burden distribution for Italian corporations. Our database covers the whole population of limited-liability firms thus allowing for conclusions on the revenue impact of tax changes. We consider the new treatment of losses, the extended deduction of IRAP from IRES and the newly implemented 'Aiuto alla Crescita Economica' (ACE, Aid to Economic Growth). In year 2014 we reckon that the impact of the new treatment of losses is low, while the IRAP deduction and the ACE reduce the tax burden on corporate profits for over half of the companies (57.3%). Among these, about one third benefits of both provisions. The new ACE lowers the average corporate tax rate at an increasing extent. The percentage of beneficiaries increases with firm size, however the tax cut is higher for small-medium sized firms than for larger companies. The analysis shows that corporations with high profitability, low financial ratio and low capital intensity are favored by the current tax system. In contrast, the effective tax burden on corporations with high financial ratio is comparably higher.*

**Keywords:** Tax treatment of losses; Allowance for corporate equity; Corporate taxation; Microsimulation

<sup>1</sup> The views expressed in this paper are those of the authors and do not necessarily represent the institutions with which they are affiliated. Any errors or mistakes remain the authors' sole responsibility.

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## Contents

<b>1.</b>	<b>Introduction</b>	7
<b>2.</b>	<b>The Italian Corporate tax system</b>	8
2.1	An overview of recent reforms	8
2.2	The structure of the Corporate Taxation	10
2.2.1	<i>The tax treatment of losses</i>	10
2.2.2	<i>Consolidated taxation mechanism</i>	10
2.2.3	<i>The Participation Exemption</i>	11
2.2.4	<i>Interest deductibility regulation</i>	11
2.2.5	<i>The newly implemented ‘ACE’</i>	12
2.2.6	<i>The local business tax</i>	12
<b>3.</b>	<b>The corporate tax microsimulation model and data</b>	13
3.1	The Istat–MATIS model framework	13
3.2	Data description	15
<b>4.</b>	<b>Evaluating recent tax reforms</b>	16
4.1	The new tax treatment of losses	16
4.2	Pro-growth measures, the expanded IRAP deduction and the new ACE	18
4.3	The distribution of the effective tax burden	21
<b>5.</b>	<b>Concluding remarks</b>	26
<b>A</b>	<b>The integrated dataset</b>	27
<b>B</b>	<b>The validation of the model</b>	28

## 1. Introduction

Microsimulation is a modeling technique typically used to simulate the behavior of the basic unit of analysis and provides a description of the whole population taking into account differences across individuals. The main advantage of microsimulation models in relation to economic policy analysis is that policy implications can be analyzed at the disaggregated level. Tax systems may impose a non-uniform effective tax rate on different businesses, depending on their size, ownership structure (standalone versus belonging to a group of firms, domestic versus foreign-owned), business activity and location. Corporate tax microsimulation models compute the net tax liabilities for individual firms and are used to forecast the revenue impact as well as the distributional consequences of tax reforms, and assess ex-ante whether policy initiatives had the intended or unintended effects.

The starting point for tax microsimulation models is a (large) microdata set which provides comprehensive information on the determinants of individual tax liabilities. In principle, corporate tax models require the use of two complementary company-level data sources — confidential corporate tax return data and accounting data — because usually corporate taxable income differs from economic income. Corporate tax returns allows to precisely determine the tax position of corporations in each fiscal year as well as to recover information on the use of non-debt tax shields, like capital allowances, losses carry forward and preferential tax treatments. Knowledge of loss offsetting and firms' ability to shift taxable profits over time are especially important for revenue forecasting. However, to completely identify heterogeneity in business activities other information are required. In particular, company accounts provides information of interest on the economic determinants of corporate profits.

Microsimulation models for firms are relatively rare compared to models for households (Ahmed (2006)). Firm models are more complex than household models both because firm behavior involves inter-temporal aspects and tax rules are usually more complex. In addition, access to firm data, especially tax, is more restricted compared to household data. Firm's models are usually static, thus disregarding behavior and time. A notable exception is the study of Finke et al. (2013) that provides an analysis of the German 2008 corporate tax reform based on a model that allows for behavioral responses of firms to tax changes.

To our knowledge this is the first study that documents a multi-period corporate microsimulation model founded on corporate tax returns. The approach developed in this paper is inspired by previous microsimulation models for Italy. A comprehensive corporate tax microsimulation model for Italy is MATIS (Modello per l'Analisi della Tassazione e degli Incentivi alle Società) developed under the aegis of the University of Bologna (Giannini et al. (2001)). The MATIS model is multi-period and based on accounting data for large manufacturing firms (Centrale dei Bilanci archive). Caiumi (2001) improves the design of the statistical archive of MATIS by selecting a representative sample with a stratified method from the universe of firms listed on the Istat firms register (Archivio statistico delle imprese attive, ASIA). Further, Caiumi (2005, 2006, 2007) develops a one period model based on cross-sectional confidential tax returns data. Balzano et al. (2011) develop a one period micro-based model that exploits numerous data sources, including published financial statements and survey data on Italian firms.

In this paper we present a new corporate microsimulation model developed by Istat, the Italian National Institute of Statistics. This new model, Istat-MATIS, combines a multi-period framework with the use of large complementary data set. Istat-MATIS is an algebraic framework that reproduces tax liabilities of Italian corporations and fiscal groups in accordance to fiscal rules. We analyze recent tax interventions by taking into account all the complexities of the Italian tax regime, including the tax treatment of losses, the partial interest deductibility rule and the group taxation.

The paper provides a comprehensive analysis of the implications of recent reforms of the Italian corporate tax system after a major tax reform in 2008: the new treatment of tax losses, the expanded deduction of the labor component of the IRAP and the newly implemented 'Aiuto alla Crescita Economica' (Aid to Economic Growth). Under the new ACE regime, a notional return on equity is deductible against corporate profits. The Italian ACE is applied on an incremental basis in order to minimize tax revenue losses.

The multi-period framework allows for dynamic simulation and to consistently trace firm-level inter-temporal developments of fundamental tax base variables, like for example interests deduction

add-backs (carry forwards), losses carry forwards and tax allowances carry forwards. This model approach is particularly suited to evaluate tax reforms that are gradually introduced into force. Tax changes often provides advantages partially offset by restriction in other provisions and the sign of the net effect on tax liabilities may vary over time. As we will show, this is the case for the reform of the tax treatment of losses recently introduced in Italy. Besides, the incremental nature of the new ACE-type reforms involves cumulative effects over time.

An important feature of our microsimulation procedure is that it does not require the underlying data panel to be balanced, therefore our simulation results are not affected by selection bias. Moreover, being based on the entire population of corporations, our results allows for conclusions on the distribution of the tax burden among taxpayers as well as on the revenue impact of tax changes. The richness of our database allows to represent the heterogeneity of Italian corporation according to key variables, like economic sectors, technological intensity, size expressed both in terms of turnover and number of employees, location, export-oriented, and last but not least, property structure.

In year 2014 we reckon that the impact of the new treatment of losses is restrained, while the IRAP deduction and the ACE reduce the tax burden on corporate profits for over half of the companies (57.3%). Among these, about one third benefit of both provisions. The percentage of beneficiaries is higher for industrial firms and medium-large sized firms, groups of firms and those located in the North. The introduction of these measures determines a tax cut of 9.8% corresponding to 2.6 bn euros in 2014. The main contribution to the reduction of the tax debt is attributable to the new ACE (5.4%). Firms with turnover between 500 thousand and 10 million euros, firms belonging to the construction sector and those located in the South and in the North-Est are the main beneficiaries. The new ACE lowers the average corporate tax rate of benefiting firms at an increasing extent. We find that the percentage of beneficiaries increases with firm size. However, the ACE mechanism entails a tax cut which is higher for small-medium sized firms than for larger companies. As expected, single entities benefit from the new ACE less than companies belonging to a group.

The paper is organized as follows. The next section outlines the main features of the Italian corporate tax legislation and gives the details about the tax reforms that will be simulated. Section 3 presents the microsimulation model and the database. Section 4 provides empirical results of a distributional analysis of recent tax reforms on Italian corporations. Section 5 concludes.

## 2. The Italian Corporate tax system

### 2.1 An overview of recent reforms

Since the second half of the '90s the Italian corporate income tax has been subject to frequent reforms. The reduction of the corporate tax rate and the enhancement of tax neutrality with respect to financing decisions have been the main drivers. Table 1 summarizes the main corporate tax reforms over the last decades. The increase in neutrality of the tax system in respect of the source of financing is dealt more in depth in Caiumi et al. (2015).

In 1997 a broad reform deeply renewed the business taxation system with the aim at reducing the tax burden on profits as well as on business net worth and correct the historical imbalance in the Italian tax system towards indebtedness. This objective was pursued with the introduction of a restricted version of the ACE, called Dual Income Tax (DIT) and a new local business tax, the regional tax on productive activity (IRAP). Under the DIT scheme a lower statutory rate (DIT rate), 19% instead of 37%, is applied to the notional return from post-reform equity stocks. This new feature of the tax system reduced the tax advantage of debt as a source of finance for companies. The IRAP replaced a number of taxes, including the regional income tax (ILOR), a tax on dividend distributions by corporations, the net worth tax, and payroll contributions levied to finance a national health scheme. This permitted a relevant simplification of the tax code. In addition, by broadening the base the introduction of IRAP permitted a significant reduction of the tax rate on profits. The statutory rate was set at 4.25%. After the introduction of the DIT system and the IRAP, the statutory tax rate on corporate profits dropped from 53% to 41.25%. Coherently with the main purpose of the reform, interest expenses were made not deductible from the IRAP tax base so that the regional business tax can be characterized as a CBIT-type reform.



In 2001 a newly-elected government progressively depotentiated the DIT mechanism. In 2004, a comprehensive tax reform definitely abolished the DIT system and reduced the statutory corporate tax rate from 37% to 34%. Also, the imputation system was replaced by the participation-exemption system and a formal group taxation was introduced. Under the new system, the tax advantage of financed debt was no longer addressed with the exception of few anti-avoidance rules (thin-capitalization). The CIT was renamed *Imposta sul reddito delle società* (IRES).

In 2008 a further major tax reform saw a significant drop both of the main statutory corporation tax rate from 33% to 27.5% and of the IRAP tax rate from 4.25% to 3.9%. The revenue neutrality was almost ensured by a broaden tax base, obtained mainly through the abolishment of accelerated and anticipated capital depreciation allowances<sup>4</sup> and the introduction of a stronger restriction to interest deductibility in replacement of the thin-cap rule. The reform was clearly inspired by the German corporate tax reform that came into force some months earlier, and motivated by the need to react to the tax competition particularly strong in the EU countries, especially after the EU enlargement. Unlike German reform, in Italy the limitation to interest deductibility applies to all industrial and commercial companies, being motivated not only by the need to limit the revenue loss associated with the statutory tax rate cut, but also by the intention to correct the fiscal favor to indebtedness associated to the profit tax system in force.

**Table 1 - Major tax reforms in corporate taxation in Italy, 1982-2014**

Tax year	Tax changes
1982	IRPEG: 27%; ILOR: 16.2%, deductible from IRPEG.
1983	IRPEG: 36%.
1991	Deduction of ILOR from IRPEG up to 75% .
1992	Elimination of ILOR deduction from IRPEG; new tax on net business wealth (Patrimoniale).
1995	IRPEG: 37%.
1997	DIT – notional return on equity: 7%, reduced tax rate: 19%; minimum average tax rate: 27%.
1998	Abolition of ILOR, Patrimoniale, payroll contribution and other minor taxes. Introduction of IRAP: 4.25%.
2000	Super-DIT multiplier: the DIT base is raised at 120% of the new equity stock.
2001	IRPEG: 36%; Super-DIT multiplier: 140%. Abolition of minimum tax rate of 27%; abolition of DIT on new equity (since June 2001).
2002	Abolition of Super-DIT multiplier.
2003	IRPEG: 34%.
2004	Abolition of DIT; IRES: 33%. Introduction of a participation-exemption system and group taxation.
2008	IRES: 27.5%; IRAP: 3.9%. Abolition of anticipated and accelerated depreciation allowances. Introduction of a lump-sum IRAP deduction from IRES and a ceiling to interest deductibility.
2011	New treatment of tax losses. ACE – notional return on equity: 3% in 2011–2013.
2012	Expanded deduction of the labor-component of IRAP from IRES.
2014	ACE notional return: 4%, 4.5% , 4.75% in 2014, 2015, 2016 respectively.

In the summer 2011 with the deepening of the financial crisis of the Italian public debt, a reform of the tax treatment of losses was introduced with the aim of increasing tax revenues. At the end of

<sup>4</sup> The reform should have been accompanied by a deep revision of tax depreciation rules to follow the economic depreciation of the assets as closely as possible, so as to enhance the neutrality of the tax system with respect to the choice of capital investment goods. However, that revision has not been introduced yet.

2011, the ‘Salva-Italia’ introduced tax relief both on capital through the so called ‘Aiuto alla Crescita Economica’ (Aid to Economic Growth) and on labor, increasing the deductibility of the IRAP labour component from income taxes.

The ACE shares not only the acronym but, also, the main characteristics of the British ACE (see IFS, 1991). It also shares some characteristics with the Italian DIT. Like the former DIT mechanism, the Italian ACE is applied on an incremental basis in order to minimize the reduction of tax return. However, under the new ACE regime, a notional return on equity is fully deductible against corporate profits. The imputation rate used to calculate ordinary income has been progressively increased. It is set equal to 3% for the first three years and then 4%, 4.5% and 5% for the three subsequent years (legge di stabilità 2014). The measure has been introduced to contrast economic downturns, by promoting investments through a reduction in effective tax rates on companies. At the same time, it is expected that a more balanced tax treatment of financial sources should expand the share of capital allocated to real economic activities, relocating resources from financial activities.

Further, the ‘Salva-Italia’ expanded the deduction of the labor component (net of deductions) of the IRAP against the IRES, and increased the deduction on labor costs only to those under 35 and women newly employed under permanent contracts (from 4,600 to 10,600 euros; in Mezzogiorno regions from 9,200 to 15,200 euros). The latter provisions aim at reducing labor taxes and sustaining labor demand.

## 2.2 The structure of the Corporate Taxation

In what follow, this section goes into detail of the legislation of the main components of the corporation tax system. This serves as an introduction to a more detailed analysis in the next sections.

### 2.2.1 *The tax treatment of losses*

The tax treatment of losses changed in 2011. According to rules previously in force, losses arising in a given tax period could be carried forward and deducted from corporate taxable income in subsequent periods up to a maximum of five years. Tax losses arising in the first three tax periods following the company establishment date could be deducted from taxable income in subsequent periods with no time limits, as long as losses concern a new business activity (e.g., the losses are not incurred in the course of a merger or business contribution). As from 2011, tax losses are no longer subject to a 5-year expiration period even for not-expired losses incurred in previous years. However, 20% of a year’s taxable income cannot be offset against tax losses carried forward and will be subject to corporation tax. Losses incurred by a company during the first three taxable periods may be carried forward and entirely used to offset corporate taxable income, but, as before the reform, only if they arise from a new business activity. The reform of the tax treatment of losses leave unchanged the ban to losses carryback.

### 2.2.2 *Consolidated taxation mechanism*

After the major reform of 2004 the economic reality of corporate groups is formally recognized with the introduction of a formal group taxation system to the aim of further aligning the Italian tax system to the most efficient tax systems in force within the EU. In broad terms, the group relief recognizes to a business the same overall tax treatment of losses whether it operates as a single entity or as a group. Two different group taxation systems are in force; a national tax consolidation system and a world tax consolidation system. Consolidation for tax purposes is available to domestic groups, with each subsidiary in a group free to choose whether or not to consolidate. Consolidation is available to a parent and its resident companies that are under its direct or indirect control. The control requirement is met when the participation company holds more than 50% of the share capital of another company and is entitled to more than 50% of the profits of that company. Domestic consolidation may also be adopted if a non resident company is the controlling company but only if the company is resident in a country that has concluded a tax treaty with Italy and carries on business

activities in Italy through a permanent establishment holding the participation in the controlled Italian companies. Domestic consolidation is not available to companies benefiting from a reduction of the corporate tax. It requires a minimum three-years commitment. Once an option for consolidation is made, it may not be revoked for three years unless the subsidiary ceases to be controlled by the parent company. The new domestic consolidation employs a ‘pooling’ approach. Exercising the consolidate taxation option therefore involves calculating a single taxable income for all companies included in the tax consolidation, by compensating income and losses within the consolidation scope (with adjustment for intra-group transactions). Taxable incomes are fully offset regardless of the controlling share. Tax losses realized previously to exercise the consolidation taxation option cannot be attributed to the parent company.

The group taxation system provides additional opportunities and tax advantages such as the offsetting of tax credits and tax liabilities among group members, like for example the amount of the notional deduction in excess of the net taxable income as described in more detail below.

World tax consolidation effectively extends the group taxation treatment to foreign companies; incomes and losses realized by foreign subsidiaries are imputed to the Italian controlling company in proportion to the controlling share and calculated according to Italian tax rules.

### *2.2.3 The Participation Exemption*

A central feature of the major tax reform of 2004 was the adoption of a participation exemption as a system to avoid the double taxation of revenues from participations in other corporations/partnerships in the form of dividends and capital gains. The PEX regime implies that 95% of capital gains realized by companies resident for tax purposes on the disposal of equity investments in corporations/partnerships resident in Italy or abroad are IRES-exempt. Equity investments eligible for such treatment are those classified as non-current financial assets, engaged in commercial activities, held continuously for at least twelve months and resident for tax purposes in a country or territory other than a tax haven (white list countries). Capital losses, write-downs and expenses related to the disposal of equity investments qualifying for the participation exemption are not deductible. Dividends received from corporations resident for tax purposes in Italy or a State or territory other than a tax haven are excluded from taxable income for IRES purposes in the amount (currently) of 95%.

### *2.2.4 Interest deductibility regulation*

Corporations can fully deduct interest expenses and similar charges (not capitalized in the cost of assets) in an amount equal to interest income and similar revenues. The excess may be deducted up to a ceiling of 30% of Gross Operating Profit (GOP).<sup>5</sup> Interest expense that cannot be deducted (due to limit exceeding) can be carried forward to subsequent tax periods and added to the amount of interest expense and similar charges for such periods. To allow a gradual implementation of the new rule, the ceiling is augmented of an amount equal to 10,000 euros in the first year (2008) and 5,000 euros in the second year (2009). As from 2010, the GOP portion not used in a given tax period as it exceeds interest expense may be carried forward to increase GOP in subsequent years.

Specific rules apply in the case of companies participating in the consolidated taxation mechanism. The excess of GOP not completely used for interest deduction by the company that generated it, can be used to compensate interest expense not deducted by other entities belonging to the consolidation scope. This compensation is not allowed to interest expense carry forwards generated prior to the access to the consolidation. In addition, further restrictions apply to a consolidated company that holds both interest expense not deducted and loss carry forwards generated prior to exercising the consolidated taxation option. The aforesaid excess of interest expenses can be deducted from the consolidated taxable base up to the amount of the taxable income that the same company had conveyed to the consolidation. This is to avoid circumvent the rule that preclude loss carry forward generated prior to the access to the consolidation to be transferred to the consolidated taxable base.

<sup>5</sup> GOP is equal to the difference between item A (Production Value) and item B (Production Costs) in the income statement, increased by depreciation and amortization of property, plant and equipment, and intangible assets and lease payments.

### 2.2.5 *The newly implemented 'ACE'*

Starting from tax period 2011, taxable income is split into two components, ordinary and above-normal return. Ordinary income is exempt under ACE. The provision is aimed at spurring companies' own capitalizations by counterbalancing the tax advantage of debt.

The ordinary return is computed by applying a notional interest rate to new equity generated after 2010.<sup>6</sup> Specifically, the ACE base is computed from the algebraic sum of positive components (capital increases and allocations of profits to reserves) and negative components (the contemporaneous increase in equity investment qualifying for participation in related entities) due to anti-avoidance rules. The latter amount does not include any profits from that year. The notional interest is computed using a percentage set annually by the Minister of Finance. The percentage is set considering the Italian public debt securities' average return and a risk factor. The return is set at 3% for the first three fiscal years (2011–2013). It has been recently increased at 4%, 4.5% and 4.75% for the three subsequent years. Afterwards it will be based on Government bonds rate. The amount of the notional deduction in excess of the net taxable income can be carried forward to relieve future taxable income with no time limitation. The ACE relief is applied also to firms belonging to a fiscal group. The ACE deduction is computed at the firm level up to entirely offset its taxable income. The amount of the notional deduction in excess of the net taxable income can be carried forward to relieve future taxable income or attributed to the parent company. As for tax losses, the overhang of the ACE deduction, arising before the access to a fiscal group, cannot be transferred to the fiscal unit.

### 2.2.6 *The local business tax*

The IRAP tax base is calculated by a direct subtraction method as the difference between gross receipts (sales revenues) and the cost of intermediate goods and services (purchases from other firms plus depreciation). Neither labor costs nor interest payments are deductible from the tax base.<sup>7</sup> However, the fiscal burden of the IRAP on the labor component of the tax base has been progressively reduced, mostly through the introduction of tax deductions in favor of permanent employees. Regional governments can levy an additional one (currently 0.92) percentage point or either reduce it to the same extent. The tax rate can also be differentiated according to the economic sector and the categories of firms.<sup>8</sup> Like the CBIT system, the IRAP seeks to eliminate the favorable fiscal discrimination of debt financed investment by disallowing a deduction for interest payments, but it is not neutral to investment given that outlays for capital goods are not immediately deductible (but only in accordance with normal income tax depreciation schedules).<sup>9</sup>

As of 2008 10% of the IRAP can be deducted from the IRES taxable base (and from income of firms subject to IRPEF) for firms that sustain financial and labor costs. After 2012, the total amount of the IRAP stemming from the labor component (net of applicable deductions) is deductible against the IRES. The lump sum deduction of the interest expenses component of the IRAP still applies. The overall deduction (lump sum and analytical) admitted to be offset against the IRES taxable base cannot exceed the amount of the IRAP tax debt. The share of unused deduction due to firm's tax-exhaustion can be carryforward as a tax loss in future years.<sup>10</sup>

<sup>6</sup> See Zangari (2014) for a comparison with the Belgian ACE system.

<sup>7</sup> The IRAP is essentially a net income type of value added tax on an origin basis (cfr. Ceriani and Giannini (2009)). Its peculiarity consists in the fact that it is levied not on income when taxpayers receive it, but before its distribution, on the value of production generated in each tax period by subjects engaged in business activities. The misunderstanding of this characteristic is at the root of the perception by taxpayers as a particularly oppressive tax.

<sup>8</sup> Under certain conditions, since 2013, regional governments can even set the rate to zero.

<sup>9</sup> Moreover, it probably favors capital over labor because tax depreciation allowances exceed economic depreciation (Bordignon et al. (2001)).

<sup>10</sup> In practice, the tax code allows to offset first the IRAP deductions and then, on the residual taxable base after tax loss deductions, the ACE deduction.

### 3. The corporate tax microsimulation model and data

#### 3.1 The Istat–MATIS model framework

The main determinant of income liable to corporate tax is corporate profits before taxes. However several adjustments reflecting allowances and requirements under the tax law are needed to establish the linkage between corporate profits before taxes and taxable income. The Italian corporate income tax (Imposta sul reddito delle società - IRES) envisages that the taxable income has to be determined by adding to profits (losses) before taxes stemming from company accounts, P(L), upward fiscal adjustments, Adj+, and by subtracting downward fiscal adjustments, Adj-, losses carried forward from previous tax periods, LCF, and other deductions from the tax base, like the ACE allowance:

$$\text{CIT base} = \text{P(L)} \pm \text{Adj} - \text{LCF} - \text{ACE}.$$

The tax code reckons on a large number of fiscal adjustments. Some of them have temporal nature, by deriving from the possibility to partition specific income components over several tax years (for example, the taxation of capital gains); other adjustments respond to the need of avoiding double income taxation (i.e., dividends received); finally, other adjustments entail more substantial changes in the taxable income, i.e., the add-backs of non deductible interest expenses, or the allowance of tax bonuses. The losses carry forward allows a company to deduct from the taxable income the negative tax base accrued in the previous years. Related entities are free to choose, satisfied some requirements, whether or not to file a consolidated tax declaration. Exercising the consolidate taxation option, therefore, involves calculating a single taxable base for all companies included in the tax consolidation, by compensating income and losses within the consolidation scope. Taxable incomes are fully offset regardless of the controlling share. Also losses carry forward of the fiscal group from previous tax period are subtracted. Tax losses realized previously to exercise the consolidation taxation option cannot be attributed to the parent company. For each fiscal group, the taxable income is determined as follows:

$$\text{CIT base}_{\text{FG}} = \sum \text{CIT base} - \text{LCF}_{\text{FG}}.$$

The microsimulation tax model MATIS is an algebraic framework that reproduces tax liabilities of Italian corporations and fiscal groups in accordance to fiscal rules. The microsimulation tax model MATIS is founded on fiscal declarations both at the company level and the fiscal group. As known, the majority of the adjustments required by law cannot be inferred on the basis of accounts data. An important advantaged of return data with respect to balance sheets and P&L accounts is the possibility to take into account all unpredictable tax adjustments in the computation of the taxable base in order to precisely determine the tax position of the corporation. All fiscal variables are based on information drawn from the tax archives. The sources involved in the computation of the corporate taxable base at the firm level include data from the “UnicoSC” form and the “IRAP” form filed by each corporation, and tax declarations filed by the controlling companies (“CNM” form). Other available archives at the firm level are used as complementary data as described below.

Tax adjustments that are not explicitly modeled in our simulation procedures are drawn from corporations’ tax declarations data (table RF of the UnicoSC form). Next, we offset losses brought forward from earlier tax years against taxable base. We explicitly model the tax treatment of losses according to tax rules. For the first year of our panel and for all records that enter the panel in subsequent years, loss carry forwards from earlier periods are taken from corporations’ tax declarations (table RS of the UnicoSC form). For newborn firms, the procedure sets loss carry forward equal to the tax loss incurred in the first year it occurs. In addition, we model the tax treatment of national tax consolidation. Information on consolidation group structure is drawn from the communications of adherence to the group taxation merged with all tax declarations filed by the controlling companies (“CNM” form). Specifically, we model the “pooling system” currently in force by computing the taxable income of each group member at the individual level; individual profits or losses are then transferred to the parent company and aggregated at the group level to determine the consolidated taxable base of the group. Pre-consolidation losses are offset against the taxable income of the subsidiary before consolidation. Losses carry forwards at the group level are initialized as described above for the computation of the company’s taxable base. After computing the taxable base at company and group level, MATIS computes tax liabilities for all taxpayers by applying the statutory tax rate.

The current version of the MATIS model (Istat-MATIS) reproduces in detail the main tax changes introduced starting from 2008 until the end of 2010 (*benchmark simulation*). In particular, the benchmark simulation incorporates the 2008 tax reform that saw a significant drop of the main statutory corporation tax rate from 33% to 27.5% and of the IRAP tax rate from 4.25% to 3.9% and the broadening of the tax base through the abolishment of accelerated and anticipated capital depreciation allowances and the introduction of a stronger restriction to interest deductibility in replacement of a thin-cap rule. Besides, the Istat-MATIS model accounts for all subsequent tax changes including the reform of the interest deductibility regulation in 2010, the new tax treatment of losses introduced in 2011, the expanded deduction of the labor component (net of deductions) of the IRAP against the IRES in year 2012 and the newly implemented ACE regime introduced in year 2011.

As far as tax adjustments are concerned, the simulation procedures reproduce the computation of the interest add-backs, following straightly the regulation in place both before 2010 and after the reform occurred in 2010, as well as the deductions of IRAP from IRES (both the lump sum deduction and the analytical deduction). All other unchanged tax adjustments are algebraically added. Moreover, we model the additional tax advantages provided by the domestic group relief that allows the offsetting of non deductible interest expenses of a company with the unused ceiling arising from another company of the same fiscal group.

An alternative simulation, denoted "*Reform of tax losses*", reproduces the new treatment of losses. As from 2011, tax losses are no longer subject to a 5-year expiration period even for not-expired losses incurred in previous years. However, only 80% of a year's taxable income can be offset against tax losses carried forward, thus the residual 20% will be subject to corporation tax. Losses incurred by a company during the first three taxable periods may be carried forward and entirely used to offset corporate taxable income, but, as before the reform, only if they arise from a new business activity. The reform of the tax treatment of losses leave unchanged the ban to losses carryback. We suppose that it is convenient for the firm to use first the losses that can only be used to partially offset the taxable income and then the losses that can be used to fully offset the residual 20% of the taxable income.

The simulation named "*expanded IRAP deduction*" takes into account the complete system of IRAP deduction from IRES and allows to quantify the differential effect of the new deductibility rule with reference to the pre-existent lump-sum IRAP deduction described above. The expanded IRAP deduction is computed as the amount of the labor cost, as results from the profit and loss account, net of applicable deductions drawn from the "IRAP" form (table IC and IS). We follow the tax rule by applying first the expanded IRAP deduction and then the lump-sum deduction and limiting their total amount to the whole IRAP tax due. The unused deductions is added to losses carried forward and used to offset taxable base in subsequent years.

The simulation of the new "*incremental ACE*" regime accounts for the deduction of a notional return to equity - from 2011 to 2014 (2008-2011 simulation years) - obtained by the product of the net positive variation of equity as for the end of 2010 and the notional ACE rate set at 3% in the first three years 2011-2013 and recently increased to 4% for 2014, respectively. Anti-avoidance rules are also applied. The net variation of equity is computed by adding net increments observed for contributions in cash and retained profits feeding available reserve provisions (table RF "UnicoSC" form) and subtracting the increments of control participations as well as the increments of loans granted within a group (accounts data). In contrast, it is not possible to account for cash contributions within a group on the basis of the available data. This gives rise to a potential source of overestimation for the simulated ACE allowance. Anti-avoidance rules against the "refreshing" of the old capital are approximated by excluding from the benefit firms that are involved in transformation events (mainly cessation for transformation in a new firm). In addition, we exclude firms that are subject to insolvency proceedings (i.e. failure, liquidation and extraordinary administration) based on the Statistical Register (ASIA). Then the upper limit of the qualified ACE base is set equal to the net worth of the company existing at the end of the tax year with the exclusion of the reserves for own shares (accounts data). For newborn firms the computed deduction reckons on the entire amount of equity (net of participations and loans within a group). The ACE relief is entirely offset against the company's taxable income. The amount exceeding the taxable base is brought forward and added to the ACE allowance of the next periods or attributed to the fiscal group. Unrelieved ACE deductions against the group taxable income are

carried forward, proportionally, by the same companies that generated them. As for tax losses, the surplus of ACE allowance accrued prior to exercising the option for the consolidation are strictly used to offset the company taxable income of the next periods.

It is worth underlying that given the unavailability of information for the tax periods after year 2012, it is not possible to simulate the most recent tax reforms starting from the year of entry into force. Therefore, the simulation year is slipped backwards as if the reforms were introduced in year 2008, such that the legislation in force in year  $t$  is simulated on the basis of information for the year  $t - 3$ . In other words, the tax year 2008 is used to simulate tax rules in force in 2011 and so on.

The drawbacks of this approach are obvious in the presence of significant changes both in the tax structure and in the economic conditions underlying the simulation period in comparison to the year of reference for the tax rules. However, this doesn't seem of a major concern here. After the major tax reform in 2008, the broad structure of the Italian corporation tax system has remained relatively unchanged. Also, the economic downturns, that have so heavily affected the profitability of firms since the financial crisis in 2008, still persist. Thus, the chosen time span 2008-2012 seems suitable to be deployed for distributional analysis of recent tax reforms.

Given the complexity of our microsimulation framework and because of the use of a large database that melt together a variety of data, it is necessary to test the ability of the model to provide reliable analysis of policy changes. See Appendix B for some insights. In the next section we apply the Istat–MATIS microsimulation model to analyze the distributional effects of recent corporate tax reforms in Italy.

### 3.2 Data description

The Istat–MATIS model is founded on corporate tax return data plus additional information drawn from other administrative sources on Italian corporations and Istat statistical archives. The sources involved in the integration process are the company accounts database, the Istat archive on national business groups, the statistical register of Italian active enterprises (acronym ASIA), information on spin-offs and mergers, and business structural surveys, in particular the survey on foreign trade (COE), the survey on Italian enterprises controlled by foreign firms (Fats-inward) and the survey on resident firms with foreign subsidiaries (Fats-outward).

The available archives cover the population of corporations over a fairly long period of time (1998-2011). The integrated database used in this paper covers the years 2005-2011. An important feature of our microsimulation procedure is that it does not require the underlying data panel to be balanced, therefore our simulation results are not affected by selection bias. Moreover, being based on the entire population of corporations, our results allows for conclusions on the distribution of the tax burden among taxpayers as well as on the revenue impact of tax changes. The number of tax returns filed by corporations has constantly increased in recent years (see Table 2). Most of them are standalone corporations. The number of fiscal groups has also grown. In 2008, 4,936 group tax returns were filed (about 84 percent of which were from corporate groups with five or fewer corporations) - almost two thousand more than in 2004 when the national tax consolidation was introduced - whereas the number of tax returns for corporations not participating in the group taxation system was 1,020,833. In 2011 5,624 group tax returns were filed (about 83 percent of which were from groups with five or fewer), while 1,074,013 corporate tax returns came from corporations not participating in the consolidation. The simulation exercises encompass all corporations that filed the tax return module at least once over the years 2008-2011. Simulation results illustrated in Section 4. are based on a subsample of about 860.330 corporations selected by excluding firms belonging to agriculture, financial sector, health, education, as well as firms showing non-positive turnover that are not active (with the only exception of newborn firms). This subsample accounts for approximately the 75% of the total corporate tax revenue.

Table A.1 in Appendix A provides aggregate statistics about main variables used in our simulation exercises for the selected sample of corporations (year 2011). It is worth underlying that our sample reproduces the main features of the firm population in Italy. Most of the corporations belonging to our sample are small or very small enterprises, correspondingly our database is not biased toward large firms as commonly used microeconomic data sources. The figures presented relate to unconsolidated

**Table 2 - IRES Taxpayers**

Tax year	Single entities	Companies participating in tax groups	Fiscal groups	Total
2008	1,021,276	20,033	4,936	1,041,309
2009	1,047,019	21,270	5,249	1,068,289
2010	1,067,386	21,789	5,314	1,089,175
2011	1,062,713	22,499	5,498	1,085,212

Source: tax return data

**Table 3 - Distribution of fiscal groups by number of companies**

Tax year	Number of companies				
	2 %	3 %	4 %	5 %	≥ 6 %
2008	42.9	20.2	12.8	7.3	16.8
2009	42.7	20.4	12.7	7.1	17.1
2010	41.5	20.9	12.8	7.5	17.3
2011	41.8	20.4	12.9	7.9	17.0

Source: tax return data

data for individual companies. As we can see, a significant number of large companies are part of fiscal groups. These firms represent only 2% of the total number of firms, but each of them account for more than 100 employees on average. Notice also that these firms are characterized by an equity over assets ratio higher than the sample mean (35% against 30%) and average values for pre-tax profits and before deductions taxable base well above the sample mean. In contrast, the percentage of companies with turnover lower than 500 thousand euro represents almost 60% of the total number of companies considered here. These firms show an average number of employees lower than 2, an equity over assets ratio slightly below average (28% against 30%) but negative pre-tax returns. Notice also that the equity ratio is higher on average in firms belonging to other services.

In the next section we present a detailed analysis of recent tax reforms implemented in Italy. See also ISTAT (2014).

#### 4. Evaluating recent tax reforms

##### 4.1 The new tax treatment of losses

Table 4 provides some descriptive statistics of losses arising and losses used for Italian corporations. The percentage of non-profitable companies (either with null income or with losses arising in the fiscal period) is quite high, around 40% on average over IRES taxpayers in each year. This turns out to be a structural feature of the Italian companies distribution not strictly related to the recession in business activities in 2008-2011. Based on our benchmark simulation results, around 47 bn euros of losses were generated by Italian companies yearly. In columns 2 and 3 of Table 4 loss deductions in each tax year are split between losses used by stand-alone firms or either by the controlling/controlled firms before transferring taxable income to the fiscal unit, and surrendering losses to other companies within the same fiscal group. As it is shown, a large share of this amount is offset against other profits in that year under the group relief rules. Specifically, column three of Table 4 shows that the magnitude of group relief over total current deducing losses has increased from 46.3% in 2008 to 65.3% in 2011. This probably reflects the increased number and dimension of fiscal groups, a process that can be expected to continue in the next coming years. A group taxation system tends to place businesses that operate as a group not benefiting from the group relief at a competitive disadvantage. For a controlling company not part of a fiscal consolidation, the tax code does not provide other provisions to offset profits earned in a given year with losses incurred in another subsidiary. Presumably the



concern over losses utilization is acute in the observation period, given the recent build up of business losses due to the persistent recession. Thus, the increased number of fiscal groups can be seen as the result of a reorganization of the Italian groups' structure in order to meet the eligible requirements for tax consolidation.<sup>11</sup> Finally, the last two columns of Table 4 aggregate unrelieved losses due to tax-exhaustion for standalone firms and fiscal groups. The annual share of undeducted losses is around 50% or even higher in terms of the total amount of current losses used for standalone firms, while it drops below 25% for fiscal units. It seems probable that the majority of these unused losses occurred in companies and groups that were loss-making overall.

**Table 4 - Loss-making companies, losses used and expired - benchmark simulation**

Tax year	Loss-making companies %	Losses used by single entities % of income	Group relief %	Losses expired for tax-exhaustion Single entities %	Fiscal groups %
2008	42.9	53.7	46.3	74.8	-
2009	44.3	47.2	52.8	42.3	15.8
2010	40.8	45.3	54.7	53.0	24.8
2011	38.9	34.7	65.3	-	-

Source:Istat–MATIS microsimulation model

This shows loss deductions are a major factor in determining corporations' tax liabilities. In 2011 the new treatment of tax losses was introduced in order to consolidate tax revenues. The negative impact on companies was expected to be reversed after several years since its implementation. This is confirmed by our simulation results. The new rules imply that a reduced amount of losses brought forward from earlier periods can be set against current profits. The estimated increase in tax revenues is relatively moderate, lower than 1% on average in 2011. Afterwards, in 2014 this effect is almost counterbalanced by the relaxation of the schedular system (see Table 5, first column). As we can see from Table 6 (third column) for standalone firms the losers of the reform ranges from 6.2% in 2008 to 7.4% in 2011. The share of gainers is much lower although increasing, from 1.5 to 2.4 percent. For fiscal groups the percentage of gainers is slightly higher in each tax years.

**Table 5 - Recent tax provisions on IRES taxpayers - Tax debt changes**

Year	Single entities	Losses reform vs Benchmark %	IRAP ded. vs Losses reform %	ACE vs IRAP ded. %	Total %
2011	841,228	1.0	-	-2.4	-1.3
2012	845,194	0.6	-4.5	-3.4	-7.3
2013	862,511	0.5	-4.3	-3.8	-7.6
2014	860,330	0.1	-4.5	-5.4	-9.8

Source: Istat–MATIS microsimulation model

<sup>11</sup> Group taxation, by providing increased scope for tax loss utilization (current tax deductions for otherwise unused tax losses) can be expected to result in lower corporate income tax revenues, ignoring any positive impact on domestic economic activity that the provision may generate. The revenue effects of the group taxation system in force should be evaluated by offsetting the informal consolidation provisions available to separated lines of business activities prior to the introduction of the pooling system in 2004. Simulation results based on tax return data for the tax year 2003 indicated that the estimated revenue loss associated with the domestic tax consolidation system was roughly of 10% in 2004 (Caiumi (2005)). After several years from its introduction, it seems that the introduction of the consolidation regime (combined with other tax provisions) and the effects of the economic cycle, did not result in a negative revenue impact. Italy's statistics suggest that corporate income tax revenues increased from 23,960 mln in 2004 to 34,883 mln of euro in 2010.

**Table 6 - The reform of tax losses: gainers and losers - Single entities and Fiscal units**

Year	Single entities			Fiscal units		
	Advantaged %	Indifferent %	Disadvantaged %	Advantaged %	Indifferent %	Disadvantaged %
2011	0.0	93.8	6.2	0.9	93.1	6.0
2012	1.5	92.7	5.8	2.5	94.0	3.4
2013	1.8	91.0	7.2	2.2	93.5	4.3
2014	2.4	90.2	7.4	2.5	91.9	5.6

Source: Istat-MATIS microsimulation model

#### 4.2 Pro-growth measures, the expanded IRAP deduction and the new ACE

The cost for the tax system arising from the expanded deduction of the labor component of the IRAP amounts approximately to 1.2 bn euros yearly in the period 2012 - 2014, corresponding to a tax cut of 4% for IRES taxpayers on average. The beneficiaries of the provision, about 45% of corporation in our sample, are non-tax-exhausted firms with permanent employees (Table 7). The composition effect between the expanded and the former lump-sum IRAP deduction on labor gives rise to a negligible percentage of disadvantage companies.

**Table 7 - The reform of IRAP: gainers and losers - Single entities**

Year	Advantaged %	Indifferent %	Disadvantaged %
2011	0.0	100.0	0.0
2012	44.8	54.9	0.3
2013	44.3	55.3	0.4
2014	45.2	54.3	0.4

Source: Istat-MATIS microsimulation model

The cost of the ACE, evaluated after four years from its introduction, is equal to 1.4bn, an amount 60% higher than that estimated for the first year of implementation as a result of the accumulation of corporations' internal finance. The share of single companies (fiscal groups) benefiting from the allowance increases of about 15% (4%), reaching the 31.1% (19%) of the entire distribution over the time span examined here (Table 8). The potential impact in reducing the company tax burden can also be measured as the difference between the statutory and the implicit tax rate, computed as the ratio between tax due after the ACE deduction and the pre-deduction taxable base. For firms that are not tax-exhausted, the new ACE lowers the average corporate tax rate at an increasing extent, from 1.2 percentage points in the first year of implementation to 2.1 points in 2014 (Table 9). For fiscal groups the tax cut is lower, reaching 1.1 percentage points in year 2014.<sup>12</sup> At the same time, the allowance carryovers of tax-exhausted companies raise from 38% of the total amount of the ACE deduction in 2011 to 86% in 2014 on average. These figures are useful to better understand the ACE mechanism. By definition a tax allowance results in a major impact during economic upturns. In the current situation of the Italian economy, characterized by persistent economic crisis, the low profitability of firms limits the possibility to benefit from the tax cut. When the recovery will occur, the new ACE will probably deploy its full impact on growth by enhancing firms' competitiveness. For the most profitable and dynamic firms, the incremental nature of the ACE scheme may guarantee, in the coming years, a decreasing tax burden on corporate profits in line with the international trend in

<sup>12</sup> It is worth reminding that, at the present stage of the research program, these estimates do not incorporate behavioral responses of taxpayers.

CIT tax rates, therefore reducing gains from shifting profits abroad.

**Table 8 - The incremental ACE: share of beneficiaries - Single entities and Fiscal units**

Year	Single entities			Fiscal units		
	Advantaged %	Indifferent %	Disadvantaged %	Advantaged %	Indifferent %	Disadvantaged %
2011	16.1	83.9	0.0	14.3	85.7	0.0
2012	20.6	79.4	0.0	13.5	86.5	0.0
2013	25.0	75.0	0.0	15.7	84.3	0.0
2014	31.1	68.9	0.0	19.0	81.0	0.0

Source:Istat–MATIS microsimulation model

**Table 9 - The incremental ACE: corporate effective tax rates - Single entities and Fiscal units**

Year	Single entities			Fiscal units		
	that fully benefit from ACE %	Average stat. rate $\tau$ %	Benefit (stat. rate - $\tau$ ) %	that fully benefit from ACE %	Average stat. rate $\tau$ %	Benefit (stat. rate - $\tau$ ) %
2011	15.0	26.3	1.2	12.9	27.1	0.4
2012	18.8	25.9	1.6	12.3	26.9	0.6
2013	22.2	26.0	1.5	14.2	26.9	0.6
2014	27.4	25.4	2.1	17.1	26.4	1.1

Source:Istat–MATIS microsimulation model

Figure 1 reports the absolute changes in the corporate effective tax rates computed as described above due to the ACE mechanism by economic sector and firm size. After four years from its introduction the ACE regime lowers the average corporate tax rate of both large and small-medium sized firms. As we can see, tax rate falls are higher the smaller the firm. The distance in the tax cut among smaller and larger firms is higher for companies belonging to other services (6.0 and 1.1 points, respectively). This result which is not new in the literature (Giannini et al. (2001), Caiumi (2002), Balzano et al. (2011)) seems not only due to a lower financial ratio in smaller firms, eligible for the ACE deduction, than in larger ones, rather to a relatively lower taxable base with respect to the allowance accrued (see section 3.2 and Appendix A on descriptive statistics).

Overall, the new ACE and the expanded IRAP deducibility reduce the tax burden of IRES taxpayers by 9.9% in 2014. Table 10 displays the distributional effects of the tax provisions based on our projections for the year 2014. The simulation results show that more than 30% of the taxpayers benefit from both tax rebates. Also for both provisions, the share of ‘gainers’ increases with company size (defined in terms of turnover). This result is conceivable since large corporations are more able than smaller ones to take advantage of tax saving opportunities stemming from own capital accumulation or labor input utilization. Looking at tax debt changes, the new ACE entails a tax bonus negatively correlated to firm size, while the expanded IRAP deducibility is more concentrated in medium-large firms. With regard to economic sectors, the highest share of beneficiaries is concentrated in manufacturing industry for both measures, while public utilities benefit from both tax cut to the smallest extent.

Focusing on geographical areas, the introduction of ACE especially favors the North-Est of Italy, although the cumulative effect of both tax deductions is comparably higher in Southern regions. As expected, the share of single entities benefiting from the new ACE is lower than companies belonging to a group given their lower capacity to raise internal finance, however the distribution of tax savings do not appear to negatively affect single firms.

Given the features of the tax provisions of interest here, the distribution of gains and losses across corporations may be also differentiated in relation to the structure of the profit and loss making. To

**Table 10 - The expanded IRAP deductibility and the new ACE, distributional effects year 2014**

	Companies	Beneficiaries		Tax debt changes		Overall effect
	%	IRAP deductibility	ACE	IRAP deductibility	ACE	
	%	%	%	%	%	%
<b>Total</b>	100.0	45.2	31.1	-4.5	-5.4	-9.9
<b>Sectors</b>						
Manufacturing	15.6	70.0	36.4	-5.6	-5.3	-10.9
Public utilities	1.7	34.3	34.1	-2.2	-3.5	-5.7
Construction	18.3	39.5	28.6	-5.5	-5.5	-11.0
Trade	21.6	53.1	32.0	-4.9	-4.9	-9.9
Other services	42.8	35.1	29.7	-3.6	-6.2	-9.8
<b>Turnover</b>						
< 1	4.5	1.0	3.5	-0.5	-5.5	-6.0
1-500,000	59.4	27.5	24.6	-2.1	-10.5	-12.5
500,000 - 2 mln	21.8	75.7	40.6	-6.1	-7.7	-13.9
2 - 10 mln	10.8	86.8	51.7	-7.1	-6.8	-13.9
10 - 50 mln	2.7	88.2	55.9	-6.2	-6.0	-12.2
>50 mln	0.7	76.8	49.0	-3.0	-3.5	-6.5
<b>Localization</b>						
North-West	29.5	47.2	36.7	-4.1	-5.3	-9.5
North-East	20.8	48.0	35.8	-5.2	-6.6	-11.7
Center	25.1	42.7	28.7	-3.7	-4.3	-8.0
South	24.7	43.2	23.0	-6.6	-6.6	-13.1
<b>Ownership structure</b>						
Standalone	81.0	44.5	29.9	-5.7	-6.7	-12.4
Belonging to a group	16.0	46.2	35.6	-5.0	-6.8	-11.8
Consolidated taxation	2.1	55.3	36.7	-2.6	-4.0	-6.6
Foreign controlled	0.8	69.6	40.7	-3.8	-2.1	-5.9
Multinational	0.2	82.1	47.1	-4.8	-5.7	-10.5

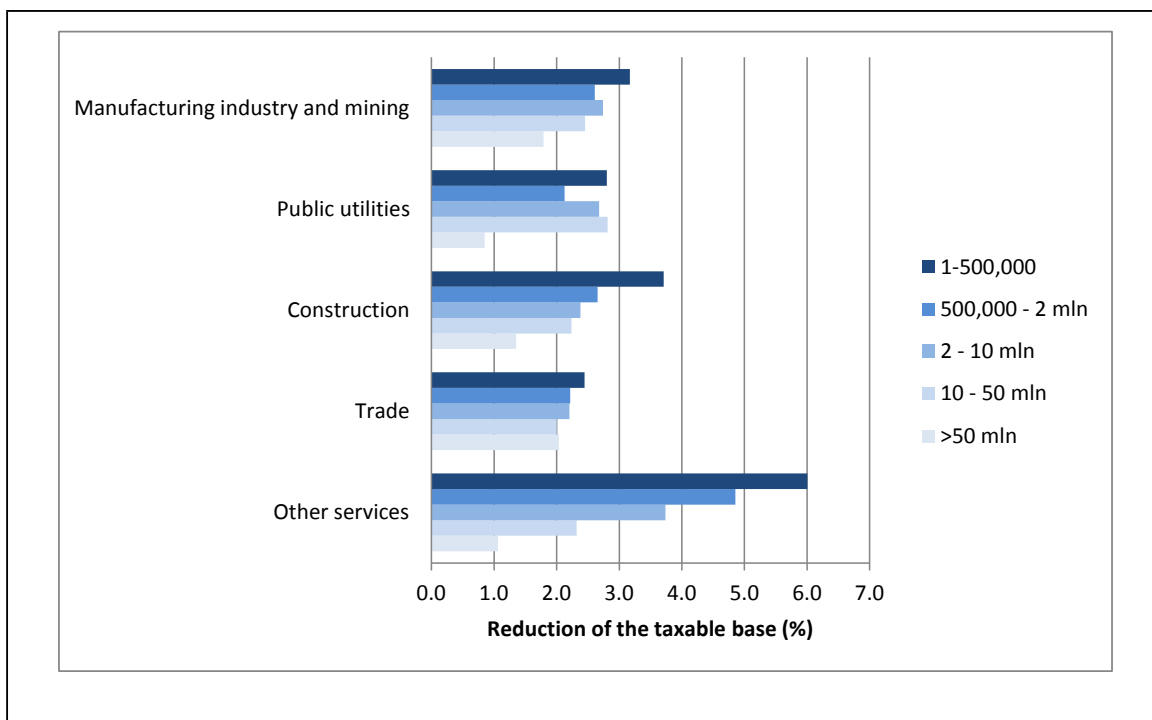
Source: Istat-MATIS microsimulation model

**Table 11 - Distribution of tax savings by profitability, financial ratio and capital intensity, year 2014**

Profit.	Financial Ratio	Capital Intensity	Companies	Losses reform vs Benchmark	IRAP ded. vs Losses reform	ACE vs IRAP ded.
			%	%	%	%
1 - Low	High	Low	8.4	0.4	-9.6	-6.5
2 - Low	Low	Low	2.3	2.7	-17.7	-6.8
3 - High	High	High	9.6	0.7	-3.8	-8.8
4 - High	Low	High	29.8	-0.1	-3.5	-6.9
5 - Low	High	High	14.2	2.9	-6.1	-18.9
6 - Low	Low	High	6.8	1.9	-7.2	-27.2
7 - High	High	Low	5.6	0.2	-9.3	-6.1
8 - High	Low	Low	23.3	0.0	-7.4	-3.1

Source: Istat-MATIS microsimulation model

**Figure 1 - The incremental ACE - reduction in the corporate effective tax rate by economic sector and firm size, year 2014.**



gain insight in the distribution of the tax burden across companies, Table 11 displays the effect of recent tax provisions according to the corporation’s profitability, as well as other structural characteristics, in particular the financial ratio and capital intensity. As already pointed out, tax savings due to deduction from the taxable base (i.e., the expanded IRAP deduction and the ACE allowance) have relatively higher intensity in corporation of low profitability (i.e., low taxable base). Firms of low profitability rate and low capital intensity benefit most of the expanded IRAP deduction (third row of Table 11), whereas firms of low profitability and high capital intensity benefit most of the ACE deduction. Again firms of low debt ratio obtain the higher tax cut.

### 4.3 The distribution of the effective tax burden

To further investigate the distribution of the tax burden taking into account the composition of the tax base, we compute average effective tax rates as the ratio of tax accrued on before-tax profits and compare the distributions associated to the different tax reforms introduced after year 2011. To account for the dynamical components of the taxable base we consider the whole time span 2011-2014 as follows

$$ETR_i = \frac{\sum_{t=2011}^{2014} T_{i,t}}{\sum_{t=2011}^{2014} P_{i,t}},$$

where  $i$  indexes the taxation rules,  $T_{i,t}$  is the tax debt at year  $t$  and  $P_{i,t}$  are the profits before taxation at year  $t$ .<sup>13</sup>

<sup>13</sup> We consider only companies that are present in our panel for all the quadriennium. In addition, we eliminate the last percentile with value for the effective tax rate greater than 1.

Figure 2 depicts the movements in the average effective tax rates for the whole distribution of taxpayers.<sup>14</sup> Not surprisingly, all distributions are concentrated around the statutory tax rates (31,4%) and zero tax rate (loss-making firms). As we can see, the introduction of the tax losses reform significantly reduces the frequency of companies not paying taxes and increases the density of the bottom side of the distribution up to 10% points in comparison with the benchmark simulation. A number of taxpayers holding losses carried forward, that under the former tax losses regime were allowed to offset the whole taxable income against losses from previous years, are now paying taxes on the 20% of their taxable income that cannot be offset any longer. On the other hand, the most recent tax cuts due to the expanded IRAP deducibility and the ACE deduction cause a significant movement of the entire distribution on the left.

**Figure 2 - Average effective tax rates on before tax profits, 2011-2014.**

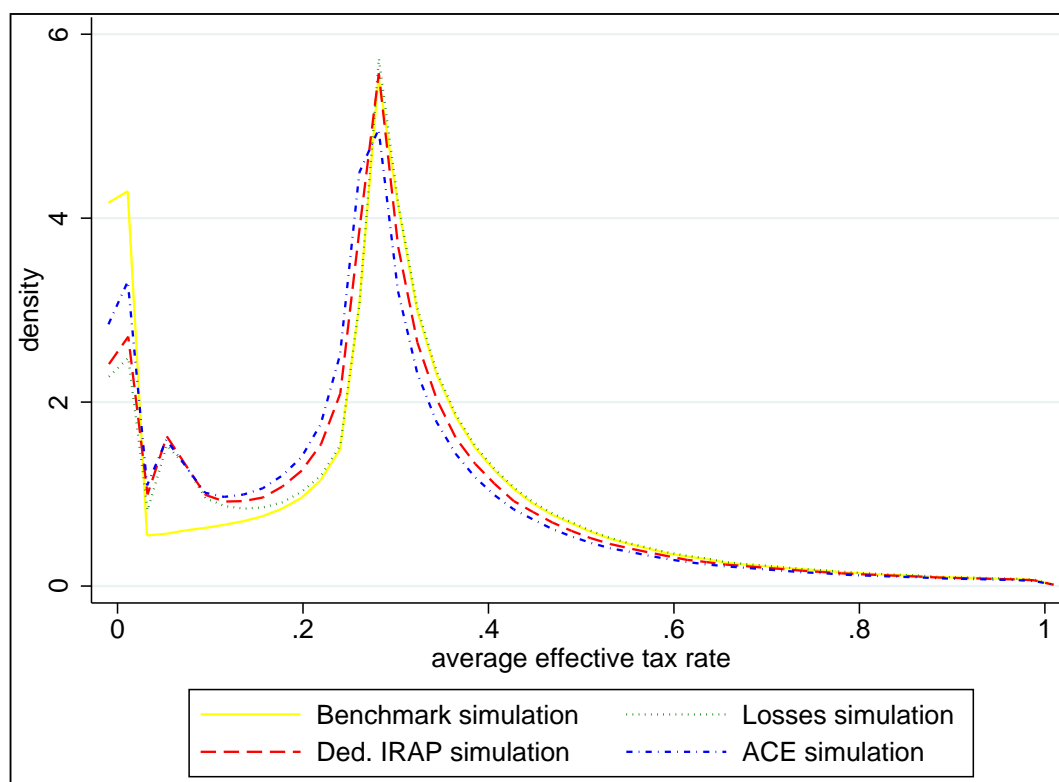


Table 12 summarizes the main statistics, mean and median, of the corporate effective tax rates stemming from the 2008 reform and the main subsequent tax changes considered here. As a matter of fact, revenue neutrality played a major role in the design of the 2008 reform inspired by tax-cum-base-broadening type of reforms that took place in that period in other European countries. The average tax burden on economic profits is 31.7% points (Table 12, first row), a value closer to the statutory tax rate in force before the reform (33%) than the current tax rate (27.5%). The share of taxes drained from profits increases after the reform of tax losses at 33%, it drops at 31.4% points with the expanded IRAP deduction and further reduces at 29.4% points after the implementation of the ACE regime. Notice that the median value of the distribution is steadily below the mean (of about 3 percentage points) suggesting that the dispersion of the effective corporate taxation has been more or less invariant with respect to recent tax changes and the concentration of the distribution has been maintained at lower levels than the mean.

<sup>14</sup> The kernel density is estimated using the Epanechnikov kernel.

As expected, corporations of high profitability and low financial ratio are the most advantaged by the 2008 reform. Notice that capital intensity does not appear a major factor in reducing the effective tax rates due to the abolishment of accelerated and anticipated capital depreciation allowances. For example, consider the case of corporations of high profitability, low financial ratio and high capital intensity (fourth row of the Table): mean and median are almost the same compared to the alternative cluster with low capital intensity (last row of the Table). Overall, corporations of high financial ratio are hit particularly hard by the interest deductibility restriction with an average effective tax rate always higher than 33% points (rows (1), (3), (5) and (7) of the Table).<sup>15</sup>

As regards recent tax provisions, the expanded IRAP deductibility provides significant tax relief for corporations of low capital intensity (rows (1), (2), (7) and (8)), which experience a reduction in the effective tax burden between 2 and 4 percentage points. In contrast, the newly implemented ACE advantages mainly corporations of high capital intensity by reducing the average effective tax rate between 1.8 and 6.3 percentage points (rows (3), (4), (5) and (6)). The composition effect of the different tax provisions causes a reduction in the distance between the minimum and the maximum of the corporate effective tax rates moving from the benchmark simulation to the ACE simulation (from 5.4 to 3.8 percentage points). Corporations of high profitability, low financial ratio and low capital intensity appear strongly favored by the current tax system, being at the bottom of the ranking with the lowest effective tax rate. In contrast, corporations of high financial ratio remain high in the ranking.

**Table 12 - Average effective tax rates by profitability, financial ratio and capital intensity - 2011-2014**

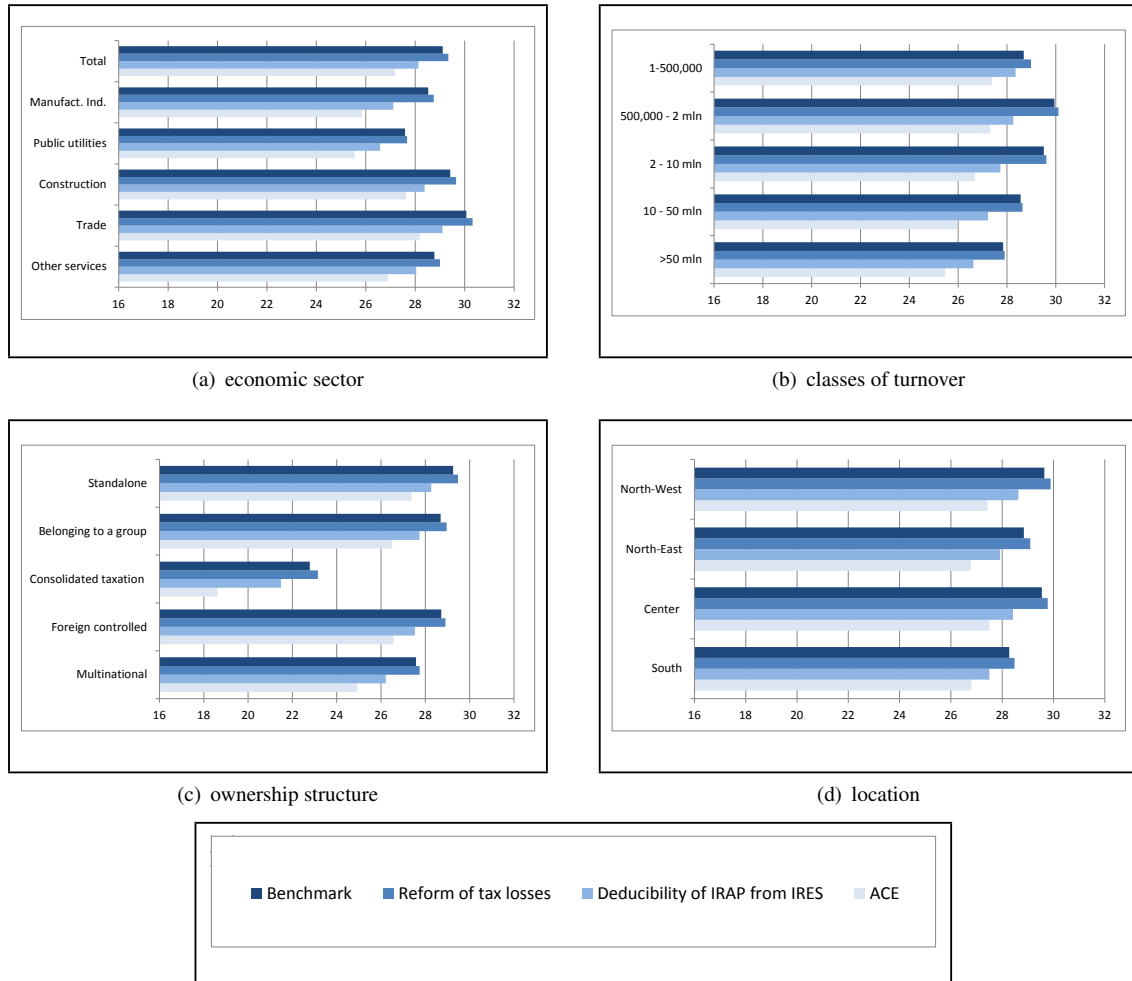
Profit.	Debt ratio	Capital Intensity	Firms %	Benchmark		Reform of tax losses		Deductibility of IRAP from IRES		ACE	
				Mean %	Median %	Mean %	Median %	Mean %	Median %	Mean %	Median %
Total			100.0	31.7	29.1	33.0	29.3	31.4	28.1	29.6	27.2
1 - Low	High	Low	8.3	32.3	29.4	34.5	30.0	31.7	27.8	30.9	27.2
2 - Low	Low	Low	2.2	29.6	28.6	30.8	28.9	27.3	26.3	26.5	25.5
3 - High	High	High	10.6	39.8	34.6	41.4	35.3	39.8	33.7	37.1	31.1
4 - High	Low	High	29.3	28.9	28.8	29.3	28.8	28.4	28.2	26.6	27.1
5 - Low	High	High	13.8	34.7	29.0	38.0	30.3	37.0	29.4	33.3	27.2
6 - Low	Low	High	6.2	33.9	29.4	35.4	29.9	34.5	29.0	28.2	24.9
7 - High	High	Low	6.4	39.4	35.8	40.5	36.2	36.6	32.3	35.8	31.5
8 - High	Low	Low	23.0	28.5	29.0	28.8	29.0	26.1	27.3	25.5	26.6

Source: Istat-MATIS microsimulation model

The subsequent Figure 3(a)-(d) show the relation between corporate effective tax rates and, respectively, business sectors, turnover classes, ownership structure and location. It is worth underlying the presence of a considerable variation in average effective tax rates ascribable to the features of the tax code in force in year 2008 that recent corporate tax changes have not modified. As we can see, the tax burden is heavier on companies of the trade sector and on small-sized firms (with less than 10 mln euro of turnover). In contrast, companies belonging to a group relief bear the lowest tax burden and, as expected, benefit to a relatively larger extent of the ACE regime: the corporate effective tax rate is of only 18.6 percentage points, about 9 percentage points less than standalone companies. Belonging to a group relief turns out to be more advantageous even in comparison to multinational companies. Yet, corporations located in Southern Italy are less hit by the tax code than in the rest of the country.

Differences in tax treatment across clusters of companies are usually recognized in micro backward-looking studies (Nicodème (2007)). Different tax provisions may prove to be more beneficial for some groups than others. For example, as already shown, the influence of tax allowances diminishes with profitability levels and effective tax rates tend to statutory tax rates. Variation in profitability rates due for instance to differences in market structure therefore may explain, at least partially, the dispersion in corporate effective taxation across sectors and macro-regions. In addition, given the complexities of the tax system, larger firms may be more able to devote resources to lower their tax liabilities.

<sup>15</sup> These results are obtained by simulating the interest deductibility regulation actually in force in 2008-2011 (see section 2.2).

**Figure 3 - Average effective tax rates, median values 2011-2014**

We further investigate how the tax system affects the effective tax burden on firms of different size from a different perspective. The available database allows us to isolate the effect of specific features of the tax system. Table 13 shows the composition of the taxable base by turnover decile according to the tax system in force in year 2008. Firms in the upper decile, holding as much as 95% of the total amount of before tax profits (second column of the Table), are advantaged by the tax system in that their share of taxable income amounts at only 86.9% of the total (fourth column of the Table). Specifically, this effect is due to tax adjustments rather than to the use of loss carryforwards. At the opposite, in all other deciles effective taxation is increased by the tax component of the taxable base: the share of taxable income is higher than the related share of economic profit as a result of tax adjustments only partially offset by the use of losses carryforwards.

Table 14 provides a comparison with the current tax system. We observe that the newly implemented ACE regime is quite effective in counterbalancing the redistributive impact of other components of the taxable base by easing the tax burden on small and medium-sized firms. The distribution of tax liabilities increases of almost 1% point in the last decile while it slightly reduces in the deciles between the fourth and the ninth (Table 15). This proves that the incremental ACE regime improves neutrality in taxation not only by alleviating tax distortions on the choice of funding as shown in Caiumi et al. (2015), but also by reducing unintended differences in corporate effective taxation across firms of different size.



**Table 13 - Decomposition of the taxable base among economic and fiscal components by deciles of turnover - 2008 corporate tax reform, year 2014**

Deciles of turnover	Turnover %	P(L) %	P(L) ± Adj %	P(L) ± Adj - LCF %
1	0.0	-4.8	-1.8	-2.2
2	0.1	-2.0	-0.5	-0.7
3	0.2	-0.8	0.2	0.0
4	0.4	-0.2	0.8	0.6
5	0.7	0.6	1.2	1.0
6	1.1	0.8	1.7	1.5
7	1.9	1.9	2.5	2.3
8	3.4	3.3	4.1	3.8
9	7.0	6.0	7.0	6.8
10	85.2	95.2	84.8	86.9

Source: Istat–MATIS microsimulation model

**Table 14 - Decomposition of the taxable base among economic and fiscal components by deciles of turnover - incremental ACE regime, year 2014**

Deciles of turnover	Turnover %	P(L) %	P(L) ± Adj %	P(L) ± Adj - LCF %	P(L) ± Adj - LCF - ACE %
1	0.0	-4.8	-1.9	-2.4	-2.6
2	0.1	-2.0	-0.5	-0.8	-0.9
3	0.2	-0.8	0.2	0.0	-0.2
4	0.4	-0.2	0.8	0.6	0.4
5	0.7	0.6	1.3	1.0	0.8
6	1.1	0.8	1.7	1.5	1.3
7	1.9	1.9	2.5	2.3	2.0
8	3.4	3.3	3.9	3.7	3.4
9	7.0	6.0	6.6	6.3	6.0
10	85.2	95.2	85.5	87.8	89.7

Source: Istat–MATIS microsimulation model

**Table 15 - Comparison between benchmark and ACE simulation, shares of tax liabilities by deciles of turnover**

Deciles of turnover	Benchmark simulation %	ACE simulation %
1	0.8	0.8
2	0.8	0.8
3	1.2	1.2
4	1.6	1.5
5	2.0	1.9
6	2.5	2.4
7	3.2	3.1
8	4.6	4.4
9	7.6	7.3
10	75.8	76.6

Source: Istat–MATIS microsimulation model

## 5. Concluding remarks

This paper provides an analysis of the dynamic effects of the recent corporate tax reforms in Italy using a new microsimulation model founded on corporate tax returns data. Our model framework is multi-period in order to account for intertemporal components of the taxable base, such as losses carried forward or tax allowances carried forward. In particular, the structure of our model allows us to account for all relevant interdependencies among tax provisions over time, as well as to trace the cumulative effects of the incremental ACE regime recently introduced in Italy.

The impact of the new treatment of losses, the expanded deduction of IRAP from IRES and the new ACE has been examined over time and across different categories of corporations according to the economic sector, size, ownership structures, location and structural characteristics, like profitability rate, financial ratio and capital intensity. Our results show that the new treatment of losses raises the tax burden on companies in the first implementation years but the impact is almost reversed after four years since its introduction. In contrast, the expanded deduction of IRAP from IRES and the new ACE lower the tax burden on corporate profits to the extent of 9.9%, corresponding to 2.6 bn euro in 2014. Firms that benefit most of both provisions are those belonging to the manufacturing industry and with low profitability rate. The expanded IRAP deducibility provides significant tax relief for corporations of low capital intensity, while the newly implemented ACE advantages mainly corporations of high capital intensity, thus it turns out to be the most effective provision to spur economic growth. Overall, the tax burden remains high on companies of the trade sector and on small-sized firms, whereas companies belonging to a group relief show the lowest effective tax rate.

Given the available databases, the redistributive impact to the tax system as a whole has been also analyzed. We show that firms in the upper decile are advantaged by the tax system. However, the ACE regime is quite effective in easing the tax burden on small and medium-sized firms.

The model is algebraic and does not account for behavioral responses by taxpayers to tax changes. Therefore its analytical capacity is limited to first round effects. We plan to develop the model further and incorporate the main effects that corporate taxes exert on corporations' decisions. Specifically, a comprehensive analysis of the newly implemented ACE requires to account for possible debt-equity substitution effects and the consequent lower deductions of interest costs. It is also necessary to investigate the impact on investment decisions for different types of firms.

## A The integrated dataset

**Table A.1 - Descriptive statistics - year 2011 (average values, .000 euro)**

	companies	ASIA empl.	accounting assets	equity (%)	Profit bf taxes	tax returns PBT± tax adj	losses used	taxable base
<b>Total</b>	860,330	10.6	4,205	30	73	142	6	136
<b>Sectors</b>								
Manufacturing	134,109	22.2	7,372	32	178	310	14	296
Public utilities	14,592	21.3	21,244	31	980	1,034	23	1,011
Construction	157,251	5.7	3,410	22	10	56	3	53
Trade	186,210	8.7	2,702	24	51	108	4	103
Other services	368,168	8.7	3,421	35	36	99	5	95
<b>Turnover</b>								
< 1	38,908	2.3	1,401	11	-43	13	2	11
1-500,000	511,420	1.8	785	28	-6	17	2	15
500,000 - 2 mln	187,143	7.5	1,862	27	21	61	5	56
2 - 10 mln	93,140	19.9	5,437	27	88	196	12	185
10 - 50 mln	23,644	63.4	22,751	30	461	891	42	849
>50 mln	6,075	406.5	259,458	33	7,256	10,211	199	10,014
<b>Localization</b>								
North-West	253,432	13.2	5,901	32	80	217	9	208
North-East	178,603	11.9	4,094	31	92	148	7	141
Center	215,603	9.2	4,230	29	114	137	5	132
South	212,692	7.5	2,034	25	5	53	3	49
<b>Ownership structure</b>								
Standalone	696,640	6.2	1,411	25	24	50	3	46
Belonging to a group	137,285	14.7	6,444	27	76	194	12	182
Consolidated taxation	18,172	109.1	75,284	35	1,257	2,556	43	2,514
Foreign controlled	6,479	60.5	25,608	35	1,509	1,769	80	1,690
Multinational	1,754	95.6	42,809	35	1,502	1,748	80	1,666

Source: tax return data

## B The validation of the model

In this appendix we assess the performance of the current model to consistently approximate the IRES tax base and to provide finegrained policy information. In Table B.1 simulation results are compared with official data provided by the Department of Finance for the same tax years, 2008-2011. At the aggregate level the IRES tax due is over estimated by only 3% in all four years considered. Tables B.2-B.4 compare estimates of the main components of the taxable base with information drawn from tax declarations at the firm level for the last year of simulation (2011). As we can see, for losses carryforward, losses used and the taxable base there are no systematic deviations of the MATIS microsimulation results: each variable is exactly predicted for more than 65% of companies in our database and the estimated deviation between simulated and actual data is lower than 2% on average (Tables B.2-B.4). The quality of our estimates drops for the ACE deduction. The distance with real data is on average equal to 11.2%. However, this does not seem to significantly affect the estimated distributional impact of the new ACE regime in terms of tax savings, beneficiaries and implicit tax rates as shown in Table B.5.

**Table B.1 - Comparison of MATIS simulation results with official tax return data. IRES tax due**

Tax year	Single entities		Fiscal groups	
	MATIS simulation	Agenzia delle Entrate	MATIS simulation	Agenzia delle entrate
2008	23,954,612	23,589,293	14,766,116	14,124,477
2009	21,421,570	20,821,636	14,319,947	13,897,647
2010	22,808,730	22,143,140	12,782,185	12,292,081
2011	23,114,893	22,648,003	12,531,896	12,178,419

Source: Istat-MATIS microsimulation model

**Table B.2 - Comparison of MATIS simulation results for the taxable base with tax return data: Losses carried forward, 2014**

	companies	frequencies (%)			simulated values	UnicoSC	diff. %
		over estim.	exact estim.	under estim.			
<b>Total</b>	860,330	14.8	76.1	9.1	103,459	104,893	-1.4
<b>Sectors</b>							
Manufacturing	134,109	15.1	73.9	11.0	229,820	236,063	-2.6
Public utilities	14,592	22.2	70.5	7.3	232,638	237,059	-1.9
Construction	157,251	13.0	76.4	10.7	49,278	54,534	-9.6
Trade	186,210	14.0	77.9	8.1	75,542	77,726	-2.8
Other services	368,168	15.6	76.1	8.3	89,573	87,123	2.8
<b>Turnover</b>							
< 1	38,908	31.8	55.0	13.2	156,986	144,681	8.5
1-500,000	511,420	15.6	74.9	9.4	52,983	54,750	-3.2
500,000 - 2 mln	187,143	11.9	80.2	7.9	66,368	66,968	-0.9
2 - 10 mln	93,140	10.8	81.1	8.1	154,285	153,908	0.2
10 - 50 mln	23,644	9.3	81.8	8.8	507,702	508,501	-0.2
>50 mln	6,075	6.5	86.5	7.0	2,800,010	2,917,239	-4.0
<b>Localization</b>							
North-West	253,432	14.4	76.2	9.4	147,870	147,937	0.0
North-East	178,603	14.3	75.9	9.8	94,831	99,550	-4.7
Center	215,603	14.6	76.4	9.0	87,277	88,807	-1.7
South	212,692	15.8	75.9	8.3	74,190	74,396	-0.3
<b>Ownership structure</b>							
Standalone	696,640	14.9	76.5	8.5	47,800	46,581	2.6
Belonging to a group	137,285	15.1	72.8	12.1	244,647	248,759	-1.7
Consolidated taxation	18,172	6.7	87.3	6.0	637,898	701,374	-9.1
Foreign controlled	6,479	16.6	70.0	13.4	1,425,454	1,464,731	-2.7
Multinational	1,754	12.5	73.7	13.8	738,903	801,454	-7.8

Source: Istat–MATIS microsimulation model

**Table B.3 - Comparison of MATIS simulation results for the taxable base with tax return data: Losses deduction, 2011**

	frequencies (%)			simulated values	UnicoSC	difference %
	over estimation	exact estimation	under estimation			
<b>Total</b>	6.0	90.7	3.3	6,248	6,203	0.7
<b>Sectors</b>						
Manufacturing	7.1	88.2	4.7	13,946	14,195	-1.8
Public utilities	9.7	86.6	3.7	23,004	23,013	0.0
Construction	6.0	90.5	3.5	3,686	3,418	7.8
Trade	5.0	92.3	2.6	4,179	4,180	0.0
Other services	5.9	91.0	3.1	4,921	4,839	1.7
<b>Turnover</b>						
< 1	3.6	95.3	1.1	2,094	1,969	6.3
1-500,000	6.0	91.3	2.7	2,229	2,081	7.1
500,000 - 2 mln	6.3	89.3	4.4	4,920	4,732	4.0
2 - 10 mln	6.4	88.5	5.1	11,868	11,673	1.7
10 - 50 mln	6.2	88.5	5.4	41,902	42,599	-1.6
>50 mln	4.6	90.8	4.5	187,178	200,148	-6.5
<b>Localization</b>						
North-West	6.0	90.4	3.6	9,048	9,076	-0.3
North-East	6.0	90.3	3.7	6,691	6,671	0.3
Center	5.9	90.9	3.2	5,299	5,219	1.5
South	6.0	91.1	2.9	3,503	3,385	3.5
<b>Ownership structure</b>						
Standalone	5.8	91.2	3.1	3,284	3,131	4.9
Belonging to a group	7.1	88.3	4.7	12,428	12,483	-0.4
Consolidated taxation	3.8	93.3	2.9	39,013	42,899	-9.1
Foreign controlled	7.4	85.8	6.8	79,955	80,085	-0.2
Multinational	9.1	84.2	6.7	88,069	81,773	7.7

Source: Istat-MATIS microsimulation model

**Table B.4 - Comparison of MATIS simulation results for the taxable base with tax return data: aggregate, 2011**

	frequencies (%)			simulated values	UnicoSC	difference %
	over estimation	exact estimation	under estimation			
<b>Total</b>	11.5	67.4	21.0	135,725	134,832	0.7
<b>Sectors</b>						
Manufacturing	16.4	58.1	25.5	294,425	293,124	0.4
Public utilities	12.5	59.6	27.9	1,013,578	1,006,772	0.7
Construction	13.6	65.3	21.0	54,680	52,664	3.8
Trade	11.3	68.0	20.6	102,975	102,597	0.4
Other services	8.9	71.7	19.4	94,303	94,012	0.3
<b>Turnover</b>						
< 1	5.3	90.7	4.0	12,275	11,017	11.4
1-500,000	6.9	77.9	15.2	15,438	15,310	0.8
500,000 - 2 mln	15.3	53.9	30.8	56,343	55,670	1.2
2 - 10 mln	24.1	39.6	36.4	185,103	183,345	1.0
10 - 50 mln	33.5	30.4	36.1	845,358	841,154	0.5
>50 mln	42.0	26.0	32.0	9,979,026	9,935,446	0.4
<b>Localization</b>						
North-West	13.3	64.8	21.9	206,922	206,323	0.3
North-East	13.4	67.3	19.3	141,165	139,969	0.9
Center	10.7	68.1	21.3	132,680	131,054	1.2
South	8.8	70.0	21.3	49,407	49,161	0.5
<b>Ownership structure</b>						
Standalone	10.3	69.3	20.4	46,572	46,146	0.9
Belonging to a group	15.4	61.0	23.7	182,716	180,484	1.2
Consolidated taxation	24.1	51.9	24.0	2,499,399	2,492,682	0.3
Foreign controlled	20.9	53.9	25.2	1,686,271	1,679,438	0.4
Multinational	34.6	35.7	29.6	1,650,815	1,651,520	0.0

Source: Istat–MATIS microsimulation model

**Table B.5 - Comparison of MATIS simulation results for tax savings, beneficiaries and implicit tax rate arising from the new ACE regime with tax return data, 2011**

	ACE allowance (%)		beneficiaries (%)		27,5%-implicit tax rate	
	simulation	UnicoSC	simulation	UnicoSC	simulation	UnicoSC
<b>Total</b>					-0.25	-0.23
<b>Sectors</b>						
Manufacturing	32.8	39.4	21.5	24.4	-0.24	-0.26
Public utilities	8.9	6.8	2.2	2.4	-0.18	-0.12
Construction	8.9	6.6	16.1	14.1	-0.30	-0.21
Trade	15.6	15.6	23.0	22.4	-0.24	-0.22
Other services	33.7	31.6	37.2	36.6	-0.28	-0.24
<b>Turnover</b>						
< 1	0.3	0.2	0.4	0.3	-0.18	-0.11
1-500,000	10.4	9.5	34.5	29.8	-0.38	-0.32
500,000 - 2 mln	11.0	7.8	29.7	27.7	-0.30	-0.20
2 - 10 mln	17.9	14.6	25.0	27.7	-0.30	-0.23
10 - 50 mln	19.3	18.7	8.3	11.3	-0.28	-0.25
> 50 mln	41.1	49.2	2.1	3.2	-0.20	-0.21
<b>Localization</b>						
North-West	48.1	51.0	36.3	39.8	-0.27	-0.26
North-East	23.3	23.9	25.3	29.7	-0.27	-0.25
Center	18.8	18.2	21.7	19.4	-0.19	-0.17
South	9.9	6.9	16.7	11.2	-0.28	-0.17
<b>Ownership structure</b>						
Standalone	31.4	24.1	72.9	68.0	-0.28	-0.20
Belonging to a group	26.5	25.6	21.3	24.0	-0.31	-0.27
Consolidated taxation	33.9	40.7	3.7	5.2	-0.22	-0.24
Foreign controlled	5.7	6.9	1.5	2.0	-0.15	-0.17
Multinational	2.6	2.7	0.6	0.8	-0.26	-0.24

Source: Istat-MATIS microsimulation model



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