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From IRAP to CBIT: Tax Distortions and Redistributive Effects

Marco Manzo* Maria Teresa Monteduro‡

Abstract

The paper explores the differences between IRAP (the Regional Tax on Productive Activities*) and CBIT (the* Comprehensive Business Income Tax*), which approximately corresponds to allow the deduction of labor cost from the taxable base of IRAP. By developing a DSGE model that incorporates business taxes, like IRAP or CBIT, we find that tax distortions due to IRAP are more contractionary than those caused by the presence of CBIT. Empirically, tax revenues and redistributive effects are more carefully analyzed. We implement a microsimulation model (MSM) based on a dataset of more than 150,000 incorporated firms. We show that small incorporated firms are particularly harmed by IRAP, especially when business run a loss instead of a profit. This is due to the fact that IRAP is a business tax on value added, which does not allow for the deduction of labor cost. For this purpose, we focus on the introduction of a reform based on the CBIT principle. Our result is that CBIT is particularly costly and more able to enhance the profitability for larger enterprises. Moreover, the tax design of CBIT is more regressive compared to the IRAP including tax allowances. Consequently, an efficiency-equity trade-off between IRAP and CBIT might be emphasized.*

Journal of Economic Literature Classification Numbers: E32, E62, H25, H32
Keywords: business cycles, tax distortions, micro-simulations models, distributive effects, Italy.

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1 Introduction

Integration of markets and demands for greater neutrality in the tax levy marked the recent evolution of systems of corporate taxation. The strategy consisting in the reduction in the rate and in the widening the tax base was the distinctive feature of the reforms implemented since the mid-eighties in almost all OECD countries following the U.S. Tax Reform Act.

With the increasing international tax competition[1], statutory corporate income tax rates were significantly reduced almost everywhere in many countries by even more than 15 percentage points (*e.g.*, France, Germany, Holland, Portugal, United Kingdom). Although tax rates are still different across EU countries, recent developments show a trend of convergence towards a European average of 24%. In parallel, to avoid unsustainable falling in revenues, tax bases have been broadened through a variety of measures, including the abolition of tax expenditures, anti-avoidance regulation and thin capitalisation rules, tax allowances (*i.e.* fiscal depreciation schemes) and inventory valuations.

Furthermore, current tax systems in Europe favor debt financing over equity financing. While, in general, interest on debt is deductible from the corporate tax base, return on equity is not. This leads to a higher leverage of firms since financing investments with debt is more attractive. The eighties and nineties were also marked by a well grounded policy debate on improving efficiency in corporate taxation by minimising tax distortions between debt and equity finance and by reducing the cost of capital. The discussion on reforming the tax system towards achieving financing neutrality has gained even more interest nowadays in light of the current financial crisis and the economic downturn which highlighted that for many companies the debt ratio is too high. In general terms, within a marginal framework that places exclusive attention to the effects of tax system on marginal investments, two different schemes of neutral taxation

[1] See OECD [23] Bretschger and Hettich [9] and Devereux *et al.* [12].

are conceivable. A first proposal taxes business cash flows without allowing the deductibility of investment financial costs (whatever the source), but providing the immediate deductibility of costs incurred for the purchase of capital goods.[2] An alternative proposal taxes profits of companies, allowing deductibility of the cost of financing (whatever the source) but limiting the deductibility of investment expenses to true economic depreciation. Beside the practical applicability of the cash flow tax, the debate about the ways of restructuring corporate tax systems towards debt-equity neutrality has led to a variety of proposals.[3] In principle, two opposing measures exist that might eliminate this distortion by treating both sources of finance in the same way: a Comprehensive Business Income Tax (CBIT) or an Allowance for Corporate Equity (ACE).

First the CBIT, proposed by U.S. Treasury (U.S. Department of the Treasury [30]), broadens the tax base by disallowing a deduction for interest payments on debt. If the tax rate remains unchanged, this leads to an increase in tax revenue. The additional revenue can be either used for a reduction in the statutory corporate tax rate or of other taxes if the reform is supposed to be revenue neutral.

On the contrary, the ACE would grant the same deduction for the return on equity as for interest paid, abolishing the tax advantage of debt (IFS [17]). Within the corporate profits, ACE distinguishes two components: the first is the ordinary return on capital invested, that is fully deducted and thereby totally exempted from taxation; the second is the extra residual profit that is subject to the normal corporate tax rate. ACE reduces the tax burden on marginal investment, but also leads to a narrower tax base. In order to collect the same amount of tax revenue either the statutory corporate tax rate or other taxes have to be increased to finance such a reform.

[2] See Meade Committee [20] and Sinn [27].

[3] See Cnossen [10] and De Moij and Devereux[11]

Italy was a latecomer to the process of reforming corporate taxation.

Since the late ninenties, the Italian business income tax system was subject to two major reforms after over twenty years where only minor changes to the regime designed at the beginning of the 1970*s* were implemented. The first was introduced in 1997 while the second one came into effect in 2003. Although both reforms state among their targets simplification of the business tax system as well as reduction of the firms' tax burden, the tax policy design underlying the two regimes is actually different (Giannini [16]).

At a first stage, the move towards a lower rate on profits did follow only partially both the academic debate discussed extensively in economics and the traditional tax design in most Western European countries. In the latter, since the 1980*s* the corporate tax base was broadened by eliminating a number of allowances from the profit tax base (*i.e.* accelerated depreciation). In Italy, instead, the reduction of the tax rate on profits was initially obtained in the late nineties by extending taxation at the business level to other types of income different from profits, rather than by widening the definition of profit to be used as tax base. Tax reform introducing IRAP (the regional tax on business activities) in 1998 was mainly aimed at simplifying and rationalizing the tax system by reducing the excess burden of taxation, by increasing neutrality of tax levy with respect to different forms of organising businesses and with respect to the use of different productive factors, namely capital and labor (profits, interests and wages are all included in the same tax base and taxed with the same rate), by rebalancing tax incentives towards equity (instead of debt) financing and by reducing the incentives for tax avoidance and tax evasion (mostly by small business). IRAP dispays the properties of an origin-based, (net) income-type value added tax (OB-(N) IT-VAT). Since the inclusion of all factors of production in the tax base at a rather low and competitive statutory tax rate (originally set at 4.25%), IRAP is considered a *broad-base and low-rate* (BB-LR) local business tax. Apart from the specific rules established for the banking system, financial intermediaries and insurance companies, for most business activities IRAP tax

base is computed by subtraction, as the accounting difference between revenue from sales and costs of intermediate goods and services. Neither labor costs, nor interest payments are deductible from the tax base. Thus, the IRAP base basically equals the sum of wages, profits, rents and interest payments at the business level and roughly corresponds to the total economy's net value-added. With respect to the US tax design of a Comprehensive Business Income Tax, IRAP is clearly much less radical, even if the underlying rationale does not differ much. IRAP shares with CBIT the idea of taxing interest payments and goes even further in widening the tax base, in so far as labour costs are also included. Overall, the statutory tax rate on profits was reduced by about 10 percentage points, even if the IRAP tax reform mostly favored firms with higher relief from health contributions and lower skilled employees (Bordignon *et al.* [8]; Monteduro and Vagliasindi [21]). At the early stage of the introduction of IRAP the underlying rationale was also to pursue selective tax burden reductions aiming at narrowing the distortion in the tax treatment of equity finance as compared to debt, implicit in the previous system. In order to attain this purpose the main innovation of the 1997 reform was the introduction of the Dual Income Tax (DIT) allowance, a dual-rate scheme where a lower statutory rate is applied on that part of business profits representing the opportunity cost of new equity financing, compared to other forms of capital investment. This system offered a structural reduction of the company tax burden depending on the amount of capital increases undertaken by the company, in the form of new subscriptions and retained earnings as established by the tax code. The dual system for business income taxation was somewhat intermediate between the Dual Income Tax (DIT) system implemented in the Nordic countries in the 1990*s* (Sørensen [28]) and the Allowance for Corporate Equity (ACE) proposed in the UK by the IFS [17]. On the other hand, to enhance capital mobility in an international context and in particular to foster the choice of investment and location made by multinational companies (Bond [7] and Devereux and Griffith [12]), the statutory and the average rate of taxation on profits was reduced.

At a second stage, following international practice, the reform of the corporate tax implemented as of January 2004 implied a radical change, being aimed at reducing the tax burden on corporations, and at introducing a tax system more in line with the corporate income tax systems in European countries. The policy design envisaged by the 2003 reform set explicitly that tax instruments aimed at modifying firms' financial decision tended to introduce distortions in firms' behaviour and, therefore, should be eliminated. Consequently, the reform abolished the DIT system and moved back to a uniform tax rate system, by reducing the corporate tax rate from 36 per cent in 2002 to 33 per cent as from 2004. Furthermore, the new regime set some changes to the definition of the corporate tax base by introducing a participation-exemption regime and by removing the full imputation of dividends, and brought in an optional consolidated tax statement for corporate groups, in this way attaining simplification in the tax base computation. The reform also included provisions for a gradual abolishment of IRAP. Not surprisingly, the evolution in the regional tax on productive activities raised over time increasing criticisms, and was considered as an important factor in explaining several distortions and drawbacks of the Italian system. The main argument were that: *i*) by not allowing the deduction of labor costs, it prejudices employment; *ii*) it is due also when business run a loss instead of a profit; *iii*) it is at odds with the 'correspondence' principle, because it is levied on business but in practice it finances the national health system, which accounts for roughly 80 percent of the regional expenditure.

In 2007, social security contributions have been excluded from the tax base, with the aim of reducing the burden on labour. Since 2008, the standard rate has been reduced to 3.9 per cent and the tax base calculation has been greatly simplified, establishing a direct derivation from the P&L account and abolishing the application of the tax bridge used for determining the CIT taxable base.

In this paper we deal with a comprehensive reform that shifts business taxation from IRAP to CBIT, either using a macroeconomic or a microeconomic framework of analysis. By developing a DSGE model that incorporates busi-

ness taxes, like IRAP or CBIT, we find that tax distortions due to IRAP are more contractionary than those caused by the presence of CBIT. The broad contraction is leaded by the collapse in employment and, in its turn, by the tax distortion in the labor market due to the presence of the IRAP; by contrast, the deduction of the labor cost in presence of a CBIT-type taxation allows a smaller reduction in employment, thus making the different impact on output quite considerable.

Empirically, tax revenues and redistributive effects are more carefully analyzed. We implement a microsimulation model (MSM) based on a dataset of more than 150,000 incorporated firms. First, we point out the methodological techniques; then, we briefly clarify how the tax rules in 2008 and 2009 are simulated in the microsimulation model. We definitely stress redistributive effects and loser-winner comparisons. We show that small incorporated firms are particularly harmed by IRAP, especially when business run a loss instead of a profit. This is due to the fact that IRAP is a business tax on value added, which does not allow for the deduction of labor cost. For this purpose, we focus on the introduction of a reform based on the CBIT principle. Our main result is that CBIT is particularly costly and more able to enhance the profitability for larger enterprises. In fact, the basic simulation shows a slight redistributive effect of IRAP, more probably due to tax allowances. Afterwards, we define two types of CBIT reform: the first one is the *revenue non-neutral* reform; the latter is the *revenue neutral* reform, in which we simulate the tax rate that allows the same amount of tax revenues collected in the case of IRAP (with a standard tax rate equal to 3.9 per cent). The non-neutral reform obviously reduces the tax incidence; however, this reduction is totally due to the decrease in the average tax rate. Indeed, we find that the CBIT reform is very regressive as shown by the negative value of the Kakwani index. Overwhelmingly, it is possible to observe that a neutral reform would increase the tax incidence too, by soaring the Reynolds-Smolensky index. Our unequivocal outcome is a regressive effect of the CBIT reform. The point is that the proportion of labor cost on the

taxable base is positively-related to the amount of IRAP positive components (or turnover), for micro enterprises. Thus, the deduction of labor compensation principally favors larger enterprises. Moreover, we also find that the tax design of CBIT is more regressive compared to the IRAP by including tax allowances (current deductions, tax reliefs, tax wedge reductions).

Summing up, while IRAP is more distortionary, as suggested in our macroeconomic analysis, CBIT's unfairness straightforwardly stems from our microsimulations. Consequently, an *efficiency-equity* trade-off between IRAP and CBIT might be emphasized.

The remainder of the paper is organised as follows. The next section discusses the main theoretical features of IRAP and CBIT. Section 3 describes a simple thereoretical model for analyzing tax policy issues related to business taxation in a macroeconomic context. Turning toward a microeconomic framework, in Section 4 we briefly describe the data and sampling procedure. Section 5 shows the results of the microsimulation model, by focusing on the shifting from IRAP to CBIT. Finally, concluding remarks are laid off in Section 6.

2 Economic Crisis and Tax Distorsions: IRAP *vs* CBIT

In September 2008 the collapse of Lehman Brothers opened up grim prospects for global finance and the world economy. The action of monetary authorities and government staved off the collapse of confidence among investors and consumers. In the G7 countries as a group, public financial support for the economy exceeded 5 percentage points of GDP in 2009. Real short term interest rates turned negative and the central banks provided unprecedented volumes of liquidity. Output declined by 2.4 per cent in US, 4.1% in the euro area, and 5 per cent in Italy (see Bank of Italy [2]). Government budget deficits and public debt have spiralled. The roots of the crisis that has beset the world for nearly three years lie in regulatory and supervisory deficiencies in the main financial centres.

The expansionary monetary policy conducted by the US from the end of the 1990*s* helped to create a financial environment conducive to the explosion in private debt and the aggraviation of global imbalances; clear indications derive from this for the future, regarding both the system of financial regulation and monetary policies. In particular, the experience of the crisis also influences the design of monetary policies. Their objective continues to be price stability, but they must be more prepared to counter developments in credit and money that can fuel financial disequilibria, even in the absence of immediate inflationary dangers.[4] Euro-area monetary policy has been strongly expansionary for some time. But in the last few months the consequences of the crisis have tested the cohesion of the euro area. The massive creation of public debt suddenly increased the risk premium on some sovereign debtors (*e.g.* the Greek crisis).

In Italy, in the two years 2008-09 GDP contracted by 6.3% per cent, almost half the entire growth achieved in the ten preceding years. Households' real income diminished by 3.4 per cent, their consumption by 2.5 per cent. Exports fell by 22 per cent. Rapidly spreading uncertainty and the deteriorating outlook for demand led firms to cut investment, causing it to contract by 16 per cent. Employment decreased by 1.4 per cent, the number of hours worked by 3.7 per cent (see Bank of Italy [2]). Economic policy limited the damage, containing the fall in GDP by an estimated two percentage points, of which about one point can be attributed to monetary policy, half a point to the automatic stabilizers built into the budget and the rest to the recomposition of revenue and expenditure enacted by the Government. However, in Italy the increase in the budget deficit was smaller than in the other main advanced economies, thanks in part to the solidity of the banking system, which did not need significant public support. Yet, the ratio of public debt to GDP declined by 18 percentage points between 1994 and 2007. In the last two years of recession it increased by 12 points, to stand at 115.8 per cent.

Economic crisis put economists and policy makers up against the fall in em-

[4]See, among the others, Blanchard *et al.* [6].

ployment and the risk of a jobless recovery. Growth is slowing, the economy might go into a doble dip depression with unemployment rates rising again. Tax distortions in labor market are becoming crucially important and call for relevant reforms in labor market. The renewed interest in reforming corporate tax systems in the direction of the comprehensive business income tax (CBIT) aims at neutralising the distortionary effect of the regional tax on productive activity on employment, productivity and investments of companies, by reducing tax wedge on labor. A solution would be to eliminate discrimination by implementing a reform that cuts labor costs from IRAP tax base shifting towards a Comprehensive Business Income Tax (CBIT). Indeed, a potential disadvantage of CBIT is that its narrower tax base reduces corporate tax revenue, and thus requires higher tax rates to yield the same revenue. By contrast, CBIT disallows the exemption of interest. It turns the corporate income tax into a broad-base tax on capital at the level of the firm. This raises the overall cost of capital so that investment declines. The broadening of the base under CBIT will raise corporate tax revenue and, if revenue is to be maintained, allows for a higher corporate tax rate with respect to IRAP.

The first-order conditions that characterize firms' optimal decisions can provide some intuitions for understanding the effects of shifting taxation from IRAP to CBIT. Using a standard model with Cobb Douglas production functions, the first-order conditions for capital and labor are displayed on the Table below. Both systems aim to neutralise the distortionary effect of corporate taxes on the financial structure of companies. In IRAP tax scheme, at the optimal point where profits are maximised, tax rates are cancelled out so indicating the neutrality of taxation with respect to the firms' marginal choices of production factors. Furthermore, maximization of profits for firms under the Comprehensive Business Income Tax (CBIT) implies that, for a given interest rate, the tax cut in employers' labour costs decreases the marginal product of labour. Tax rates on capital do not alter factors marginal products, while labour costs have a direct effect.

	Capital Market	Labor Market
IRAP	$f_k^{'}(K_{t-1}, L_t) = \rho_t \frac{(1-\tau_c)}{(1-\tau_c-\tau_{IRAP})}$	$f_l^{'}(K_{t-1}, L_t) = W_t \frac{(1-\tau_c)}{(1-\tau_c-\tau_{IRAP})}$
CBIT	$f_k^{'}(K_{t-1}, L_t) = \rho_t \frac{(1-\tau_c)}{(1-\tau_c-\tau_{CBIT})}$	$f_l^{'}(K_{t-1}, L_t) = W_t$

	Tax Neutrality Sources of Finance	Tax Neutrality Investment Choices	Neutrality of Inflation
IRAP	√		
CBIT	√		
ACE	√	√	
CASH FLOW	√	√	√

The tables above compare the trade-offs in IRAP and CBIT reform, and all together including ACE and cash-flow tax scheme. Economists typically favour ACE. This system grants equity holders a certain allowance equal to a notional risk-free return and turns out to be attractive as it reduces the effective marginal tax rate to zero, implying that ACE is a tax on economic rent. As such, it does not distort decisions about the scale of investment, though even a tax on economic rent can affect discrete investment choices that depend on an effective average tax rate. A lower rate will typically not be sufficient to prevent a rise in the effective marginal tax rate, which is why CBIT has not gained the same popularity as ACE. Both IRAP or CBIT systems are neutral with respect to marginal investment decisions, since financing investments through debt is not tax-favoured. Furthermore CBIT allows for a deduction of labor costs. Shifting from IRAP to CBIT would reduce the distortion on the labor market thus making companies less vulnerable during economic downturns.

3 A Theoretical Macroeconomic Framework

This section outlines a simple theoretical framework for analyzing tax policy issues related to different kinds of the business taxation in a macroeconomic context. More precisely, by considering a negative demand shock that hits the economy, the aim of this section is to evaluate the dynamic behavior of the main aggregate variables, like labor, capital and output, in two different cases: in the first case an origin-based value-added tax (OB-VAT), like IRAP (*Regional Tax on Productive Activities*), is explicitly incorporated in the model; in the second one IRAP is replaced by a taxation ispired to the Comprehensive Business Income Taxation (CBIT) that does not include the labor cost in the taxable base. We think that this investigation is very challenging and attractive for at least two reasons: from the one side, the business tax is seldom considered in macroeconomic models; from the other side, by facing an economic crisis, *i.e.* a negative aggregate demand shock, it is relevant to question how proper is a tax distortion in the labor market. Our simple theoretical strategy is the following: first, we develop a simple macroeconomic model in a New Keynesian Framework that includes several features developed by the more recent literature; second, we calibrate the deep parameters of our model according to the standard literature, except for tax rates, where we apply the Italian coefficients; third, we analyze the impulse-response functions to consumption and investment (negative) shocks; finally, we compare IRAP to CBIT and evaluate the main differences.

3.1 A DSGE New Keynesian Model

We follow Galì *et al.* [15] in order to take into account both the nominal rigidities and the empirical evidences that seem to confirm a non-negligible presence of non-Ricardian consumers.[5] The model is able to consider both the capital adjustment costs and the imperfect competition in the intermedi-

[5] See, among the others, Di Bartolomeo *et al.* [13].

ate goods. Monetary policy follows the Taylor principle, but only cares the inflation target; fiscal policy is explicitly considered under the assumption of non-explosive debt dynamics, like in Galì *et al.* [15]. More in detail, a continuum of infinitely-lived heterogeneous agents normalized to one is assumed. A fraction $(1-\lambda)$ of them consumes and accumulates wealth as in the standard setup (Ricardian Consumers or *Optimizers*). The remaining fraction λ is composed by agents who do not own any asset, cannot smooth consumption and, therefore, consume all their current disposable income (Non-Ricardian or *Rule-of Thumb* Consumers). We refer to *Optimizers* by superscript o, while *Rule-of Thumb* Consumers are pointed by the superscript r. Each consumer is assumed to maximize an optimization problem given by:

$$
\begin{aligned}
[1] \qquad & \underset{C_t,\ K_t,\ N_t,\ B_t}{Max} \ E_t \sum_{t=0}^{\infty} \beta^t \left[\tfrac{1}{1-\sigma} \left(C_t^j L_t^{j v} \right)^{1-\sigma} \right] \\
& \text{s.t.} \quad P_t \left(C_t^j + \psi I_t^j \right) + \psi B_t = \left[W_t N_t^j + \psi \left(R_t^K K_t + D_t \right) \right] \left(1 - \tau_t^P \right) + \\
& \qquad + \psi \left[B_{t-1} R_{t-1} - P_t \overline{T}_t \right] \\
& \qquad K_t = \left(1 - \delta \right) K_{t-1} + \phi \left(\tfrac{I_t}{K_{t-1}} \right) K_{t-1}
\end{aligned}
$$

where $j = \{r, o\}$, and $\psi = 0$ *if* $j = r$, $\psi = 1$ *if* $j = o$. C_t, L_t, N_t, I_t and D_t represent consumption, leisure, labor, capital, investment and nominal dividends from ownership of firms, respectively, at time t. P_t is the general index of prices, R_t^K is the nominal return of capital and W_t the nominal wage; B_t is the quantity of nominally risk-less bonds that pay R_t of money at maturity, *i.e.* the nominal interest rate; β is the subjective discount factor and σ the intertemporal elasticity of substitution; $\overline{T}_t$ is a lump-sum tax that burdens the Ricardians' budget constraint; τ_t^P is the personal income tax rate. The capital accumulation reflects the convexity of capital adjustment costs, which determines the change in the capital stock (gross of depreciation) induced by investment spending.

Each firm *h-th* sets a price at each period to maximize its profits by considering its production function. Taking the wage and rental cost as given, profit

maximization is as follows:

$$[2] \quad \underset{K_{t-1,h},\, N_{t,h}}{\text{Max}} \; \Pi_{t,h} = \left(P_{t,h}Y_{t,h} - W_t N_{t,h} - R_t^K K_{t-1,h}\right)\left(1-\tau_t^C\right) + \\ -\zeta\left(P_{t,h}Y_{t,h} - \delta P_{t-1,h}K_{t-1,h}\right)\tau_t^{irap} + \\ -\left(1-\zeta\right)\left(P_{t,h}Y_{t,h} - W_t N_{t,h} - \delta P_{t-1}K_{t-1,h}\right)\tau_t^{cbit}$$

$$\text{s.t.} \quad Y_{t,h} = K_{t-1,h}^{\alpha} N_{t,h}^{1-\alpha}$$

$$P_{t,h} = \left(\frac{Y_{t,h}}{Y_t}\right)^{-\frac{1}{\epsilon}} P_t$$

Differently from Galì *et al.* (2007), we introduce distortionary taxes. In detail, we consider the taxation at the corporate and business level: τ_t^C is the corporate income tax rate; τ_t^{irap} represents the tax rate of IRAP (acronym of regional tax on productive activities), while τ_t^{cbit} is the tax rate of Comprehensive Business Income Taxation. ζ is equal to 1 in the case of IRAP, 0 in the case of CBIT. We may capture the degree of monopoly power of each firm by the elasticity of substitution ϵ. The technology is represented by a standard Cobb-Douglas function, where Y_t is the aggregate output produced at time t, while $Y_{t,h}$ is the real output produced by the firm *h-th*. The tax base of IRAP is constituted by the net value added (δ is the depreciation rate); compared to IRAP, the tax base of CBIT encompasses the deduction of the labor cost. The derivation of the stationary state is quite similar to Galì *et al.* [15], Di Bartolomeo *et al.* [13] and Di Bartolomeo and Manzo [14]. The steady-state level of employment is determined as illustred in the Appendix A1. Tax revenues are defined in the following equation:

$$[3] \quad P_t T_t = P_t \overline{T}_t + \left(W_t N_t + R_t^K K_t + D_t\right)\tau_t^P + D_t \frac{\tau_t^C}{\left(1-\tau_t^C\right)} + \\ +\zeta\left(P_{t,h}Y_{t,h} - \delta K_{t-1,h}\right)\frac{\tau_t^{irap}}{\left(1-\tau_t^C\right)} + \\ +\left(1-\zeta\right)\left(P_{t,h}Y_{t,h} - W_t N_t - \delta K_{t-1,h}\right)\frac{\tau_t^{cbit}}{\left(1-\tau_t^C\right)}$$

We can assume exogenous tax rates or exogenous government expenditure, depending upon our choice. We focus on business taxes ($\widehat{\tau}_t^{irap}$, $\widehat{\tau}_t^{cbit}$), whose

rates automatically change in order to allow the convergence of budget constraint; by contrast, we fix the value of tax rates at the personal and corporate level ($\widehat{\tau}_t^P$, $\widehat{\tau}_t^C$); lump-sum taxes are also kept constant. This assumption is not only due to the fact that our interest is strictly focused on business taxes, but also to the empirical evidence that tax rates of IRAP automatically vary in order to balance the regional debt, in Italy. Consequently to our hypotheses, the coefficent values of IRAP or CBIT tax rates are endogenously determined. The linearization of the first order conditions allows us to define the model that describes the short run dynamics around the steady state and to verify if the conditions for equilibrium determinacy hold. We can combine the log-linearized equilibrium conditions and, hence, derive the system of difference equations describing the business cycle, composed by 16 equations in 16 unknown variables (y_t, c_t, i_t, g_t, k_t, n_t, q_t, $(w_t - p_t)$, $(r_t^K - p_t)$, r_t, π_t, $\widehat{\mu}_t$, t_t,b_t, d_t, $\widehat{\tau}_t^{irap}$ or $\widehat{\tau}_t^{cbit}$), as reported in the Appendix A2.

3.2 Calibration

Each periosd is assumed to correspond to a quarter. We calibrate the model according to the baseline parametrization in Galì *et al.* [15]. So, with regard to preference parameters, we set the discount factor β equal to 0.99 and ϵ to 6, a value consistent with a steady state markup of 20 percent. The rate of depreciation is set to 0.025; the elasticity of output with respect to capital is assumed to be one third, a value roughly consistent with income share given the assumed low steady state price markup. Following the literature, our baseline setting for the weight of rule-of-thumb consumers λ is 0.5. There are several estimations of this coefficient for Italy, but there are different ways to define the participation in the capital market, whether considering or not the real estate. In order to rule out this inconvenient, for simplicity, we assume the standard parameter, which is in the range of estimated values in literature of the weight of rule-of-thumb behavior (Mankiw [19]). The fraction of firms that keep their

prices unchanged is given by a baseline value of 0.75, which corresponds to an average price duration of one year. We set the value of v in the utility function, the cost of working, in such a way that the steady state level of labor is equal to eight hours in a day.

The policy parameters are chosen as follows. We set the size of the response of the monetary authority to inflation to 1.5, a value commonly used in empirical Taylor rules (and one that satisfies the so-called Taylor principle). For the two parameters describing the fiscal rule (equation [A2.12]) we use the information provided by results obtained in Bohn [4], Blanchard and Perotti [5] and Galì *et al.* [15]. Therefore ϕ_b is equal to 0.30, ϕ_g is equal to 0.12, while s_g, which corresponds to the government spending share, is fixed at 20 per cent.

Tax rates are calibrated according to the empirical evidence in Italian micro-data. Thus, τ^P is equal to the average tax rate at the personal rate and equal to 22.9% according to Italian Tax Files; τ^{irap} is equal to the average tax rate for incorporated firms and equal to 4.12%; τ^{cbit} is fixed under the condition to guarantee the same amount of tax revenues of IRAP. This value is estimated at 7.45% by using the micro-simulation model described in Section 5; finally, τ^C is equal to 27.5%.

3.3 Negative Demand Shocks and Business Cycle

The goal of our model is not to accurately replicate the entity of the economic crisis in terms of the main aggregate variables, consistently with the figures above described, but, more properly, to investigate the role of distortionary taxation in a dynamic general economy hit by a negative demand shock. In fact, we may interpret negative shocks on consumption and the Tobin's Q as a collapse of confidence among investors and consumers. Hence, we perturb the economy by considering two types of shocks: a negative shock that involves the expected pattern of consumption described by the Euler Equation; another negative shock that affects the expected value of Tobin's Q and, consequently, the dynamic path of investment. In other terms, economic crisis can be viewed

as a crisis on private expectations on consumption and investment. The role of the Central Bank, in our model, is to avoid the endogenous fluctuations leaded by self-fulfilling prophecies. According to our calibration, animal spirits are effectively prevented by a monetary policy that follows the Taylor principle; the weight of non-Ricardian consumers is not enough to foster sunspot equilibria. In such a way, the role of tax policy is not to support the Central Bank in stabilizing the economy, rather avoiding the explosion of the public debt.

Therefore, tax policy is oriented to alleviate the public deficit. As we consider proportional taxes at the personal and corporate level, a decline in output triggers a corresponding decline in tax revenues. Moreover, we exogenously assume, as illustred in the Appendix A2, an inertia in government spending in nominal terms; hence, a wave of deflation is faced by an increase in government spending. It is worth noticing that tax policy is built to partially respond to the increase in public spending and debt, according to equation [A2.12]. Specifically, in our model the only way to increase tax revenues is to hike up business tax rates, IRAP or CBIT. We are concentrated on analyzing the difference between CBIT and IRAP. We can distinguish two types of tax distortions: first, the IRAP distorts the labor market, by shifting downward the labor demand (see equation [A2.5]); second, the tax rate of CBIT is larger than that of IRAP, hence the capital demand is more affected by tax hikes (equation [A2.6]). A trede-off can be emphasized: from the one hand, the labor market is more distorted by IRAP; on the other hand, the capital market is more distorted by CBIT. However, while the tax distortion on the capital allocation is quantitatively different between the case of IRAP and the case of CBIT, the tax distortion on labor is displayed only in the case of IRAP (*i.e.* labor market does not imply inefficiency whereas a business tax is designed as a CBIT).

For this purpose, we compare the impulse-response functions in the two cases. We depict the dynamic behavior of the main variables in Figure 1. Panel a) describes the dynamic behavior of output and labor. This picture clearly illustrates the more recessionary impact of IRAP with respect to CBIT. The

broad contraction is leaded by the collapse in employment and, in its turn, by the tax distortion in the labor market due to the presence of the IRAP; the deduction of the labor cost in presence of a CBIT-type taxation allows a smaller reduction in labor. The different impact on output is quite considerable, especially in the medium run. The hump-shaped dynamic of output is very prominent in the case of IRAP. After six quarters, the annual growth rate of real GDP is equal to -1.57 per cent in the case of IRAP and -1.06 per cent in the case of CBIT. The convergence toward the steady state level of employment is rapid in presence of CBIT. By contrast, Panel b) shows that the fall in investment (14.7 per cent in the first year) is larger when a CBIT is considered; this is due to the broader tax distortion in capital market, as shown in Panel c) as well. The decrease in consumption is suddenly very high in the case of IRAP. The rationale of this phenomenon is strictly connected with the presence of non-Ricardian households, whose consumption hinges upon the level of aggregate wages. The deflationary pressure in real wages is smaller in presence of a CBIT, while the return of capital plummets compared to the case of IRAP. Panel e) shows the rise in the tax rates necessary to guarantee the same amount of tax revenues, whose dynamic is reported in Panel f) together with government spending and public debt.

Summarizing, from a macroeconomic point of view the business taxation ispired to the CBIT principle is less distortionary rather than IRAP. This is clearly due to the tax distortion in the labor market since IRAP does not allow the deduction of labor cost from the tax base.

4 The Empirical Microeconomic Framework

At this stage of the analysis, we turn our attention on the empirical evidences and stylized facts that concern tax revenues and redistributive effects related to IRAP. The main objective is to analyze the impacts of a business tax reform that eliminates the labor cost from the tax base. Before discussing the main

features of the microsimulation model, it is important to outline the benefits and problems of linking micro and macro models. In general, microsimulation modesl (MSMs) are tools which are designed to answer "what if" questions about different policy reform options. In the run-up of the implementation of a specific reform proposal, it is crucial to predict the expected consequences to provide policy-makers with well-founded decision guidance.

The complexity of macroeconomics requires the usage of simplified models for the evaluation of reform proposals. Theoretical models allow to point out a single argument in a semplified framework and to construct hypotheses which can be tested empirically. Conversely, empirical models allow for an econometric evaluation of a given reform and are especially useful whenever the magnitude, and thus not only the sign, of the effects are to be estimated. If the reform already has been implemeted (and data is available) an *ex-post* analysis is possible using standard econometric procedures. On the other hand, if the reform has not been implemented, only simulation models can provide information for an *ex-ante* analysis of different reform proposals. Therefore, in our context the reform of IRAP can be analyzed by using MSMs.

Despite of the increasing interest for microsimulation models in analyzing tax policy reforms and redistributive effects, the empirical literature principally focuses on the personal income taxation. To the best of our knowledge, analyses at the corporate level are much less developed. Fiscal policy evaluations on the firms' side is concentrated on behavioral analyses through econometric tools and longitudinal data. This is more likely for a twofold reason: first, tax distortion is often studied in models that regress investment on the user cost of capital; second, the impact of tax policy on firms' productivity growth rate requires the usage of dynamic models that are founded on panel data.

By contrast, microsimulation models are built for different purposes; the analysis is conducted *ceteris paribus* in the sense that MSMs do not investigate impulse-responses behaviors; otherwise, the interest is usually restricted to the tax revenue impact or redistributive effects. The idea of policy evaluation is

quite simple. Given a baseline tax system these models allow estimating the effects of a policy reform by simulating numerically the tax-benefit system before and after the policy intervention. In such a way, MSMs may help understanding who gains and who loses from a new policy reform. In Italy, an important point of reference for MSMs at the corporate level is represented by the project named DIECOFIS (Development of a system of Indicators on Economic COmptetiveness and FIScal impact on enterprise performance) financed by the programme IST (Information Society Technology) of the European Commission and co-ordinated by ISTAT. More precisely, the CTM (Corporate Tax Model) is based on an integrated dataset which combines micro-data of the ISTAT-SCI (the Italian acronym is *Sistema dei Conti delle Imprese*) survey and accounts micro-data from the Chamber of Commerce.[6] Frequently, an important hurdle difficult to overcome in these models is to single out tax credits and incentives.[7] Within the DIECOFIS project some modules are explicitly developed for the simulation of IRAP, social contributions and excise taxes.

However, our model is totally focused on IRAP. In addition, our model differentiates from the previous ones for the utilized sample. The sample is drawn from tax revenues declared by incorporated firms in 2008 (fiscal year 2007). Hence, the data refer more on tax declarations than P&L accounts provided by Chamber of Commerce. Anyhow, we try to integrate tax data with P&L accounts available in CERVED (provided by Chamber of Commerce). Such a data integration allows us to take account of some relevant discrepancies. The empirical strategy is as follows: next section sketchs out the methodological techniques; then, we briefly discuss the tax rules simulated in the model; finally, results are carried forward beginning from the basic formulation of IRAP to conclude with the tax reform proposal concerning the CBIT. We definitely stress redistributive effects and loser-winner comparisons.

[6]This integration is necessarily due to the fact that for tax modelling purposes in some cases variables in the accounts are defined at a more disaggregated level, and therefore it allows for a more accurate simulation of the tax rules (see Oropallo and Parisi [24]).

[7]See Bardazzi *et al.* [3].

4.1 Data and Sampling Method

The source of data used in the model is constituted by a stratified sample drawn from the tax declarations of incorporated firms in the fiscal year 2007. The stratified sampling is used when a representative unit (firm) from each subgroup (firm's size) within the population (incorporated firms) need to be represented in the sample. The first step in stratified sampling is to divide the population into subgroups (*strata*) based on mutually exclusive criteria. Random samples are then taken from each subgroup. A procedure for allocation of sample sizes to different strata consists of drawing a preliminary sample of fixed size from each stratum to estimate the strata variances and test their homogeneity. If the strata variances are found homogeneous, the sample sizes to be drawn from different strata are allocated according to proportional allocation; otherwise, they are allocated according a modified proportional allocation stratified sampling (*modified* PASS). Differently from data of households or individual taxpayers, the sampling design of firms is better implemented in the modified proportional allocation.[8] Accordingly, the sampling fraction is fixed in $1/7 = 0.143$. Such a fraction assures a representative sample size, but it is modified in order to take care of larger enterprises, where most of the variability is concentrated. For this purpose, data includes incorporated firms that declare positive components in the tax base of IRAP higher than 25 millions of euro. The variables of stratification are: *i)* 20 regions; *ii)* 35 ATECO sectors [9] *iii)* 4 classes of positive IRAP components.[10] Population is represented by more than $830,000$ incorporated firms; the sample size corresponds to $151,419$ firms. A sample weight is associated to each unit to derive population estimates from the survey sample and can be written as $w_{hij} = \frac{N_{hij}}{n_{hij}}$, where N_{hij} is the population

[8] In fact, the variance is very high and a weighted allocation would require a more complex study in order to specify the variables that may explain the latent characteristics.

[9] The Italian Istitute of Statistics (ISTAT) elaborates the ATECO classification from the list of NACE codes, *i.e.* an European industry standard classification system consisting of a 6 digit code.

[10] The first class refers to firms with less than 2 millions of euro; the second one between 2 and 10 millions of euro; the third one between 10 and 25 millions of euro; the last one more than 25 millions of euro.

number and n_{hij} is the sample size.[11] Table 1 and 2 show the performance of the sample dataset in terms of percentage errors as regards to positive components of IRAP by sectors and regions, respectively. On average the difference is equal to three percentage points. The data have been cleaned for obvious keypunch and filling errors. Especially, it is worth reviewing the reported values in the Section XI concerning the amount of deductions for labor costs.

5 Microsimulations and Results

Given that we are interested in evaluating the impact of IRAP in 2009, we need to update the values reported in the fiscal year 2007. The updating procedure takes into account the nominal growth rate of value added by each sector according to the forecasts provided by PROMETEIA [25]. The Forecast Report published by PROMETEIA provides complete and detailed analysis of microsectors in the Italian economy. The analysis has been integrated with the quarterly forecasts carried out by ISTAT, particularly in order to update variables related to the number of employees, nominal wages and social security contributions. Moreover, other variables has been updated by using the nominal groth rate of GDP reported by the Forecast and Planning Report for 2008 and 2009 (The Treasury Department, Ministry of Economy and Finance [29]). Finally, the amount of interest payments have been updated by applying the growth rate of loans as reported by the Supplements to the Statistical Bulletin - Money and Banking - (Bank of Italy [1]). The next step consists of simulating the tax rules for 2008 and 2009.

The Regional Tax on Productive Activities (IRAP) was introduced by Legislative Decree No. 446 of December 15, 1997 as an implementation of the delegation provided by the 1997 Financial Act. Along with the introduction of IRAP, the following taxes and contributions were abolished: *i)* National Health

[11] h refers to regions, i to sectors and j to positive components of IRAP. Obviously, for the firms with positive components higher than 25 millions of euro the sample weight is equal to one.

Service Contributions; *ii)* Local Income Tax (ILOR); *iii)* Municipal Tax on Productive, Artistic and Professional Activity (ICIAP); *iv)* Tax on State Concessions for VAT positions; *v)* Net Worth Tax on Enterprises. The purpose of this tax is to simplify the tax system by reducing the number of taxes applicable and to start the process of regional tax autonomy. IRAP is a regional tax on net production deriving from the activity carried out on the territory of a region. The tax applies to the net production attributable to the activity carried out in the territory of the region. If the activity is carried out in the territory of several regions, the net production value must be proportionally split among the regions where the activity is carried out, by considering, as a general rule, the amount of compensation due to all personnel. To this regard, some specific rules apply for banks, financial companies, insurance companies and farming enterprises.

Figure 2 shows the distribution of IRAP by headquarters or plants. It is worth noting that IRAP does reasonably well in terms of geographical distributions. One of the arguments in favor of IRAP as a good local tax is that the tax base is well apportionated among regions. Furthermore, as shown in Figure 2, the distribution favors the depressed areas of the Mezzogiorno, such as Puglia, Molise, Calabria and Sicilia.

The statutory IRAP rate was 4.25 per cent. For most enterprises, the taxable base must be calculated starting from the profit and loss account. Nevertheless, some different temporary rates were foreseen depending on the kind of activity (banking, insurance and farming entities). The determination of the production value varies depending on the nature of the taxpayer (banks, insurance companies, manufacturing companies, etc.) and on the adopted accounting regime. Only in 2000 regions could start using the faculty of maneuvering the tax rate, by differentiating the rate among economic sectors and categories of taxpayers. In addition, the Decree set forth the general rules applicable to all parties and established whether or not some costs are deductible for IRAP purposes. Generally, the following items are not deductible: costs relating to employed

personnel; compensation for independent collaborations which are not carried out on a regular basis; costs for personnel employed on an ongoing and co-ordinated basis; compensations for services treated as subordinate employment; profits allocated to associated in participation contributing only by work; the part of financial leasing attributable to interests payable. It is worth noting that the general rule adopts an accrual, and not a cash, principle. On the other hand, the following items are deductible: contributions for compulsory accident insurance in the work place; trainee and apprentice expenses; expenses for the personnel hired with apprentice employment contracts. In order to determine the taxable base, it is necessary to take into consideration the accounting items relevant for civil law purposes, along with the above-mentioned exclusions and exceptions. These items have to be adjusted according to the tax provisions applicable for income tax purposes. The taxable base varies depending on the activity carried out by the taxpayer.

5.1 The Baseline Simulation (IRAP-MSM)

The Italian Finance Bill for 2008 (Law no. 244 of 24 December 2007) envisaged several changes to the Italian tax system. In our basic simulation we take account of four relevant changes and we neglect all others: the changes in the tax treatment of depreciation, such as the reform of the corporate income taxation (IRES); the reduction in the tax rate; the new formulation of deductions; the different tax treatment of interest expenses.

As a general rule, depreciation is deducted under a straight line method on the basis of depreciation rates and schedules approved by the tax administration for different classes of assets. Previous law allowed accelerated depreciation, equal to two times the ordinary depreciation rates in the first three years of purchase of new assets or in the first year of purchase of used assets, and extraordinary depreciation based on a particularly intense use of the assets (determined on a case by case basis). The new rules repeal both the accelerated and extraordinary depreciation and a substitute tax (ranging from 12 per cent to 16

per cent rate) may be paid in order to obtain tax relief for differences between book and tax values. In other terms, the tax base calculation has been greatly simplified by establishing a direct derivation from the P&L account and abolishing the application of the tax bridge used for determining the CIT taxable base. By using data available for 2007, before the outset of the reform, a rigorous computation of the abolition of extraordinary and accelerated depreciation is quite difficult to simulate. For this reason, we make the simple assumption to keep exclusively the values reported as direct derivation from the P&L account without considering the variations necessary to derive the amounts for IRAP purposes (coherently with the compilation of the form that concerns the excess costs - the so-called *quadro EC*). We only correct these values by a small percentage (equal to 1.2 per cent), which we compute in order to fit the trend of tax revenues in 2009. We uniformly apply the average percentage of correction to all firms.

Second, the 2008 budget reformed the structure of the tax system (Legislative Decree No. 344/2003), reducing corporate income tax (IRES) rate by 5.5 nominal points from 33 to 27.5 percent, and trimming the regional business tax (IRAP) by a coefficient equal to 0.9176, from 4.35 to 3.9 percent for the standard tax rate. Specifically for the farm sector the tax rate remains unchanged at 1.9 per cent. These tax cuts are in response to increased EU-wide competition for investment, particularly as the enlargement of the EU to 27 members ushered in various low cost, low tax East European states. Germany's 2007 decision to cut corporate tax rates by ten points rendered Italy's corporate tax rate the highest in the EU. Both the tax reforms are inspired to the *law rate - broad base* principle.

A third important reform was concentrated on the tax wedge reduction. It consisted of two parts. First, employers' social security contributions may be now deducted from the taxable base.[12] Second, a lump sum equal to $5,000$ euro (raised to $10,000$ euro for the regions Abruzzo, Basilicata, Calabria, Campania,

[12] Then, this measure has been extended to banks, financial firms and insurances.

Molise, Puglia, Sardegna and Sicilia) for each employee on permanent contract will be granted at 50% starting from the month of February 2007, and in their entirety starting from the month of July 2007, on an annual pro-rata basis.[13] The measure aimed at favouring job creation by reducing the labor costs borne by companies, through IRAP deductions, particularly in the southern regions of Italy where the rate of unemployment is still relatively high compared to other parts of Italy. The reform implemented in 2008 reduced the lump-sum from 5,000 euro to 4,200 euro and from 10,000 euro to 9,200 euro for companies located in particularly depressed areas of the Mezzogiorno. We reckon the number of employees according to a backward (*a ritroso*) procedure, which consists of applying the tax rule in vigour in 2007 to the reported value of deductions. Then, the tax rules in 2008 and 2009 are applied to the number of employees estimated for the 2007.[14] We also simulate both the *further deduction*, which is a decreasing function of the tax base up to 180,999.91 euro, and the tax relief for each employee up to a maximum of five and to 20,000 euro for each newly job created in each of the fiscal years 2005 to 2008.

Moreover, the model simulates the special treatment of interest expenses, which are deductible by 4 per cent in 2008 and 3 per cent in 2009. Finally, beginning from 2008 a share of 10 per cent of IRAP can be deducted for IRES purposes. We define the basic simulation as the IRAP - MicroSimulation Model (IRAP-MSM). Then, various simulations require supplementary and substitute modules that we are going to describe in next sub-sections. Table 3 and 4 show the performance of IRAP-MSM compared to the model implemented by Finance Department (DF Model), which is based on the universe of incorporated firms. Except for fishing[15] and other not-elsewhere-classified economic activities, the

[13] For the purposes of our simulation we consider a coefficient equal to 70.23% in order to update the entity really deducted in 2007.

[14] The number of employees is opportunely updated according to growth rates of the employment estimated by ISTAT for each sector.

[15] We remind that ISTAT aggregates Agriculture and Hunting with Fishing; thereby, some discrepancies could derive by this approximation.

percentage gap is quite small for each sector.

At a glance we emphasize how IRAP burdens firms by size and turnover. We draw the attention on the main criticisms that characterize IRAP. Given that IRAP also taxes labor compensation, it is commonly view as prejudicing employment; second, since it is also due when business run a loss instead of a profit, it has met the strong opposition of the taxpayers. Mostly, micro and small enterprises[16] perceive the unfairness and the oppression of the tax system. To the extent that IRAP does not allow the deduction of labor costs, the tax distortion principally affects micro and small enterprises, whose profits are not enough to compensate the amount of labor compensation. As a consequence, we can observe in Figure 3 that there are almost 8.3 per cent of loss firms[17] that pay IRAP; 83 per cent of them is represented by micro enterprises. In Equation [5], we outline an indicator of tax oppression in the following manner:

$$[5] \qquad I = \frac{IRAP+Loss}{TB+Loss}$$

where $IRAP$ is the amount of the taxation, $Loss$ is the amount of the losses for the CIT/IRES purposes, TB is the taxable base. If losses are equal to zero the indicator I becomes equal to the tax rate. The denominator is equal to the sum of labor compensation, interests payments and profits (without considering losses); the numerator is a sort of an economic burden constituted by tax burden and economic losses. Figure 4 shows that the economic burden is particularly high for micro enterprises.

[16] Our classification of firm's size originates from the European Commission's definition and it is the following: i) micro firms if the IRAP positive components are less than 2 millions of euro; ii) small firms if the IRAP positive components are higher than 2 millions of euro and at most equal to 10 millions of euro; iii) medium firms if the IRAP positive components are higher 10 millions of euro and at most equal to 50 millions of euro; iv) large firms if the IRAP positive components are higher than 50 millions of euro.

[17] We define "loss firms" the incorporated firms that declare positive losses for the CIT (IRES) purposes.

5.2 Introducing a Comprehensive Business Income Taxation (CBIT)

We have shown that micro and small incorporated firms are particularly harmed by IRAP, especially when business run a loss instead of a profit. This is due to the fact that IRAP is a business tax on value added, which does not allow for the deduction of labor cost. For this purpose, we now focus on the introduction of a reform based on the Comprehensive Business Income Taxation (CBIT) principle. In Figure 5 we have simulated the ripartition of the taxable base of IRAP for 2009 by distinguishing among labor cost, earnings and interest payments. The labor cost represents the great majority, almost two third of the taxable base. We observe that in 2009 the share of earnings diminished compared to 2008 because of the impact of the economic crisis. The intuition suggests that the introduction of CBIT is costly in terms of tax revenues. In order to simulate the replace of IRAP with CBIT, we substitute the module of IRAP-MSM describing the tax rule in vigour in 2009 with a new module that replicates the deduction of labor costs. However, we also do not consider in the reform proposal the current tax allowances (tax wedge, further deduction, tax reliefs etc...). In other words, we trade all the tax allowances with the entire amount of labor compensation. We define two types of CBIT reform: the first one is the revenue non-neutral reform; the latter is the revenue neutral reform, in which we simulate the tax rate that allows the same amount of tax revenues collected in the case of IRAP with a standard tax rate of 3.9 per cent.

Figure 6 summarizes the results. As expected, the non-neutral reform is particularly costly, almost 7.8 billions of euro. Almost $33,000$ enterprises becomes exempts after the reform, $23,000$ of them are small firms. The non-neutral reform requires a standard tax rate equals to 7.05 per cent; yet, the increase in the tax rate does not significantly affect the number of exempt firms. We also are interested in the impact of the reform. The redistributive effects can be measured by following a standard approach that consists in decomposing the overall

redistribution effects into two components: a progressivity effect (or departure from proportionality) and a measure of tax incidence.[18] The degree of progressivity (DP) is captured by the Kakwani index (Kakwani [18]) which measures the departure from proportionality as the difference between the concentration coefficient of tax liabilities and the Gini coefficient of before-tax income (*i.e.*, the production value). For measuring the redistributive effect (RE) we use the Reynolds-Smolensky index (Reynolds and Smolensky [26]), which equals the difference between the Gini coefficient of before-tax income (*i.e.*, the production value) and the concentration coefficient of after-tax income (*i.e.*, the production value). Therefore, the Reynolds-Smolensky index can be broken down as follows:

$$[4] \qquad (RE) = \frac{ATR}{1-ATR}\,(DP)$$

where ATR is the aggregate average tax rate and $\frac{ATR}{1-ATR}$ is a measure of the incidence of the tax, *i.e.* total tax liabities as a fraction of post-tax income. Building on this framework, we analyze the redistributive effects of CBIT reform by comparing two different scenarios. In the first one, the tax rate is assumed to be constant; in the second one, the tax rate is incremented to guarantee a zero-cost reform.[19] The baseline simulation shows a slight redistributive effect of IRAP, more likely due to the extent of tax allowances; this redistibutive effect is associated to a progressivity effect captured by the positive sign of the Kakwani index. The non-neutral reform obviously reduces the tax incidence; however, this reduction is totally due to the decrease in the average tax rate. Indeed, we find that the CBIT reform is very regressive as shown by the negative value of the Kakwani index. In the thrid column it is possible to observe that a

[18] See Monteduro and Zanardi [22].

[19] It is worth noting that the Gini index of before-tax production value is not the same in the two scenarios because we exclude the cases of firms in special regime; moreover, we do not consider the cases of non-positive values of taxable base.

neutral reform would increase the tax incidence too, by soaring the Reynolds-Smolensky index. The unequivocal finding is a regressive effect of the CBIT reform. The Lorenz Curve associated to the CBIT reform in the non-neutral scenario, depicted in Figure 7, is strongly suggestive. We enlarge the picture in the second half of the cumulative population in order to emphasize the regressive impact associated to the poorer taxpayers. Figure 8 may help us to interpret this finding. The proportion of labor cost on the taxable base is positively-related to the amount of positive components for micro enterprises. Thus, the deduction of labor compensation principally favors larger enterprises.

5.3 Increasing Tax Allowances in IRAP

For a final comparison, we discuss the tax reform of an increase in tax allowances. In spite of the small cost in terms of tax revenues, we stress the idea that such a tax reform is able to alleviate the tax burden for micro and small enterprises. Figure 9 paradoxically suggests that the number of small firms, which are going to become exempts after the tax reform, is higher compared to the case of the CBIT reform. This is probably due to the fact that this reform proposal is precisely targeted to SMEs. Nevertheless, the tax incidence decreases and the degree of progressivity is very significant.

Figure 10 illustrates all the findings in a convincing way. Both the progressivity effect of increasing tax allowances and the regressivity effect of CBIT are particularly evident by observing the decreasing function of the aggregate average tax rate by classes of IRAP positive components.

6 Concluding Remarks

We explored the differences between IRAP and CBIT, which approximately corresponds to allow the deduction of labor cost from the taxable base of IRAP. The renewed interest in reforming corporate tax systems in the direction of the comprehensive business income tax aims at neutralising the distortionary effect

of the regional tax on productive activity on employment, productivity and investments of companies, by reducing tax wedge on labour. However, a potential disadvantage of CBIT is that its narrower tax base reduces corporate tax revenue, and thus requires higher tax rates to yield the same revenue. In the first part of the paper we discussed a simple theoretical framework for analyzing tax policy issues related to different kinds of the business taxation in a macroeconomic context. More precisely, by considering a negative demand shock that hits the economy, we found that tax distortions in the case of IRAP are more contractionary than those caused by the presence of CBIT in the capital market.

In the second part of the paper we turned our attention on the empirical evidences and stylized facts that concern tax revenues and redistributive effects related to IRAP. From an empirical point of view, tax revenues and redistributive effects are more carefully analyzed. We implemented a microsimulation model (MSM) based on a dataset of more than 150,000 incorporated firms containing declared incomes in 2007. Tax rules in 2008 and 2009 are simulated in the model. We showed that small incorporated firms are particularly harmed by IRAP, especially when business run a loss instead of a profit. This is due to the fact that IRAP is a business tax on value added, which does not allow for the deduction of labor cost. For this purpose, we focused on the introduction of a reform based on the CBIT principle. We defined two types of CBIT reform: the first one is the revenue non-neutral reform; the latter is the revenue neutral reform, in which we simulate the tax rate that allows the same amount of tax revenues collected in the case of IRAP with a standard tax rate of 3.9 per cent. We found that the CBIT is particularly costly and more able to enhance the profitability for larger enterprises. Indeed, we demonstrated that the CBIT reform is very regressive, as resulted by analyzing the values of the Kakwani index, which well captures the degree of progressivity. Overwhelmingly, it is possible to observe that a neutral reform would increase the tax incidence by soaring the Reynolds-Smolensky index, which is able to measure the redistributive effect. Our unequivocal finding is a regressive effect of the CBIT reform. Thus,

we concluded that the deduction of labor compensation principally favor larger enterprises. Furthermore, the tax design of CBIT is more regressive compared to the IRAP, whether relevant tax allowances are explicitly targeted for SMEs. By merging macroeconomic and microeconomic results, we may highlight an *efficiency-equity* trade-off between IRAP and CBIT. It should be accounted for reforming the local business taxation in Italy.

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Appendix A1: The Derivation of the Steady State

The stationary state of the equilibrium conditions for households is determined by the following equations:

[A1.1] $\delta K = I$

[A1.2] $P = 1$

[A1.3] $\beta R = 1$

[A1.4] $Q = 1$

[A1.5] $R^K \left(1 - \tau^P\right) = \frac{1}{\beta} - (1 - \delta) = \rho + \delta$

[A1.6] $W \left(1 - \tau^P\right) = v \frac{C}{(1-N)}$

[A1.7] $\mu = \frac{\epsilon - 1}{\epsilon}$

where Q is the Tobin's Q in the steady-state; ρ is the subjective discount rate and μ is the steady-state markup. From the firm's maximization problem we can yield the compensation for labor and capital in both the cases of IRAP and CBIT:

[A1.8] $\frac{R^K K}{Y} = \frac{\left(1-\tau^C-\tau^{irap}\right)}{\left(1-\tau^C\right)} \frac{\alpha}{\mu} + \frac{\tau^{irap}}{\left(1-\tau^C\right)} s_I$

[A1.9] $\frac{WN}{Y} = \frac{\left(1-\tau^C-\tau^{irap}\right)}{\left(1-\tau^C\right)} \frac{1-\alpha}{\mu}$

[A1.10] $\frac{R^K K}{Y} = \frac{\left(1-\tau^C-\tau^{cbit}\right)}{\left(1-\tau^C\right)} \frac{\alpha}{\mu} + \frac{\tau_t^{cbit}}{\left(1-\tau_t^C\right)} s_I$

[A1.11] $\frac{WN}{Y} = \frac{1-\alpha}{\mu}$

where s_I is the share of investment on GDP. The steady state level of employment is easily computable by equalizing [A1.8] or [A1.10] with [A1.5], which corresponds to the market clearing condition in the capital market, and [A1.9] or [A1.11] with [A1.6], which corresponds to the market clearing condition in the labor market. After some tedious algebra, we yield the following expressions:

[A1.12] $N = \frac{\mathcal{AB}(1-\alpha)}{v[(1-s_G)\mu\mathcal{B} - \alpha\delta\mathcal{A}] + \mathcal{AB}(1-\alpha)} \Longrightarrow$ in the case of IRAP

[A1.13] $N = \frac{\left(1-\tau^P\right)(\rho+\delta)(1-\alpha)}{v\left[(1-s_G)\mu(\rho+\delta)-\alpha\delta\left(1-\tau^P\right)\right]+\left(1-\tau^P\right)(\rho+\delta)(1-\alpha)} \Longrightarrow$ in the case of CBIT

where:

Definition 1 $\mathcal{A} = \frac{\left(1-\tau^C-\tau^{irap}\right)\left(1-\tau^P\right)}{\left(1-\tau^C\right)}$ *if* $\tau^{irap} = 0 \longrightarrow \mathcal{A} = \left(1-\tau^P\right)$

Definition 2 $\mathcal{B} = \left[\rho+\delta-\frac{\tau^{irap}}{\left(1-\tau^C\right)}\delta\left(1-\tau^P\right)\right]$ *if* $\tau^{irap} = 0 \longrightarrow \mathcal{B} = (\rho+\delta)$

Appendix A2: The Short Run Dynamics of the Model

We derive the equations describing the model by log-linearizing the first order conditions, the budget constraints and the equilibrium conditions as in Galì *et al.* (2007) and Dibartolomeo and Manzo (2010). Equations [A2.1]-[A2.4] are quite easy to derive and standards in New Keynesian Models. The first one refers to the linear approximation of Cobb-Douglas production function (s_C is the share of consumption and s_I the share of investment); the second one is the aggregate demand where g_t is conveniently approximated around the steady state level of the ratio of government spending to GDP; the capital accumulation dynamic incorporates the capital adjustment costs; finally, the New Keynesian Phillips Curve (NKPC) remains unchanged with respect to the standard NEK models (ω is the Calvo parameter).

[A2.1] $y_t = \alpha k_{t-1} + (1-\alpha)\, n_t$

[A2.2] $y_t = s_C c_t + s_I i_t + g_t$

[A2.3] $k_t = (1-\delta)\, k_{t-1} + \delta i_t$

[A2.4] $\pi_t = \beta E_t \pi_{t+1} - \frac{(1-\beta\omega)(1-\omega)}{\omega} \widehat{\mu}_t$

Equations [A2.5]-[A2.6] correspond to the loglinearization around the steady-state of the first order conditions. In each equation is described the difference between IRAP and CBIT. Equations [A2.7] is the aggregate (*Ricardian* and *Non-Ricardian*) labor supply, where $\varphi = \frac{N}{1-N}$ and N is the steady state level of aggregate employment. Euler Equation, described in Equation [A2.8], takes into account the dynamic of *Non-Ricardian* consumption, as λ is the weight of rule-of-thumb consumers and $\gamma_r = \frac{C_r}{C} = \frac{v}{1+v}\frac{1}{1-N}$ is the share of *Non-Ricardian* consumption ($\gamma_o = \frac{C_O}{C} = \frac{1-\lambda\gamma_r}{1-\lambda}$ is the share of *Ricardian* consumption). The Tobin's Q dynamics are defined as in Galì *et al.* (2007).

[A2.5] $(w_t - p_t) = y_t - n_t - \widehat{\mu}_t - \zeta \frac{\tau^{irap}}{\left(1-\tau^C-\tau^{irap}\right)} \widehat{\tau}_t^{irap}$

[A2.6] $(r_t^K - p_t) = y_t - k_{t-1} - \widehat{\mu}_t - \zeta \frac{\left(1-\delta \frac{\left(1-\tau^C-\tau^{irap}\right)}{\left(1-\tau^C\right)}\right)\tau^{irap}}{\left(1-\tau^C-\tau^{irap}\right)} \widehat{\tau}_t^{irap} +$
$- (1-\zeta) \frac{\left(1-\delta \frac{\left(1-\tau^C-\tau^{irap}\right)}{\left(1-\tau^C\right)}\right)\tau^{cbit}}{\left(1-\tau^C-\tau^{cbit}\right)} \widehat{\tau}_t^{cbit}$

[A2.7] $(w_t - p_t) = c_t + \varphi n_t$

[A2.8] $c_t = E_t c_{t+1} - \frac{1}{\sigma}(r_t - E_t \pi_{t+1}) - v \left[\frac{(\sigma-1)N}{\sigma(1-\gamma_o N)(1-\lambda)} + \frac{\lambda\varphi\gamma_r}{1-\lambda\gamma_r}\right] \Delta n_{t+1}$

[A2.9] $q_t = \frac{1}{\eta}(i_t - k_{t-1})$

[A2.10] $q_t = \beta E_t q_{t+1} + [1 - \beta(1-\delta)] E_t(r_{t+1}^K - p_{t+1}) - (r_t - E_t \pi_{t+1})$

Equations [A2.11]-[A2.13] describe the policy functions as defined in Galì *et al.* (2007). Conversely, the dynamic of nominal government spending shows inertia and depends on its past value. Thereby, during a deflation period the government spending may increase as the nominal level would remain unchanged.

[A2.11] $r_t = \rho + \phi_\pi \pi_t$

[A2.12] $t_t = \phi_b b_t + \phi_g g_t$

[A2.13] $b_t = (1+\rho)(1-\phi_b) b_{t-1} + (1+\rho)(1-\phi_g) g_{t-1}$

[A2.14] $g_t + \pi_t = \rho_g (g_{t-1} + \pi_{t-1})$

The last two equations describe the dynamics of tax revenues and dividends, which are log-linearized around the steady state ratio on real GDP.

[A2.15] $t_t = \tau^P \frac{(\epsilon-1)}{\epsilon}[y_t - \widehat{\mu}_t] + \frac{\tau^C}{\left(1-\tau^C\right)} d_t +$
$+\zeta \left\{ \frac{\tau^{irap}}{\left(1-\tau^C\right)} \left[y_t - s_I k_{t-1} + (1-s_I) \widehat{\tau}_t^{irap} \right] \right\} +$
$+ (1-\zeta) \left\{ \frac{\tau^{cbit}}{\left(1-\tau^C\right)} \left[y_t - s_I k_{t-1} - \frac{1-\alpha}{\mu}(w_t - p_t + n_t) + \left(1 - \frac{1-\alpha}{\mu} - s_I\right) \widehat{\tau}_t^{cbit} \right] \right\}$

[A2.16] $\frac{1}{\left(1-\tau^C\right)} d_t = \epsilon^{-1}[y_t - (\epsilon-1)\widehat{\mu}_t] +$
$+\zeta \left\{ \frac{\tau^{irap}}{\left(1-\tau^C\right)} \left[y_t - s_I k_{t-1} + (1-s_I) \widehat{\tau}_t^{irap} \right] \right\} +$
$+ (1-\zeta) \left\{ \frac{\tau^{cbit}}{\left(1-\tau^C\right)} \left[y_t - s_I k_{t-1} - \frac{1-\alpha}{\mu}(w_t - p_t + n_t) + \left(1 - \frac{1-\alpha}{\mu} - s_I\right) \widehat{\tau}_t^{cbit} \right] \right\}$

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Table 1: Positive Components of IRAP by Sectors: Population and Sample

Sector	Population	Sample	% Error
01 - Agriculture, Hunting and Forestry	22,676,279,983	22,754,939,646	0.9965
02 - Fishing	873,644,523	862,988,856	1.0123
03 – Mining and Quarrying of Energy Producing Materials	2,178,192,885	2,166,229,125	1.0055
04 – Mining and Quarrying Except Energy Producing Materials	4,202,626,293	4,128,176,666	1.0180
05 – Manufacture of Food Products; Beverages and Tobacco	92,211,559,144	92,213,206,974	1.0000
06 – Manufacture of Textiles; Wearing Apparel; Dressing and Dyeing of Fur	63,163,611,792	63,191,221,780	0.9996
07 – Manufacture of Leather and Leather Products	16,364,986,808	16,460,686,708	0.9942
08 – Manufacture of Wood and Wood Products	13,932,810,289	14,027,750,191	0.9932
09 – Manufacture of Pulp, Paper and Paper Product, Publishing and Printing	46,336,177,443	46,234,285,715	1.0022
10 – Manufacture of Coke, Refined Petroleum Products and Nuclear Fuel	128,766,823,111	128,805,216,741	0.9997
11 – Manufacture of Chemicals, Chemical Products and Man-Made Fibres	80,958,655,784	80,833,114,071	1.0016
12 – Manufacture of Rubber and Plastic Products	43,356,152,756	43,253,135,141	1.0024
13 – Manufacture of Other Non-Metallic Mineral Products	39,694,091,319	39,672,875,694	1.0005
14 – Manufacture of Basic Metals and Fabricated Metal Products	150,543,036,134	150,618,532,481	0.9995
15 – Manufacture of Machinery and Equipment *n.e.c.*	124,077,613,392	124,070,222,769	1.0001
16 – Manufacture of Electrical and Optical Equipment	68,860,957,572	68,813,680,147	1.0007
17 – Manufacture of Transport Equipment	86,313,586,285	86,434,028,777	0.9986
18 – Manufacturing *n.e.c.*	35,978,305,289	35,984,046,561	0.9998
19 – Electricity, Gas and Water Supply	159,324,974,121	159,484,217,040	0.9990
20 - Construction	185,739,666,788	185,877,343,924	0.9993
21 – Sale, Maintenance and Repair of Motor Vehicles, Retail Sale of Automotive Fuel	128,670,442,927	129,048,119,346	0.9971
22 – Wholesale Trade and Commission Trade, Except of Motor Vehicles and Motorcycles	423,455,468,189	423,651,252,563	0.9995
23 – Retail Sale Except of Motor Vehicles and Motorcycles; Repair of Personal and Household Goods	149,474,948,702	149,548,465,431	0.9995
24 – Hotels and Restaurants	29,686,583,202	29,939,542,181	0.9916
25 – Transports, Storage and Communication	180,665,296,852	180,671,433,273	1.0000
26 – Financial Intermediation, Except Insurance and Pension Funding	231,672,716,073	231,617,635,831	1.0002
27 – Insurance and Pension Funding, Except Compulsory Social Security	115,918,268,267	115,980,243,688	0.9995
28 – Activities Auxiliary to Financial Intermediation	9,289,791,248	9,365,742,890	0.9919
29 – Real Estate, Renting and Business Activities	212,483,753,856	212,330,761,369	1.0007
30 – Public Administration and Defence; Compulsory Social Security	3,779,758,923	3,747,485,678	1.0086
31 - Education	2,599,562,745	2,586,174,747	1.0052
32 – Health and Social Work	20,872,150,474	20,817,048,591	1.0026
33 – Other Community, Social and Personal Service Activities	50,422,323,972	50,373,092,183	1.0010
34 – Private Household with Employed Persons	8,128,643	14,975,896	0.5428
35 – Not Elsewhere Classified (*n.e.c.*)	52,418,462	44,150,290	1.1873
TOTAL	**2,924,605,364,246**	**2,925,622,022,961**	**0.9997**

Source: Our elaboration of data from Finance Department, MEF, Italy.

Table 2: Positive Components of IRAP by Regions: Population and Sample

Region	**Population**	**Sample**	**% Error**
01) Valle d'Aosta	5,442,206,750	5,388,318,667	1.0100
02) Piemonte	236,434,618,453	236,486,196,714	0.9998
03) Lombardia	925,901,694,919	925,815,679,013	1.0001
04) Friuli Venezia Giulia	70,760,129,188	70,634,528,430	1.0018
05) Trentino Alto Adige	45,121,364,283	45,129,667,230	0.9998
06) Veneto	259,131,952,596	259,128,439,415	1.0000
07) Liguria	43,677,664,487	43,659,777,818	1.0004
08) Emilia Romagna	268,049,639,451	268,072,315,545	0.9999
09) Toscana	153,444,174,164	153,388,890,834	1.0004
10) Marche	51,505,471,103	51,462,606,311	1.0008
11) Umbria	27,195,324,305	27,204,423,529	0.9997
12) Lazio	537,180,408,871	537,490,857,424	0.9994
13) Abruzzo	32,606,638,400	32,740,001,270	0.9959
14) Molise	4,559,447,032	4,746,321,654	0.9606
15) Campania	95,018,235,134	95,331,144,351	0.9967
16) Basilicata	9,722,625,929	9,632,109,401	1.0094
17) Puglia	50,937,357,977	51,188,142,855	0.9951
18) Calabria	15,565,699,100	15,787,051,327	0.9860
19) Sicilia	62,875,967,423	62,903,333,315	0.9996
20) Sardegna	29,474,744,681	29,432,217,858	1.0014
TOTAL	**2,924,605,364,246**	**2,925,622,022,961**	**0.9997**

Source: Our elaboration of data from Finance Department, MEF, Italy.

Table 3: Taxable Base of IRAP by Sectors: IRAP-MSM and DF Model

Sector	Taxable Base IRAP-MSM	Taxable Base DF Model	% Error
01 - Agriculture, Hunting and Forestry	2,326,905,134	2,237,473,000	1.04
02 - Fishing	116,915,158	51,145,000	2.29
03 – Mining and Quarrying of Energy Producing Materials	831,566,741	1,147,802,000	0.72
04 – Mining and Quarrying Except Energy Producing Materials	862,985,397	835,008,000	1.03
05 – Manufacture of Food Products; Beverages and Tobacco	9,867,997,003	9,562,477,000	1.03
06 – Manufacture of Textiles; Wearing Apparel; Dressing and Dyeing of Fur	9,452,798,836	8,976,495,000	1.05
07 – Manufacture of Leather and Leather Products	2,241,872,892	2,138,348,000	1.05
08 – Manufacture of Wood and Wood Products	1,992,961,892	1,911,443,000	1.04
09 – Manufacture of Pulp, Paper and Paper Product, Publishing and Printing	7,769,248,484	7,875,232,000	0.99
10 – Manufacture of Coke, Refined Petroleum Products and Nuclear Fuel	7,732,662,377	4,890,134,000	1.58
11 – Manufacture of Chemicals, Chemical Products and Man-Made Fibres	11,848,948,464	10,810,823,000	1.10
12 – Manufacture of Rubber and Plastic Products	6,222,028,530	6,147,136,000	1.01
13 – Manufacture of Other Non-Metallic Mineral Products	6,686,878,153	5,892,078,000	1.13
14 – Manufacture of Basic Metals and Fabricated Metal Products	22,769,089,395	22,579,250,000	1.01
15 – Manufacture of Machinery and Equipment *n.e.c.*	21,015,211,362	21,267,118,000	0.99
16 – Manufacture of Electrical and Optical Equipment	12,724,844,805	12,201,997,000	1.04
17 – Manufacture of Transport Equipment	9,827,797,356	7,066,161,000	1.39
18 – Manufacturing *n.e.c.*	5,080,630,890	4,973,196,000	1.02
19 – Electricity, Gas and Water Supply	17,707,546,572	22,923,560,000	0.77
20 - Construction	27,933,061,193	25,942,112,000	1.08
21 – Sale, Maintenance and Repair of Motor Vehicles, Retail Sale of Automotive Fuel	7,348,260,043	6,116,982,000	1.20
22 – Wholesale Trade and Commission Trade, Except of Motor Vehicles and Motorcycles	31,596,392,937	31,836,890,000	0.99
23 – Retail Sale Except of Motor Vehicles and Motorcycles; Repair of Personal and Household Goods	14,188,941,478	14,201,542,000	1.00
24 – Hotels and Restaurants	6,820,795,254	6,558,495,000	1.04
25 – Transports, Storage and Communication	43,880,425,483	40,570,248,000	1.08
26 – Financial Intermediation, Except Insurance and Pension Funding	51,594,686,572	62,817,858,000	0.82
27 – Insurance and Pension Funding, Except Compulsory Social Security	5,762,583,961	7,661,332,000	0.75
28 – Activities Auxiliary to Financial Intermediation	2,038,188,102	1,954,055,000	1.04
29 – Real Estate, Renting and Business Activities	50,768,543,517	46,474,069,000	1.09
30 – Public Administration and Defence; Compulsory Social Security	775,817,786	815,050,000	0.95
31 - Education	734,238,838	837,756,000	0.88
32 – Health and Social Work	7,058,246,109	6,528,706,000	1.08
33 – Other Community, Social and Personal Service Activities	11,914,872,722	12,893,377,000	0.92
34 – Private Household with Employed Persons	6,670,429	3,586,000	1.86
35 – Not Elsewhere Classified (*n.e.c.*)	16,899,988	3,845,000	4.40
TOTAL	**419,517,513,853**	**418,702,779,000**	**1.00**

Source: Our elaboration of data from Finance Department, MEF, Italy.

Table 4: Tax Revenues of IRAP by Sectors: IRAP-MSM and DF Model

Sector	Tax Revenues IRAP-MSM	Tax Revenues DF Model	% Error
01 - Agriculture, Hunting and Forestry	56,722,216	61,772,000	0.92
02 - Fishing	2,848,189	1,373,000	2.07
03 – Mining and Quarrying of Energy Producing Materials	39,219,479	54,182,000	0.72
04 – Mining and Quarrying Except Energy Producing Materials	34,710,295	33,337,000	1.04
05 – Manufacture of Food Products; Beverages and Tobacco	383,356,642	375,712,000	1.02
06 – Manufacture of Textiles; Wearing Apparel; Dressing and Dyeing of Fur	375,133,057	357,835,000	1.05
07 – Manufacture of Leather and Leather Products	89,898,786	86,115,000	1.04
08 – Manufacture of Wood and Wood Products	78,793,102	74,842,000	1.05
09 – Manufacture of Pulp, Paper and Paper Product, Publishing and Printing	315,945,111	319,877,000	0.99
10 – Manufacture of Coke, Refined Petroleum Products and Nuclear Fuel	331,512,542	212,437,000	1.56
11 – Manufacture of Chemicals, Chemical Products and Man-Made Fibres	478,363,295	437,205,000	1.09
12 – Manufacture of Rubber and Plastic Products	247,943,892	244,996,000	1.01
13 – Manufacture of Other Non-Metallic Mineral Products	267,847,431	236,312,000	1.13
14 – Manufacture of Basic Metals and Fabricated Metal Products	895,117,182	895,705,000	1.00
15 – Manufacture of Machinery and Equipment *n.e.c.*	823,765,054	834,941,000	0.99
16 – Manufacture of Electrical and Optical Equipment	508,952,202	489,974,000	1.04
17 – Manufacture of Transport Equipment	401,613,306	290,823,000	1.38
18 – Manufacturing *n.e.c.*	204,402,645	201,081,000	1.02
19 – Electricity, Gas and Water Supply	737,897,937	976,006,000	0.76
20 - Construction	1,131,723,288	1,058,429,000	1.07
21 – Sale, Maintenance and Repair of Motor Vehicles, Retail Sale of Automotive Fuel	301,794,229	249,888,000	1.21
22 – Wholesale Trade and Commission Trade, Except of Motor Vehicles and Motorcycles	1,269,535,306	1,278,681,000	0.99
23 – Retail Sale Except of Motor Vehicles and Motorcycles; Repair of Personal and Household Goods	575,747,731	576,575,000	1.00
24 – Hotels and Restaurants	280,640,078	270,705,000	1.04
25 – Transports, Storage and Communication	1,842,051,490	1,726,504,000	1.07
26 – Financial Intermediation, Except Insurance and Pension Funding	2,411,528,252	2,820,474,000	0.86
27 – Insurance and Pension Funding, Except Compulsory Social Security	273,722,663	340,983,000	0.80
28 – Activities Auxiliary to Financial Intermediation	88,897,366	88,170,000	1.01
29 – Real Estate, Renting and Business Activities	2,055,983,639	1,904,141,000	1.08
30 – Public Administration and Defence; Compulsory Social Security	31,474,443	33,161,000	0.95
31 - Education	26,331,051	32,512,000	0.81
32 – Health and Social Work	240,852,223	225,445,000	1.07
33 – Other Community, Social and Personal Service Activities	484,930,757	530,838,000	0.91
34 – Private Household with Employed Persons	48,833	79,000	0.62
35 – Not Elsewhere Classified (*n.e.c.*)	651,669	167,000	3.90
TOTAL	**17,289,955,381**	**17,321,277,000**	**1.00**

Source: Our elaboration of data from Finance Department, MEF, Italy.

Figure 1: Impulse Response Functions

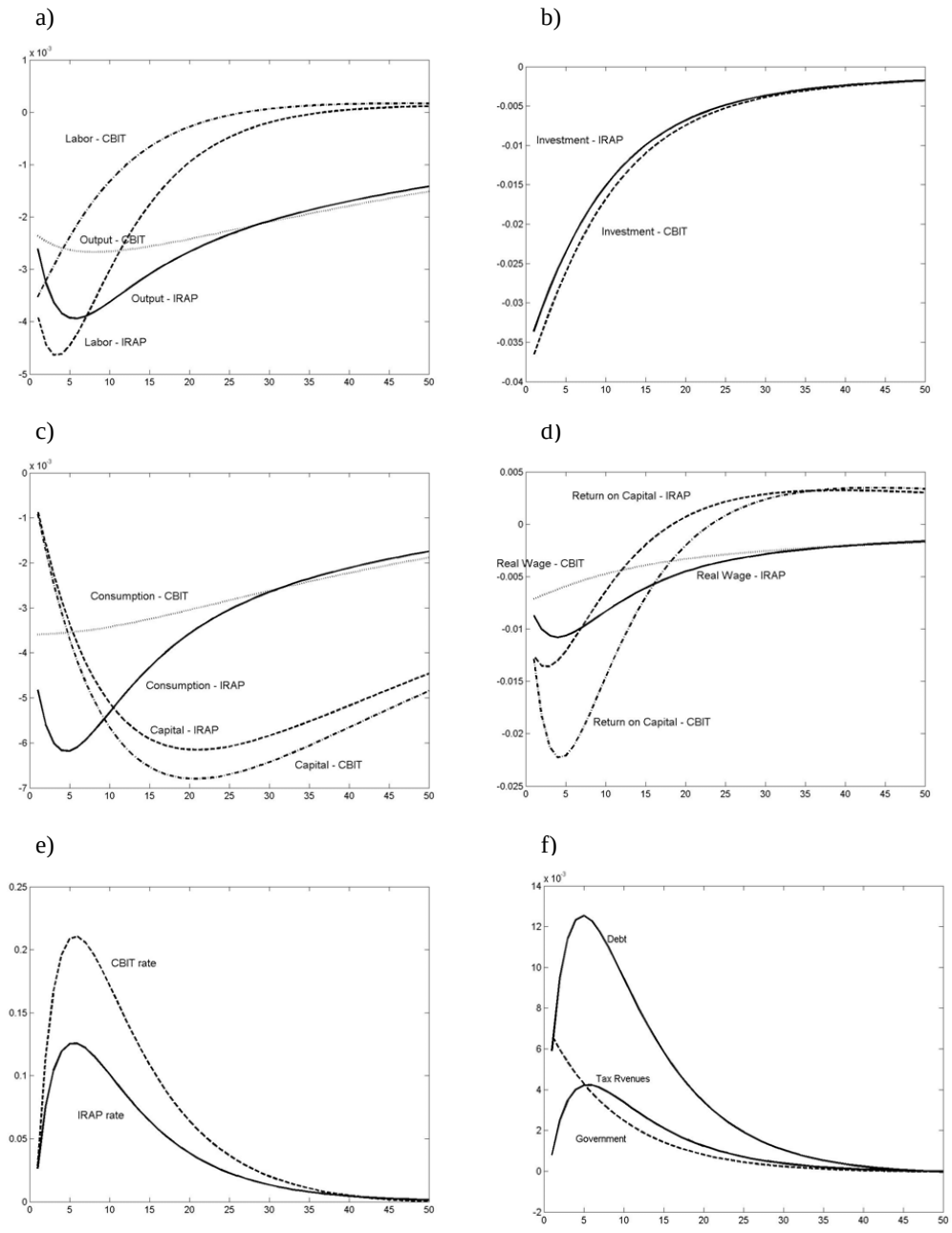
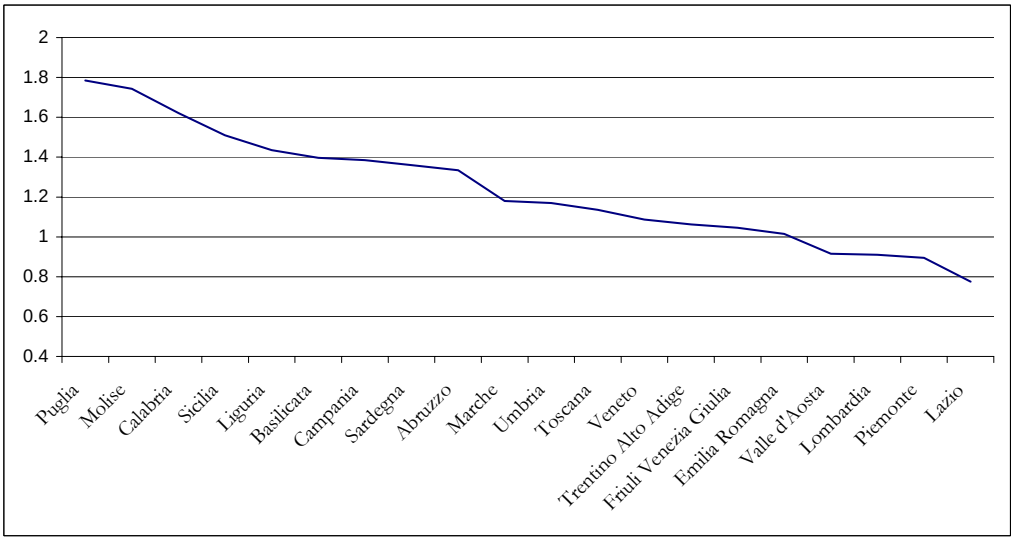


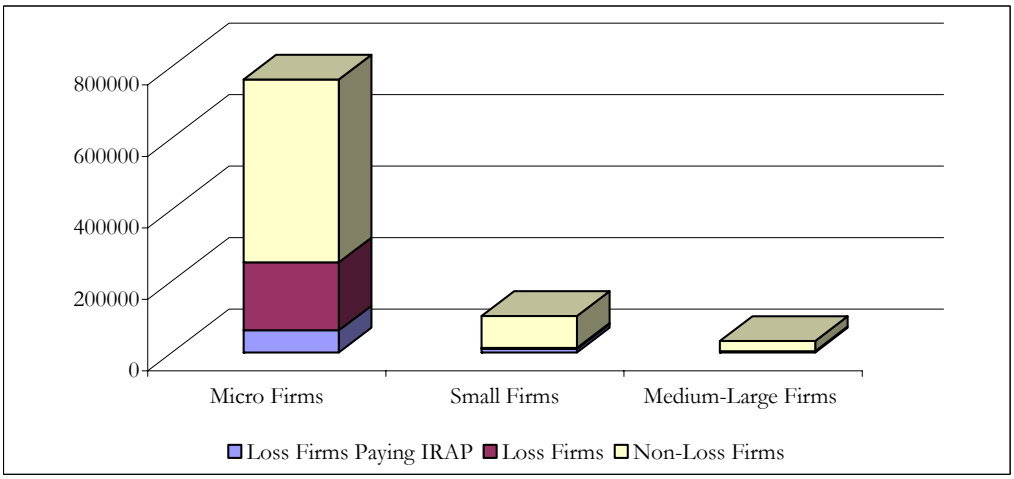
Figure 2: IRAP by Regions

Region	IRAP by Headquarters	IRAP by Plants
01) Valle d'Aosta	37,320,382	34,145,410
02) Piemonte	1,510,243,807	1,351,449,558
03) Lombardia	5,411,583,382	4,926,550,412
04) Friuli Venezia Giulia	323,743,844	338,616,171
05) Trentino Alto Adige	267,935,663	284,760,537
06) Veneto	1,494,936,654	1,624,072,056
07) Liguria	270,169,440	387,844,326
08) Emilia Romagna	1,623,455,659	1,648,038,219
09) Toscana	906,730,723	1,029,298,197
10) Marche	367,917,561	434,305,677
11) Umbria	135,968,724	159,007,513
12) Lazio	3,163,913,970	2,452,289,984
13) Abruzzo	233,333,888	311,286,335
14) Molise	29,181,337	50,836,991
15) Campania	620,387,831	859,086,308
16) Basilicata	46,958,175	65,610,367
17) Puglia	249,666,189	445,701,551
18) Calabria	88,021,945	142,718,145
19) Sicilia	352,481,323	532,245,581
20) Sardegna	156,004,885	212,092,116
TOTAL	17,289,955,381	17,289,955,381



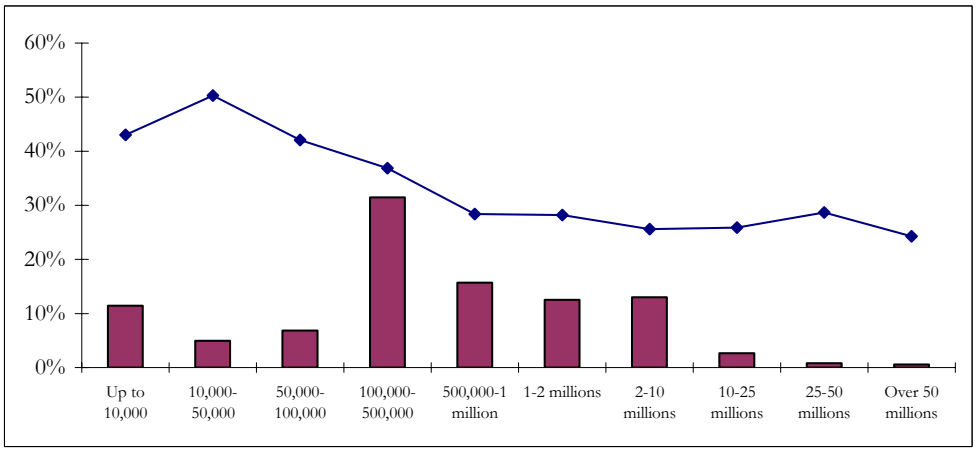
Source: Our elaboration of data from Finance Department, MEF, Italy.

Figure 3: Distribution of Loss and Non-Loss Firms



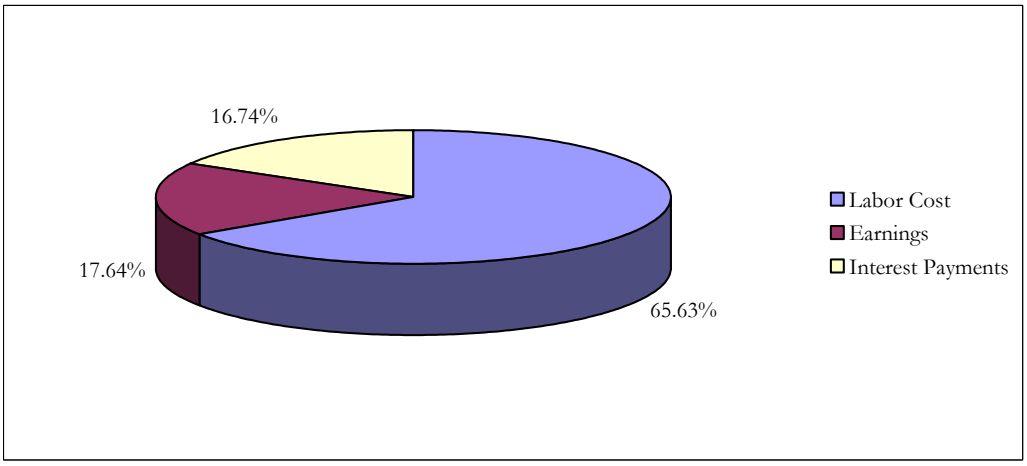
Source: Our elaboration of data from Finance Department, MEF, Italy.

Figure 4: Indicator of Tax Burden by Classes of Positive Components



Source: Our elaboration of data from Finance Department, MEF, Italy.

Figure 5: Shares of IRAP Taxable Base



Taxable Base	Interest Expenses	Labor Cost	Deductible Labor Cost	Non-Deductible Labor Cost
419,518	69,229	400,829	129,386	271,444

Source: Our elaboration of data from Finance Department, MEF, Italy. Values in millions of euro.

Figure 6: From IRAP to CBIT

Redistributive Effects and Gini Index		**IRAP**	**CBIT (Non-Neutral Reform)**	**CBIT (Neutral Reform)***
Tax Revenues (*In thousands of euro*)		17,289,955	9,565,207	17,289,955
Cost of Tax Reform (*In thousands of euro*)			**7,724,748**	**0**
Exempts		319,357	**352,316**	**352,225**
Exempts Small Firms		312,812	**335,720**	**335,629**
Gini Index	Production Value Before Tax	.86360	.88208	.88208
	Production Value After Tax	.86301	.88217	.88225
	Tax	.87805	.87771	.87771
	Reynolds Smolensky Index	.00050	-.00009	-.00016
	Kakwani Index	.01445	-.00437	-.00437
	Tax Incidence	0.0346	0.0206	0.0366

Source: Our calculations on data from Finance Department, MEF, Italy.
* Standard tax rate is equal to 7.05% (in place of 3.9%).

Figure 7: Lorenz Curve and CBIT Concentration Curve

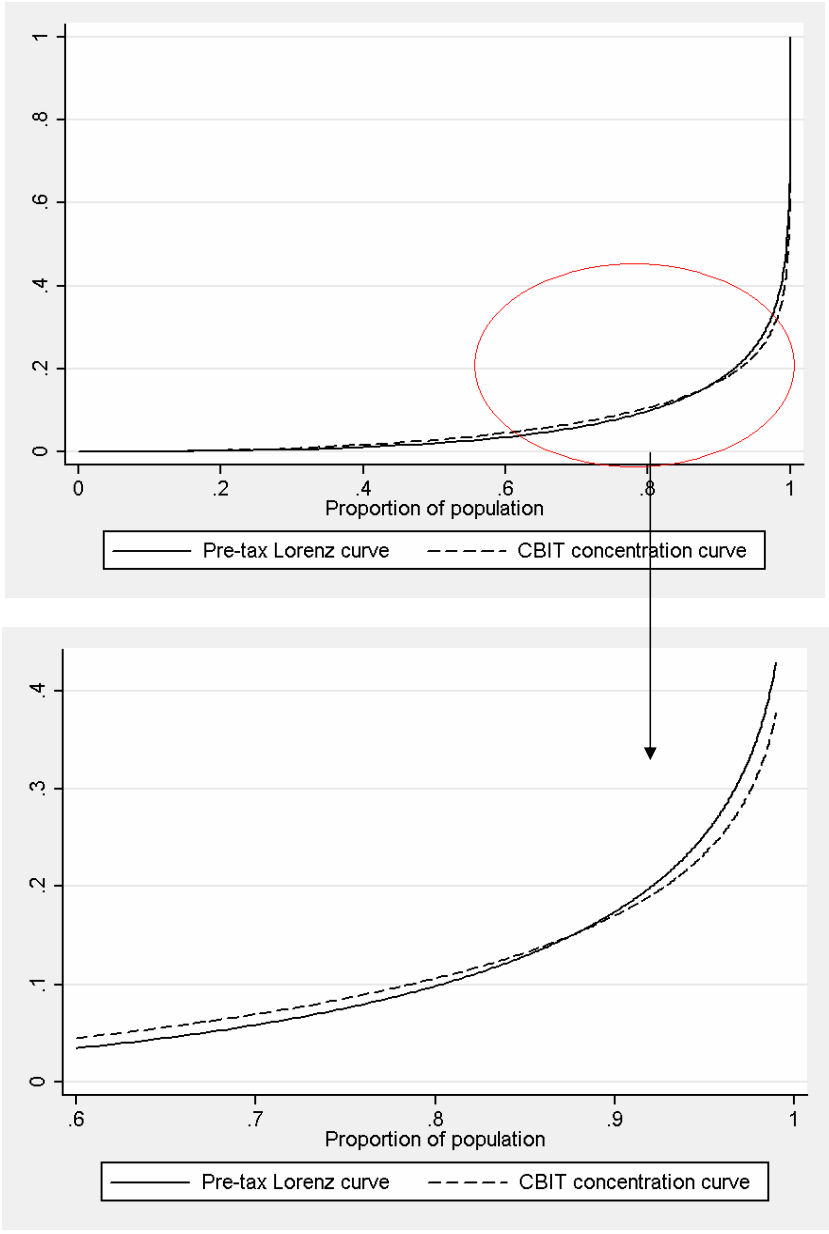


Figure 8: *Labor Cost - Taxable Base* Ratio by Size and Classes of Positive Components

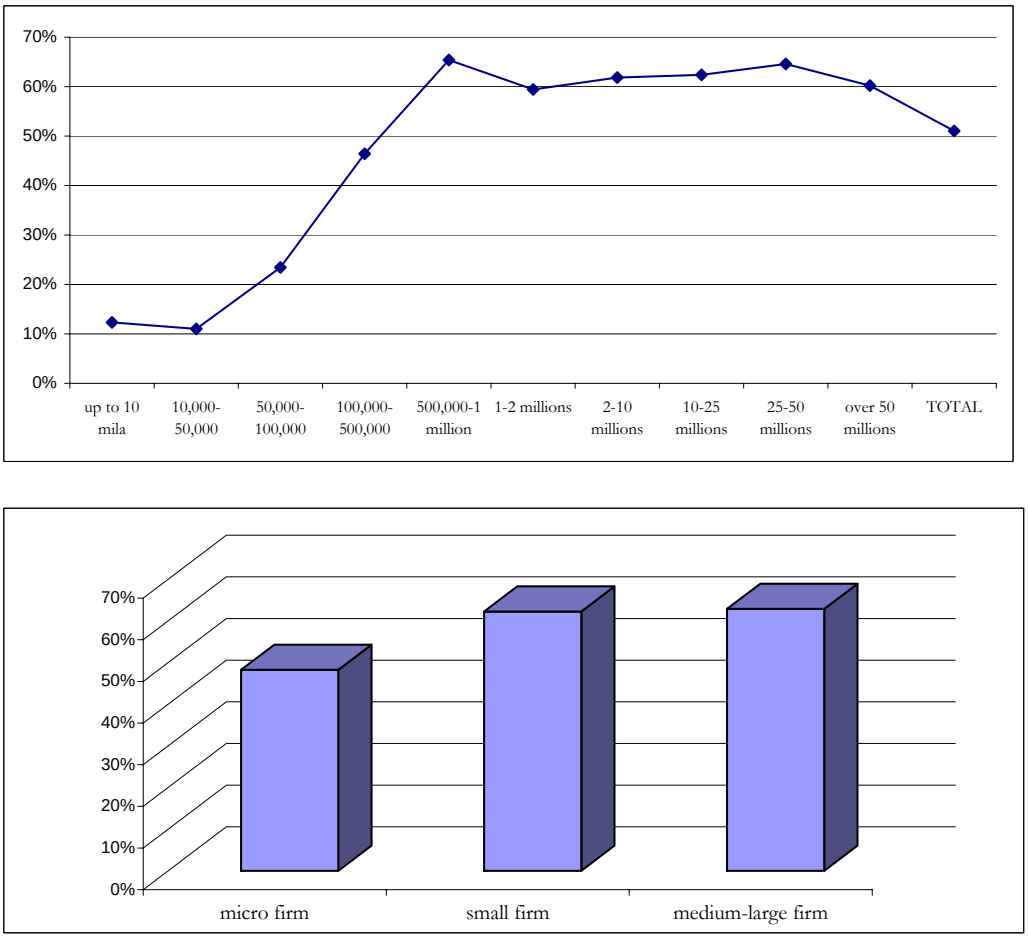


Figure 9: Increasing Tax Allowances

Redistributive Effects and Gini Index		**IRAP**	**Increasing Tax Allowances**
Tax Revenues (*In thousands of euro*)		17,289,955	17,186,067
Cost of Tax Reform (*In thousands of euro*)			**103,888**
Exempts		319,357	**363,911**
Exempts Small Firms		312,812	**357,267**
Gini Index	Production Value Before Tax	.86360	.85343
	Production Value After Tax	.86301	.85271
	Tax	.87805	.87441
	Reynolds Smolensky Index	.00050	.00072
	Kakwani Index	.01445	.02098
	Tax Incidence	0.0346	0.0345

Source: Our calculations on data from Finance Department, MEF, Italy.
* Tax allowances ex art 11 c.4 bis have been doubled in the simulation.

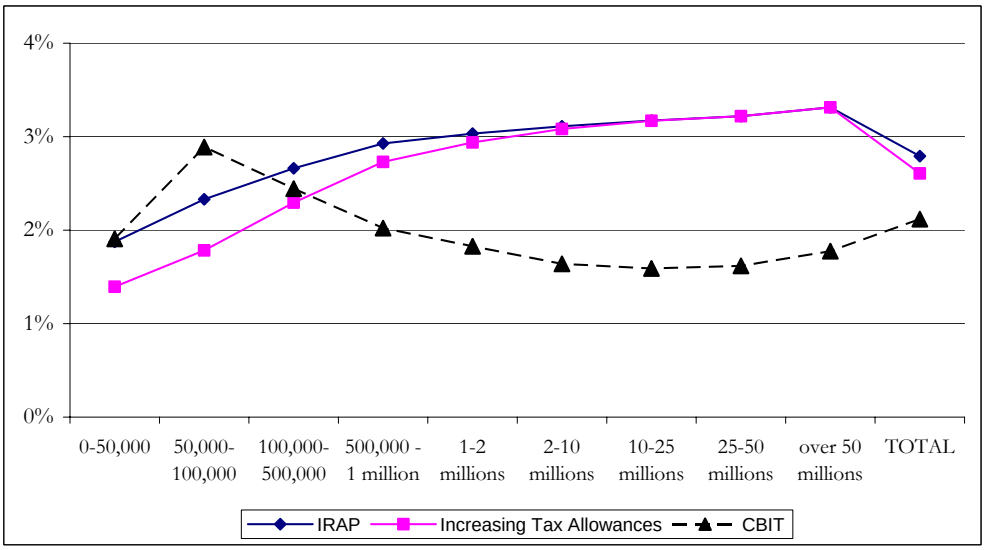



Figure 10: ATR by Classes of Positive Components