

TAX POLICY, INVESTMENT DECISIONS AND ECONOMIC GROWTH¹

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This paper evaluates the impact of the taxation system on production factor costs, investment and economic activity. This is performed on the basis of detailed analysis of the Italian tax system and the production of own estimates of the user cost of capital to labour, which capture the contribution of tax rates, tax incentives and other underlying factors. The study identifies the link between user cost and investment in the context of a full econometric model of investment demand determinants that includes aggregate demand, expectations and uncertainty. Finally, the study evaluates the past contribution of taxation to investment and economic activity, and assesses the impact of future tax reform proposals.

Keywords: corporate taxation, user cost of capital, labour cost, investment, policy evaluation and modelling, expectations, uncertainty.

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1. Introduction

Since ancient times the primary objective of taxation has been to collect revenue in order to finance state provision of essential public services. At the same time, enlightened by advances in public sector economics, current taxation policies are designed to strike the difficult balance between achieving minimal disincentives to undertake productive activities and maximum social fairness.

In this context, corporate taxation is a key part of the taxation system that directly affects current and future business decisions of the private sector. Corporate taxes impact capital and labour costs and, hence, not just current production and hiring decisions, but also the net present value of future production, which motivates corporate investment. Corporate taxation policy has been used as an instrument to both fine-tune investment and output fluctuations over the business cycle, and spur long-term economic growth and national welfare. In the last few decades, the importance of optimally designed, growth-friendly taxation policies has been further emphasised by the enhanced international mobility of capital in search of a lower tax burden and modest production costs to ensure competitiveness. Policy options, which reignite the engine of economic growth in Europe, generating welfare and internal demand, offer the only viable exit from the financial and debt crisis, as suggested by Onofri and Tsenova (2014).

This paper evaluates the empirical significance of corporate taxation policies on the macroeconomic dynamics of Italy and, on that basis, assesses the likely transmission and economic impact of future policy changes in that area. We study closely the case of Italy since it is the third largest euro area economy and because its relatively high public debt, subdued economic growth and stringent governance rules set out in the Fiscal Compact, impose critical trade-offs on fiscal policy-making aimed at escaping from the global economic crisis. Also, since Italy's corporate tax system has frequently changed over the past twenty years, this country would seem to have been actively using corporate taxation reforms to steer its economy. This provides valuable historical evidence on the efficiency of corporate taxation as a policy instrument. We also aim

at shedding more light on the possible impact of policy proposals to further reduce or abolish some corporate taxes.

To this end, we consider in great detail both the structure of the corporate taxation system in Italy and its numerous reforms, and scrupulously measure their impact on the user cost of capital to labour in the period 1996Q1-2012Q4. We construct our own measure of user cost and its components in order to distinguish the impact of the taxation system, inclusive of tax rates and temporary incentives, from other underlying factors such as monetary policy and relative price movements. We estimate the investment channel in the transmission of taxation policies to examine the link between the user cost of capital to labour within the context of a theoretically motivated Vector Error Correction Model (VECM) that contains a full set of other factors such as demand realisations, expectations and uncertainty. We use the model to conduct counterfactual historical analysis. Finally, we apply Prometeia's quarterly macro-economic model for the Italian economy, estimated on detailed sectorally disaggregated data and incorporating the investment channel, to evaluate the transmission and overall impact on economic activity of recent policy proposals to reduce corporate taxes in Italy. We compare and contrast those policies with a corresponding increase in public spending which provides a perspective on the advantages and limits of using the corporate tax system as tool to fine-tune the business cycle and stimulate long-term economic growth.

The paper builds on the micro-founded theoretical literature (e.g. Jorgenson, 1996, Devereux and Griffith, 1998, Jorgenson and Yun, 2012), which regards the user cost of capital to labour as being at the core of taxation and monetary policy transmission over the business cycle and over the longer-term. It also widens the scope and policy relevant discourse compared to other valuable efforts to analyse the direct consequences of tax reforms in Italy such as Bontempi *et al.* (1995), Bontempi *et al.* (2010), Bordignon *et al.* (2001), Bresciani *et al.* (2003), Bernasconi *et al.* (2005) and Caiumi *et al.* (2013). Whereas several empirical studies had failed to demonstrate the existence of an econometric link between the user cost of capital and investment at macro level, see Guiso *et al.* (2002), we prove successful in that direction. Furthermore, our econometric estimation incorporates demand expectations, fore-

cast and financial uncertainty in addition to observed data on supply and demand factors, which confirms previous applied studies such as Bloom (2000), Antonietti *et al.* (2015), Guthrie (2012) and Tsenova (2014), of the importance of these elements for financial and real sector decision-making.

The results of the analysis provide evidence of a significant link between the user cost of capital to labour and corporate investment. Changes in the taxation system seem to be the main determinant of variation in the capital to labour cost, leaving a very limited role for other considered factors such as monetary policy and relative prices. The cost of capital to labour has been displaying a downward trend as result of a gradual reduction in corporate tax rates and/or bases. Cyclical fluctuations around that trend can be attributed mostly to temporary fiscal incentives.

According to the econometric model of investment, reductions in the user cost of capital relative to labour have a significant and positive effect on corporate investment in both the short- and the longer-term. We also find an influence of Keynesian type demand factors such as aggregate demand, demand expectations and uncertainty. Historically, temporary tax incentives seem to have made an important contribution to boosting investment and economic activity during downturns. Reductions in tax rates and/or tax bases appear to bring about permanent alleviation of user cost and stimulus to economic activity.

The outcome of the macroeconomic assessment of policy proposals to further reduce corporate tax rates in Italy show that decreasing the regional tax on corporate activity (IRAP) would be more beneficial than comparable decline in the corporate income tax (IRES). This is because the macroeconomic model incorporates not only the investment channel in the transmission of tax policy, but also other endogenous links with impact on labour demand. Bearing in mind that in the case of IRAP tax reduction would diminish both the user cost of capital and labour, which stimulates investment, as well as employment. Instead, IRES would encourage certain degree of substitution between capital and labour, dampening labour demand and, consequently, economic activity. An alternative equivalent increase in public investment could produce overwhelmingly stronger improvement in economic activity

through its positive effect on aggregate demand and positive spillovers on corporate investment and debt sustainability.

The paper is organised as follows: Section 2 provides an overview on the evolution of corporate tax legislation in Italy; Section 3 presents the methodology, data and parameterisation; Section 4 reports the empirical results for measuring the user cost of capital to labour and its underlying components, based on estimation of a full econometric model that includes the determinants of investment demand, to assess the impact of past tax policies and future tax proposals; Section 6 concludes.

2. Italy's corporate tax system

This section provides an overview of the structure of corporate taxation in Italy and its evolution through time. Starting in the early 1990s, the Italian tax system has undergone a number of more or less substantial reforms, delivering ample basis for analysis and comparisons. The longer-term goals of the Italian government are common to all market-based economies:

- reducing the tax burden on private agents to spur economic activity and future government revenue;
- minimising distortions from corporate income accounting giving preference to debt funding over equity financing;
- encouraging investment in productive activities as opposed to consumption and accumulation of financial or real estate wealth;
- supporting investment in sectors of strategic importance for the country's long-term competitiveness and welfare.

Moving towards those complex and sometimes conflicting goals involves difficult trade-offs and decisions. Over the short-term governments try to minimise economic volatility by providing temporary incentives to support the execution of investment plans during downturns, thereby reigniting economic growth. The recent global economic crisis and the size of Italy's and the euro area's public debt has further narrowed the feasible options for fiscal and economic policy manoeuvre.

When trying to quantify the impact of Italy's numerous tax reforms on the various components of the user cost of capital and

labour, it must be remembered that the devil is in the detail. In order to apply the theoretical formulas on user cost described in the next section, it is important to gain a deep understanding of the frequency of tax reforms and their legal basis, as well as the key changes they bring to parameters and user cost formation such as different tax rates, composition of the tax bases, depreciation rates, social security contributions, temporary and permanent allowances.

We start our review at the beginning of 1996, two years before one of the most important and comprehensive reforms in Italy entered into force. This reform is known as “Visco's reform” after Vincenzo Visco, the Minister of Finance responsible for its design and implementation. Prior to this reform, the corporate tax system consisted mainly of a **corporation tax** – *Imposta sul Reddito delle Persone Giuridiche (IRPEG)* and a **local income tax** – *Imposta Locale sui Redditi (ILOR)*. Both taxes were levied on corporate profit at a national uniform rate with ILOR non-deductible from the tax base. Two more taxes applied: a **tax on business net worth** – *Imposta Patrimoniale*, and a **local property tax** – *Imposta Comunale sugli Immobili (ICI)*. The health care system was financed by social contributions paid by both employers and employees.

Tax incentives were provided to encourage new investment in capital. The first such measure was introduced in 1994, drafted by Italy's Finance Minister Giulio Tremonti, and known as “Tremonti law”.² The new rules granted firms special deductions from taxable income IRPEG for a period of three years, namely from the beginning of 1994 to the end of 1996. For each fiscal year, the special deductions were computed as 50% of the cost of new investment that exceeded the average of the cost of new investment made during the previous five fiscal years. These investment tax incentives applied in addition to the normal depreciation allowances, with the result that, for income tax purposes, the investor was able to write off more than the cost of the investment and, thus, effectively reduce corporate income tax.

In the face of this tax system structure, Visco's reform had several objectives. Firstly, it aimed at reducing Italy's corporate tax burden to be closer to that in other European countries, through

2. D.L. 357/1994 became Law 489/1994.

the imposition of a new **regional tax on business activity** *Imposta Regionale sulle Attività Produttive (IRAP)*, which substituted for a number of taxes such as ILOR, Patrimoniale, payroll contributions to finance the health system and other minor taxes. The IRAP could be considered a net income type of value added tax levied at source.³ IRAP had a broad base, and applied to the value added produced by companies, i.e. profit inclusive of interest payments and labour costs. Outlay for capital goods was deducted from the tax base in line with normal income tax depreciation rules. Due to its broad tax base, IRAP, in theory, did not produce distortions in the choice between capital and labour. However, in practice, in cases where tax depreciation exceeded economic depreciation, capital could be favoured over labour. Another consequence of the broad base was that the statutory rate was significantly lower, i.e. 4.25% on average with sectoral differentiation.⁴

Secondly, the reform introduced a *Dual Income Tax (DIT)*,⁵ which, along with IRAP, aimed at reducing the historical bias towards debt-financing. This bias generally occurs because interest payments are typically deductible from the tax base, which encourages enterprises to finance their operations with debt rather than equity (see Graham, 1996 and 2000). On the other hand, there were perhaps other objective reasons, rooted in the structure of the financial system in Europe in which, traditionally, banking institutions, rather than stock markets, provide the bulk of financial intermediation to companies.

The DIT only affected corporate income – the “duality” referring to the different returns on capital. Business income was split into two parts, to which different tax rates were applied: a standard 37% rate on capital income minus “ordinary income” (i.e. return after-tax on new equity and retained earnings); the tax rate on “ordinary income” was 19%. To determine “ordinary income”, the Ministry of Finance set an annual “normal return” on the basis of the market interest rate. To cap potential revenue losses for the

3. When IRAP was introduced, academic debate was in favour of it, but there were few examples of its application in practice.

4. The rate was 2.5% for the agricultural sector and 5.4% for the banking and financial intermediation sector.

5. D. lgs. 18.12.1997, n. 466.

state, the cumulative result of all allowances could not be reduced further than an effective average tax rate of 27%.⁶

Implementation of the IRAP and the DIT resulted in a reduced tax burden on firms in general, and particularly on those wishing to increase their capitalisation. These taxes also contributed to reducing the gap between the cost of capital from debt-financing and from own equity.

To reinforce the incentives to invest, the government decided to expand the definition of “ordinary income” coverage.⁷ Additional incentives broadened the tax base to which the 19% tax rate applied, and corresponded to the volume of investment financed by equity in 1999 and 2000. At the same time the minimum effective tax rate floor was reduced from 27% to 19%.

Visco's reform was in place for just a few years, as in the second half of 2001 the new government changed the structure of the corporate tax system substantially, and especially the DIT, which first was limited before being abolished in 2004.⁸ Other fiscal incentives were introduced in 2001 (from 2001Q2 to 2002Q4) and in 2009 (from 2009Q3 to 2010Q2). These provisions were referred to as “Tremonti-bis”⁹ and “Tremonti-ter”¹⁰ since they reproduced similar provision introduced previously, namely in 1994.

In part to offset the effect of abolition of the DIT, a **thin capitalisation scheme** was implemented in 2004, according to which companies excessively financed by debt could deduct interest rate payments only up to a certain upper threshold. At the same time, the statutory corporate income tax rate was reduced¹¹ to 33%, as the new philosophy was to decrease corporate tax generally without distinguishing among different sources of finance. Corporate tax was renamed into *Imposta sul Reddito delle Società* (IRES).

Another reform introduced in 2008,¹² imposed a further reduction in the statutory tax rates: from 33% to 27.5% for IRES and from 4.25% to 3.9% for IRAP. These tax policies were motivated

6. For further details on “Visco's reform” see Caiumi *et al.* (2013).

7. D.L. 63/1999 became law 133/1999.

8. D.lgs. 12.12.2003, n. 344.

9. L. 383/2001. Translated from Latin would mean “Tremonti II”.

10. D.L. 78/2009 became law 102/2009, translated as “Tremonti III”.

11. Already reduced from 37% to 36% in 2001.

12. L. 24.12.2007, n. 244.

mainly by international competition amongst countries to provide favourable treatment of investment activity and global capital mobility. In order to induce more neutrality amongst financing means further to the thin capitalisation scheme, accelerated and anticipated capital depreciation allowances were abolished and interest deductibility from the base rate was additionally restricted.

The reform package “*Salva Italia*” was introduced in December 2011 in the wake of the European debt crisis and currently is still in force. It is one of three exceptional budget adjustment packages enacted to reduce the public deficit and reassure financial markets. It provided *Aid for Economic Growth* (ACE), i.e. *Aiuto alla Crescita Economica*, following the example of the UK's Allowance for Corporate Equity, which is a fiscal measure aimed at stimulating companies' capitalisation and designed to favour entrepreneurship and economic growth. According to the ACE scheme, taxable income is split into two parts: ordinary, exempt from tax, and extraordinary, taxed at the normal IRES tax rate. The ordinary return is calculated by applying to new equities a notional rate, set annually by the Minister of Finance, which in the period 2011-2013 was 3%. In 2014 the notional rate increased to 4%. Although ACE is similar to DIT, it is designed to have a stronger impact on reducing the tax burden because it eliminates double taxation on business income.

Over the years, IRAP has achieved many of its original goals, such as expansion of the tax base, reduction of average tax rates, equalised treatment of companies with different sources of funding, facilitation of tax compliance, fair burden-sharing between employers and employees and, as Bird (2006) concludes, “IRAP appears to be the closest approximation to a good local business tax that now exists”. However, IRAP has been criticised by entrepreneurs and especially self-employed people, because in practice it is not purely value added. For example, some companies might be running zero profit or a small loss while simultaneously owing a IRAP tax payment, because the tax base includes both labour costs plus profit (or loss). Also, self-employed individuals are responsible for paying both the employer's and the employee's shares.

Pressure to reduce or even abolish IRAP has been recurrent over the last ten years. Several modifications to the implementation of IRAP have been made over the years. In 2008, 10% of IRAP was

deductible from the IRES tax base. In addition, for permanent employees, firms were allowed to deduct from the IRAP tax base all social contributions plus a fixed amount of 4,600 euro per employee. The 2011 “Salva Italia” law provided for deductions from the amount of IRAP paid on labour costs. To encourage the employment of women and young people, firms were allowed to deduct from the IRAP tax base 6.000 euro for each newly employed woman or young person (under 35 years) on a permanent contract.

To sum up, in analysing the Italian tax system we provide a detailed chronology of permanent and temporary tax changes and their diverse and time-varying parameters, that impact on the user costs of capital and labour. The various incentives have been substantial bringing in shocks of different magnitude not only to the corporate tax rates, but also to the tax basis and the formation of the user cost of capital and labour. In addition, there were temporary incentives at nearly a business cycle frequency. These changes are likely to result in important quantitative effects on user cost through time and across types of companies, e.g. financed by equity or debt.

On the structure of taxation, two conclusions can be drawn. First, after the reforms implemented between 1998 and 2001, which significantly reduced corporate taxation, subsequent interventions have been less drastic. Second, the main target of recurrent reforms has been the reduction of tax on self-financed companies in particular. In the following sections, we provide a quantitative assessment of how corporate taxation has shaped the user cost of capital and labour and how this has affected investment.

3. Methodology and data

According to the theoretical literature, taxation policies affect business investment through their impact on the user cost of capital and labour. This section explains our theoretical foundation, and our application of theory to the data. We focus particularly on quantifying the impact of the complex structure of the Italian tax system and its frequent reforms – initially on user costs and, consequently, on investment and macroeconomic activity. Our aim is to evaluate the user cost of capital to labour and its subcomponents, estimate the sensitivity of investment to

the user cost and incorporate those estimates in a macroeconomic simulation to assess the overall transmission of tax policies.

3.1. Determinants of the user cost of capital to labour

The foundations of the user cost of capital and the unit labour cost are neoclassical in character and represent the minimum return required by profit-maximising firms from one unit of investment and labour. Formal models on the user cost of capital and investment decisions by Dale Jorgenson unifying the classical and Keynesian strands of the literature date back to 1963. More recent extensions and representations of these models include Jorgenson (1996), Devereux and Griffith (1998) and Jorgenson and Yun (2012). The marginal labour cost and the importance of user cost of capital to labour have Keynesian origin. They are derived from the problem of a firm minimising relative capital to labour costs faced with fixed demand.

The user cost of capital represent the optimal solution to the problem of a firm maximising its present discounted value of current and future profit, subject to the capital accumulation equation and production function. As a result, the user cost of capital U^k can be defined as:

$$U_t^k = \frac{q_t(r_t - \pi_t + \delta_t)(1 - \tau_t F_t)}{p_t(1 - \tau_t)}$$

where τ is the statutory corporate tax rate; p and q denote output and investment prices respectively; π is the producer's inflation rate; r is the market interest rate; F is the present value of depreciation allowances per unit of investment, i.e. the discounted sum of depreciation allowances; and δ is the economic depreciation rate.

The user cost of capital U^k increases with the opportunity cost of holding capital rather than buying government bonds or lending to others at the rate r and the relative price of investment to output q/p . It decreases with the present value of the fiscal depreciation allowances F . The effect of τ on the user cost of capital is positive, but depends also on the interaction with the present value F and, if more detailed tax systems are considered (see below), the effect could be indeterminate. In this simple definition and in the extreme case of F equal to 1, taxation will be neutral with respect to the user cost of capital.

The above theory is augmented to incorporate the specifics of various tax policies. To do this, we modify the above formula to account for changes in the rules on accelerated fiscal depreciation allowances (F), different treatment of investment financing and temporary fiscal incentives for purchasing investments in Italy. With respect to the depreciation rate F , the law defines different depreciation rates for different assets and industries.

The user cost of capital is affected also by the way firms finance their investment, through equity or through debt. Taking this into account, we develop two different formulations for the user cost of capital – where firms are financed by debt, and where firms are financed by equity.¹³

In a rational expectations framework with complete financial markets and no market imperfection the Modigliani-Miller hypothesis would hold and companies' choice of funding would be irrelevant for their production decisions. However, financial markets imperfections and other frictions do exist, which could drive a wedge between the financing alternatives. Corporate taxation is one theoretical imperfection, which generally gives preference to debt finance and could discourage companies to resort to capital markets to fund their production and investment projects. At macro-level the volume and depth of the domestic financial markets could be unsatisfactory. Entrepreneurs in need of risky venture capital might face discouraging liquidity premium on the capital markets, leading to lower innovation and economic growth. By trying to equalise the treatment of the two types of funding, tax reforms try to encourage large eligible companies to access the capital markets. However, many companies for structural reasons do not have such choice and depend on bank loans, e.g. small and medium size enterprises. The results of the tax reform would depend on the financial choices actually available to companies and therefore is *a priori* ambiguous, see Bordington *et al.* (1999).

In the equity financing case, from the start of our period of analysis, 1996, to 1997, the formula can be modified as follows:

$$U_t^k = \frac{q_t \{ (r_t - \pi_t + \delta_t) [1 - F_t (\tau_t^i + \tau_t^s)] + \tau_t^k \}}{p_t (1 - \tau_t^i - \tau_t^s)} \quad (1)$$

13. Note that we do not take into account personal capital income taxation.

This formulation incorporates the value of the statutory tax rate on corporate income IRPEG τ^s , the local tax rate on corporate income ILOR τ^i and the tax rate on the net wealth of firms τ^k . In principle, τ^i and τ^s reduce the opportunity costs of financing investment. In 1996 the value of those parameters was 37% for τ^s , 16.2% for τ^i and 0.75% for τ^k .

In the same period, firms predominantly financed by debt were also able to deduct their interest rate costs. This led to a modification of their user cost of capital.

$$U_t^k = \frac{q_t[r_t(1 - \tau_t^i - \tau_t^s) - \pi_t + \delta_t][1 - F_t(\tau_t^i + \tau_t^s)]}{p_t(1 - \tau_t^i - \tau_t^s)} \quad (2)$$

After Visco's reform in 1998, which introduced the new corporate taxes, IRAP and DIT, the user cost of capital for equity-financed firms became:

$$U_t^k = \frac{q_t\{(r_t - \pi_t + \delta_t)[1 - F_t(\tau_t^r + \tau_t^s)] - r_t^*(\tau_t^s - \tau_t^{ss})\}}{p_t(1 - \tau_t^r - \tau_t^s)} \quad (3)$$

where τ^r is the statutory tax rate on value added IRAP, τ^{ss} is the tax rate applied to new capital – new subscriptions capital and retained earnings set at 19%, and τ^* is the return on ordinary income.

In the case of debt-financing the user cost of capital is:

$$U_t^k = \frac{q_t[r_t(1 - \tau_t^s) - \pi_t + \delta_t][1 - F_t(\tau_t^r + \tau_t^s)]}{p_t(1 - \tau_t^r - \tau_t^s)} \quad (4)$$

In the last period of the analysis, the user cost of capital, currently in force, is affected by the introduction of the ACE:¹⁴

$$U_t^k = \frac{q_t\{[r_t - \pi_t + \delta_t][1 - F_t(\tau_t^r + \tau_t^s)] - r_t^* \tau_t^s\}}{p_t(1 - \tau_t^r - \tau_t^s)} \quad (5)$$

Comparing Equation (3) and Equation (5), we see that the introduction of ACE acted to lower the user cost of capital.

Marginal unit labour costs are derived from the first order conditions of a cost-minimisation problem facing a firm under perfect competition. The marginal labour costs U^l represent a relationship between real wages, augmented by the social contribution, to the price of output. In the case of labour costs being completely deductible from the tax base, the definition is:

$$U_t^l = \frac{w_t(1 + s_t)}{p_t} \quad (6)$$

14. We have not considered the 10% deduction of IRAP from IRES tax base.

where w represents per capita gross wage before personal income tax and s is the social contribution rate. Note that ideally the labour cost should take into account the anticipated values of its determinants during the entire lifetime of the equipment. However, because expectations of those variables are very difficult to measure in practice, we choose to stick to their observational equivalents.

After introduction of IRAP, corporate taxes influence the marginal labour cost because labour costs are not fully deductible:

$$U_t^l = \frac{w_t(1+c_t^s)(1-\tau_t^s) - c^i \tau_t^r}{p_t(1-\tau_t^s - \tau_t^r)}$$

where c^s is the amount of social contribution excluding health system payroll contributions; c^i denotes the contribution for workers' sick pay, occupational accidents and the bonuses paid by employers. Deductibility of social costs and other allowances directly affects the marginal labour costs. For example, before the "Salva Italia" tax reform the formula was:

$$U_t^l = \frac{w_t[(1+c_t^s)(1-\tau_t^s) - \tau_t^r c_t^i - \alpha^1 \tau_t^r (c_t^s - c_t^i)] - \tau_t^r \alpha^1 4600}{p_t(1-\tau_t^s - \tau_t^r)} \quad (7)$$

After the reform it was:

$$U_t^l = \frac{w_t \{ (1+c_t^s)(1-\tau_t^s) - \tau_t^r [(c_t^s - \tau_t^r)(\alpha^1(1-\tau_t^s) + \tau_t^s) + (c_t^i + \tau_t^s)] \} - \tau_t^r (1-\tau_t^s)(\alpha^1 4600 + \alpha^2 6000)}{p_t(1-\tau_t^s - \tau_t^r)} \quad (8)$$

where α^1 is the share of permanent employees in total number of employees and α^2 is the share of women and young people with permanent contracts in the total number of permanent contracts. The relative cost of capital to labour is determined by the ratio between the user cost of capital and the unit labour cost, i.e.

$$U_t^{k/l} = \frac{U_t^k}{U_t^l}.$$

As indicators for user costs we use the respective time-series data and taxation parameters provided for in the corporate tax legislation reviewed above.

3.2. Determinants of investment dynamics: theory and econometric modelling

According to the neoclassical theoretical literature the demand for business investment is influenced primarily by the current and

expected costs of production. In addition, in the Keynesian literature aggregate demand factors also play an important role. New-Keynesian models with financial markets imperfections (e.g. Bernanke and Gertler, 1989) suggest that information asymmetries and credit rationing could give rise to an external financing premium and that indicators such as internal cash-flow (pre-tax profits) should also be considered. Furthermore, there is a growing micro-economic literature with Keynesian flavour on the impact of uncertainty on investment. When optimal investment decisions are irreversible and inertial, then expectations and volatility of product demand have significant influence (for details see Guthrie, 2012 and Bloom, 2000).

Empirical studies usually try to encompass and test the relative importance of the factors suggested by the different strands of the theoretical literature (e.g. Angeloni *et al.*, 2003, Guiso *et al.*, 2002 and Antonietti *et al.*, 2014). They often find it difficult to validate the importance of the user costs of capital and labour for investment and macroeconomic performance. This highlights the need for further careful econometric investigation of the transmission of tax policies to the wider economy.

Even though the virtues of incorporating demand expectations and ex-ante uncertainty in economic models are well-understood in theory, in practice they are difficult to quantify. Their best measures are extracted from surveys of professional forecasters and the financial markets (e.g. sovereign debt spreads and term premia). Surveys measuring economic attitudes and confidence are increasingly used to identify the degrees of pessimism and optimism, which are important amplification mechanisms or independent sources of economic fluctuations. Indicators of subjective expectations and *ex ante* uncertainty have been derived from the Survey of Professional Forecasters, following the methodologies proposed by Zarnowitz and Lambros (1987), Giordani and Söderlind (2003) and Tsenova (2015).

We evaluate and test the link between investment and the user cost of capital to labour in the context of a range of other determinants. For this purpose, we employ both a VECM for investment applying Johansen's cointegration method, and the Engle-Granger two stage estimation method. First, we identify the long-run equilibrium relationship of corporate investment using several

variables traditionally suggested by theory, such as ratio of capital to labour costs, and aggregate demand. We test the residual of the regression for non-stationarity. Second, we model the short-term convergence dynamics of investment in relation to the same factors and additional exogenous variables characterising demand expectations and uncertainty.

To establish the presence of a long-run equilibrium relation between investment I , user cost

$$U_t^{k/l} = \frac{U_t^k}{U_t^l}$$

and aggregate demand C , and the parameters of this relationship, we estimate Equation (10). This equation incorporates a constant and a linear deterministic trend.

$$I_t = \alpha^C C_t + \alpha^U U_t^{k/l} + \alpha^T t + \alpha^0 + z_t \quad z_t \in iid(0, \sigma^z) \quad (9)$$

$$\Delta I_t = \beta^z z_{t-1} + \beta^C \Delta C_t + \beta^U \Delta U_t^{k/l} + \sum_{n=1..N} \sum_{l=1..L} \beta^{X^n} X_{t-1}^n + \varepsilon_t \quad \varepsilon_t \in iid(0, \sigma^\varepsilon) \quad (10)$$

where X represents the additional measures of expectations, disagreement and uncertainty, to augment the traditional benchmark equation, and l represents the order of lags, where $l \in (0, 1, 2, \dots)$.

Given that the dependent and independent variables are I(1) processes, the presence of a cointegration relationship between them would produce a stationary I(0) error term, i.e. temporary deviation from equilibrium. Alternatively, there might be a spurious relationship between the variables producing non-stationary persistent errors z_t . In order to test this possibility we assess the augmented Dickey-Fuller regression in which the first difference of the residual Δz_t is regressed on its own lag and its lagged difference, Equation (11).

$$\Delta z_t = \gamma^0 z_{t-1} + \gamma^1 \Delta z_{t-1} + \varepsilon_t \quad (11)$$

The relationships are estimated using Ordinary Least Squares (OLS) in order to identify and test the role of expectations and uncertainty factors on investment over and above the impact of fundamentals, rather than imposing *a priori* structural links via full information methods. We evaluate the stability of the coefficients through rolling regressions.

To check robustness we perform alternative estimations applying Johansen's maximum likelihood cointegration methodology. The nature of the cointegration process is diagnosed through Trace and Lambda tests.

3.3. Macroeconomic simulation

The transmission of tax policies is further investigated incorporating investment dynamics and its determinants using the Prometeia empirical macroeconomic model. Taking into account the latest data and parameter estimates, we use the model to evaluate the overall macroeconomic effect of tax system reforms over the years. We conduct a forward-looking comparative analysis on the transmission of permanent changes in the corporate income tax rate (IRES) and regional tax rate on corporate activity (IRAP). In addition, we compare and contrast their transmission to other shocks on investment, such as public investment and uncertainty.

The Prometeia empirical macroeconomic model is a large-scale multi-sectoral quarterly model evaluated and used to produce Prometeia forecasts. Over the years, it has been elaborated to keep abreast of econometric theory and forecasting practice. The details of institutional forecast models are rarely published in their entirety, but the model's complexity can be deduced from Ferrari *et al.* (1992), which provides a detailed account of the structure of an early predecessor.

The model has prevailing New-Keynesian features, incorporating detailed sectoral disaggregation for the Italian economy, inclusive of nearly 1,000 structural equations, of which 150 are stochastic in nature. It can be used to investigate both cyclical and structural factors in the short- and medium-term. It incorporates financial, monetary and real sectors, inclusive of government, services, manufacturing, construction and agriculture. The model takes account of detailed public sector revenues and expenditure such as income taxes on households and firms, deposit and bond interest, housing and land, indirect taxes (VAT and fuel excise duties), social contributions, interest payments, goods and service expenditures, wages, pensions, health care and public investments.

3.4. Data

The study utilises public data from the National Accounts ESA 95 statistics provided by Istat, and financial statistics compiled by Banca d'Italia. The period of analysis spans the available time-series data from 1996Q1 to 2012Q4.

Investment I is defined as gross fixed capital formation of the economy and includes machinery equipment, transport equipment and intangibles. Due to data limitations, we cannot distinguish among investment by the different sectors of the economy. Aggregate demand C is measured as household consumption plus exports of goods and services. The macro-economic simulations also take account of investment in fixed capital (construction), distinguishing between the public and private sectors. Public investment is approximated by the time series on public investment in construction. According to data with annual frequency, investment in construction comprises predominant part of public investment and therefore constitutes a good proxy for this economic concept.

To estimate the user costs of capital and labour, output prices p are captured by the time series on producer prices of manufacturing goods, the investment price q is measured by the deflator on investment in machinery, equipment and transport, and w is wages before taxes in the private sector. In the formula for the user cost of capital we use a depreciation rate of 12% per year, which corresponds to the average of several depreciation rates for machinery and equipment, and is close to the standard applied in other studies (see Bontempi *et al.*, 1995). For equity-financed investment we use the interest rate on corporate bonds, while for debt-financed investment we use the average interest rate on corporate loans. The separate measures for the user cost of capital for companies financed by equity and companies financed by debt are aggregated on the basis of a simple average due to lack of reliable statistics on their respective share.

In the analysis incorporating demand expectations and uncertainty, we use sovereign bond yield data for the spread between the 10-year government bond yields for Italy and Germany, $R_t^{Long(IT-DE)}$, the Italian business climate survey and the corresponding aggregate indicator based on an EC survey $y^{se IT}$, and proxies for euro area

expectations and uncertainty taken from individual reports in the ECB's Survey of Professional Forecasters. More precisely, we take short-term expectations on the output growth gap in the euro area $\Delta \hat{y}^e \text{Euro}$, i.e. the difference between the short-term (one-year-forward) and long-term (five-years-forward) point forecasts of output growth in the euro area; disagreement (uncertainty) about short-term forecasts for the unemployment rate in the euro area, measured by the distance between the 95th and 5th percentile of the cross-sectional distribution of point forecasts, $\phi^{e(95\%-5\%)\text{Euro}}$. In the macroeconomic simulations, we use also disaggregated data for some sectors, e.g. employment, output, marginal labour cost, user cost of capital in the sectors agriculture, industry, construction, private services and public services.

4. Empirical results

Based on the methodology already described, we assess the historical impact of taxes on the ratio of the user cost of capital to labour and its components. We also estimate the effect of the user cost of capital to labour on investment dynamics in the short and longer terms. We apply the Prometeia empirical macroeconomic model, which incorporates the investment equation, and evaluate the macroeconomic consequences of changes in tax policies, comparing them to other policy interventions.

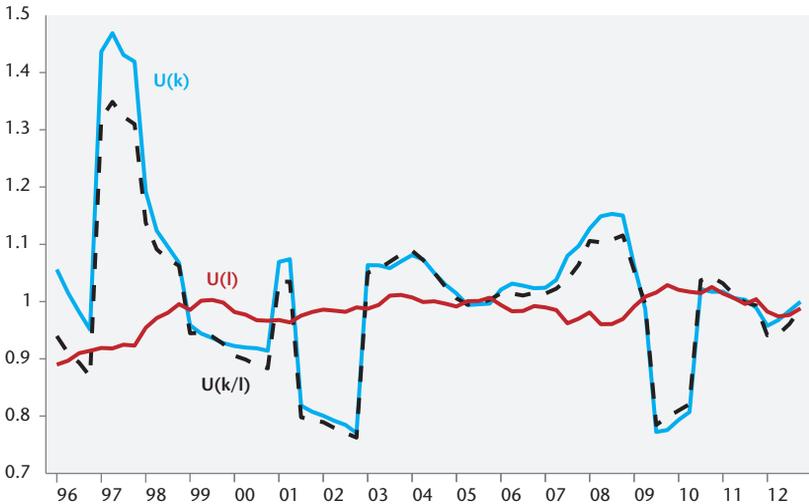
4.1. Assessing the impact of the taxation system on the user cost of capital to labour

We measure and analyse historical evolution of the user cost of capital to labour and its components in order to distinguish between a longer term tendency and cyclical fluctuations in the variable. At the same time, we try to assess the time-varying impact of the taxation system on the user cost of capital to labour, from the impact of other factors such as monetary policy transmission and relative price movements. The effect of the taxation system is further decomposed into contributions from temporary tax incentives and changes in tax rates (and/or tax bases).

The results of the evaluation, depicted in Figure 1, show that the longer-term component in the movement of our measure of the user cost of capital to labour has generally been declining over

the sample period. At the same time, the time series of the user cost of capital to labour is characterised by pronounced shorter-term fluctuations. Comparison of the dynamics of its components reveals that the user cost of capital is the major determinant. In contrast, the user cost of labour has very limited fluctuations, but plays an important role in dampening the upper extremes in the levels of the user cost of capital to labour. This is because episodes of higher capital costs coincide with modest declines in the level of the unit labour cost. Thus, labour costs contribute to softening extreme upward pressures on capital costs.

Figure 1. Evolution of the user cost of capital to labour

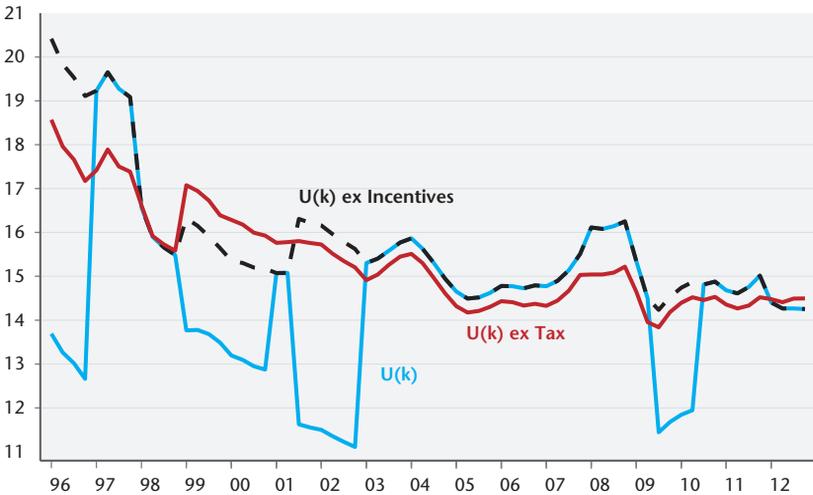


Note: $U(k/l)$ is the ratio of the user cost of capital to labour; $U(k)$ is the normalised user cost of capital for 2005 value = 1; $U(l)$ is the normalised cost of labour for 2005 value = 1.

The pronounced downward swings in the user cost of capital are due to temporary corporate tax incentives, as demonstrated by the differences in the dynamics of U^k and U^k excluding tax incentives, see Figure 2. Tax incentives seem to have achieved substantial ante-cyclical reductions in corporate costs with potentially stimulating effect on economic activity. The effects of some incentive programmes are more pronounced than others. For example, in 1999-2002, Tremonti's law had a larger impact on the user cost of capital than Visco's incentives, because the latter applied only to

firms that had undertaken new capital increase either through new subscriptions or retained earnings.

Figure 2. Evolution of user cost of capital excluding fiscal incentives and taxes

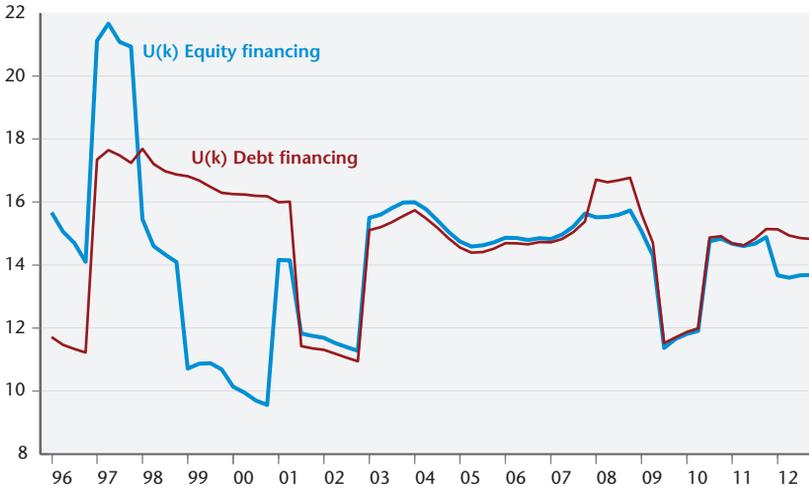


Note: $U(k)$ and its components are reported in real absolute terms, i.e. percentages.

The user cost of capital shows a pronounced declining trend with rates of over 19% in 1997 and nearly 14% in 2012, see Figure 2. The sliding trend in the user cost of capital could be associated mostly with the statutory tax on corporation income, which has been reduced progressively since the beginning of 2000. Although the IRAP tax rate has been stable, its tax base has been reduced through time. The difference in the dynamics of U^k without tax incentives, and U^k without taxes, is an indication of the contribution of tax rates on the capital costs of companies. While before 1998 tax rates weighed heavily on user costs, there are periods thereafter when their contribution was zero or even negative. At the same time, real interest rates and relative prices have contributed towards the declining trend in user costs. These effects are due to Italy's decision to join the euro area and the resulting downward convergence in nominal rates on government bonds and, to lesser extent, on loans to businesses. However, during the financial crisis, interest rates exerted pressure on user costs in the opposite direction.

Before mid-2001, there was a substantial difference in the user costs of capital for firms financed through equity and through debt, see Figure 3. While before 1998 the user cost under debt financing was lower, in the period 1998Q1-2001Q2 this tendency was successfully reversed by IRAP, which was levied also on the interest paid by firms, and by the equity capital incentives enacted with the DIT. Since then, the user costs of both groups of companies have generally been aligned. The introduction of ACE in 2012 reduced the user cost of capital for companies financed by equity, while the respective cost for debt-financed companies remained the same.

Figure 3. User-cost of capital debt vs. equity-financing



Note: User cost of capital for equity-financed and debt-financed firms. $U(k)$ and its components are reported in real absolute terms, i.e. percentages.

Altogether, taxation policies have a significant impact on the user cost of capital to labour, we find that while, in general, tax incentives account for cyclical fluctuations in this indicator, tax policies affecting the tax rate and/or tax base of corporate income tend to influence its trend. In addition, fiscal distortions on financing decisions have been reduced considerably.

4.2. Assessment of the impact of the taxation system on investment

According to the theoretical literature, the user cost of capital to labour is at the heart of the transmission of fiscal and monetary

policies to the supply side of the economy. Also, the user cost of capital and its relation to investment and capital accumulation generate persistent fluctuations, which policy-makers have been trying to control or at least influence. The snag is that the user cost is difficult to measure precisely and many empirical studies fail to provide evidence of the importance of their respective indicators for the dynamics of investment and the macro economy in general. In this sub-section, we test the significance of the link between our measure of the user cost of capital to labour and investment and try to quantify the relationship.

We evaluate an econometric model of the dynamics of investment in the longer and shorter terms. Applying the methodology described in the previous section, we find evidence of the presence of a significant long-term equilibrium relationship between investment I , aggregate demand C , and the user cost of capital to labour $U^{k/l}$. Equation (12) reports the results of the estimation. Within the sample period, this relation is accompanied also by a slight downward deterministic trend, which could represent a crude measure of exogenous technological progress giving rise to the increased efficiency of investment per unit of output.

$$I_t = 2.569^{***}C_t - 0.106^{***}U_t^{k/l} - 0.007^{***}t - 20.597^{***} + z_t \quad R^2_t = 0.947 \quad (12)$$

(0.081) (0.020) (0.000) (0.947) $\sigma^z = 0.022$

Corporate investment I tends to rise with improvements in aggregate demand (both domestic and foreign) C and reductions in the user cost of capital to labour $U^{k/l}$. As suggested by the standard errors which are reported in parentheses, all the coefficients are significant at the 1% level. Investment does not seem to linger far from its long-term equilibrium given the relatively high explanatory power of Equation (12) at 95% and relatively low mean root standard error σ^z of the Error Correction Term (ECT) z .

To validate the estimated long-term equilibrium relationship, we test the hypothesis of presence of a unit root in the regression residual applying an Augmented Dickey-Fuller test, i.e. that the coefficient γ^0 in Equation (11) is significantly different from unity. Equation (13) summarises the OLS estimates, with standard errors in parentheses and t -test statistics of each coefficient in bold.

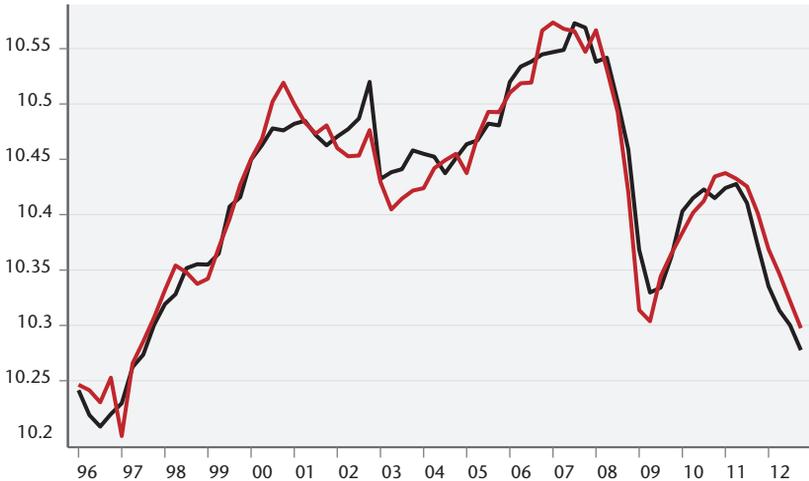
$$\Delta Z_t = -0.388z_{t-1} + 0.009\Delta z_{t-1} + \varepsilon_t \quad (13)$$

(0.1112) (0.125) (0.0018)

-3.46 **0.07**

Given that the coefficient is significantly negative with t -test statistics at -3.46 , which is less than the approximate critical value of -2.60 for a 1% confidence level and a small sample,¹⁵ we can safely reject the hypothesis of a unit root and presence of a spurious regression results underlying Equation 12.

Figure 4. Investment dynamics: observations vs. longer-term equilibrium I_t



Note: Variables are expressed in natural logarithm. The black line indicates actual observations of investment, the red line depicts equilibrium longer-term predictions.

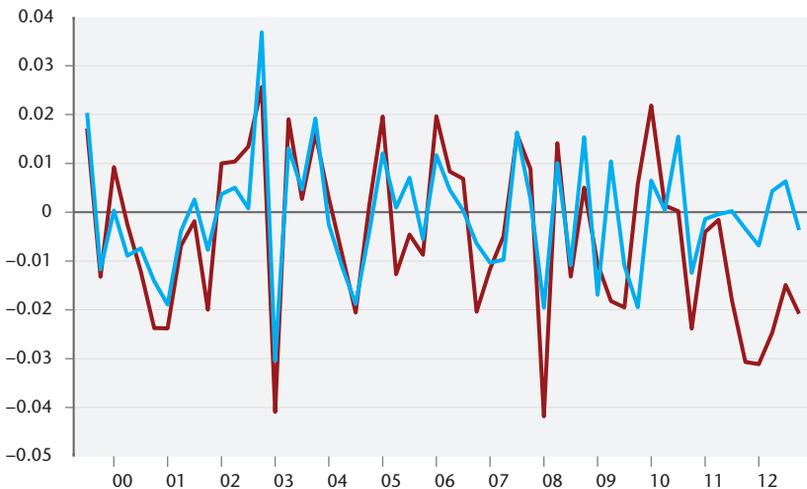
The estimated long-term dynamics of investment I to our measure of the user cost of capital to labour $U^{k/t}$ and aggregate demand C validate the findings in the theoretical literature and represent a rare empirical result. The predictions of the model suggest an equilibrium notion for private investment dynamics which could be analysed combined with actual observations, as depicted on Figure 4. Over time, there have been short periods when equilibrium investment has either over or under shot the path suggested by user cost $U^{k/t}$ and aggregate demand C . However, towards the end of the sample, i.e. after mid-2010, actual investment has persistently failed to reach its equilibrium, a feature that is likely associated with the Great Recession and the global economic crisis.

15. Enders (1995) pp. 223 and Hamilton (1994) pp. 763.

Shorter-term investment dynamics is determined by the distance from previous period's equilibrium, changes in the user cost, aggregate demand and a number of other potentially important non-fundamental factors. Table 1 reports the results of the alternative specifications.¹⁶

To evaluate the role of separate fundamentals, we estimate a benchmark specification in which changes in investment depend on changes in aggregate demand, user cost and the deviation of investment from its equilibrium, see Column (1) in table 1. Based on the estimated coefficients which are significant at the 1% confidence level, investment increases with aggregate demand and the reduction in the user cost of capital to labour, and tends to converge gradually to its longer-term equilibrium. The high significance of the reported coefficients and the relatively good explanatory power of the regression (R^2 of 59%), indicate that fundamental factors are central for explaining and predicting investment.

Figure 5. Insample prediction errors on short-term investment dynamics



Note: Red line indicates prediction errors from the benchmark equation table 1 Column (1). Blue line indicates prediction errors of augmented regression table 1 Column (4).

16. Note that to compare the explanatory power of the additional factors related to demand expectations and uncertainty, the sample is restricted to 54 observations, i.e. 1999Q3-2012Q4.

Table 1. Empirical estimation of the dynamics of investment in Italy

Long-term dynamics:

$$I_t = 2.569^{***} C_t - 0.106^{***} U_t^{K/L} - 0.007^{***} t - 20.597^{***} + z_t \quad R^2 = 0.947$$
(0.081) (0.020) (0.000) (0.947) $\sigma^z = 0.022$

Short-term dynamics:

$$\Delta I_t = \beta^z z_{t-1} + \beta^C \Delta C_t + \beta^U \Delta U_t^{K/L} + \sum_{n=1..N} \beta^{X^{n,l}} X_{t-1}^n + \varepsilon_t \quad \varepsilon_t \in iid(0, \sigma^\varepsilon)$$

	β^S (1)	β^S (2)	β^S (3)	β^S (4)
Z_{t-1}	-0.398*** (0.108)	-0.283*** (0.095)	-0.429*** (0.103)	-0.427*** (0.098)
ΔC_{t-1}	1.750*** (0.221)	0.741*** (0.278)	0.923*** (0.244)	0.795*** (0.239)
$\Delta U_t^{K/L}$	-0.82*** (0.030)	-0.076*** (0.027)	-0.026** (0.026)	-0.083*** (0.026)
$\Delta \hat{y}_t^e \text{ Euro}$		0.006** (0.003)	0.006** (0.003)	0.007** (0.003)
$\Delta \hat{y}_{t-2}^e \text{ Euro}$		0.012** (0.005)	0.011** (0.005)	
$\Delta \hat{y}_{t-3}^e \text{ Euro}$		-0.015*** (0.004)	-0.015*** (0.004)	-0.007*** (0.002)
$\phi_t^e \text{ (95\% - 5\%) Euro}$		-0.016** (0.007)		
$R_t^{\text{Long}(IT-DE)}$			-0.006*** (0.002)	-0.006*** (0.002)
$\Delta y_{t-2}^e \text{ IT}$				0.163*** (0.051)
σ	0.017	0.014	0.014	0.017
R^2	0.587	0.740	0.761	0.782
$R^{2\text{Adj}}$	0.563	0.702	0.726	0.749
F	24.2	19.1	21.4	24.0
ll	143.6	156.2	158.4	160.8

Note: I is investment; z is the error correction term (ECT); C is aggregate demand, consisting of household consumption plus exports of goods and services; y^{eIT} is the level of short-term expectations reported in the Italian business climate survey; $U_t^{K/L}$ is the ratio of user cost of capital to labour; $\Delta \hat{y}^e \text{ Euro}$ is short-term expectations on the output growth gap in the Euro area, i.e. the difference between the short-term (1 year forward) and long-term (5 years forward) point forecasts on output growth in the Euro area; $\phi^{e(95\% - 5\%) \text{ Euro}}$ is disagreement (uncertainty) about short-term forecasts of the unemployment rate in the euro area, measured by the distance between the 95th and the 5th percentile of the cross-sectional distribution of point forecasts; $R_t^{\text{Long}(IT-DE)}$ is the spread between the 10 year government bond yields in Italy and Germany; the variables I , C , $U_t^{K/L}$ and y^{eIT} are in natural logarithms; $\phi^{e(95\% - 5\%) \text{ Euro}}$ and $R_t^{\text{Long}(IT-DE)}$ are demeaned; standard errors are reported in parentheses; σ is measured in root mean squared errors; *** denotes 1% or less significance level, ** 5% or less significance, * 10% or less significance level; for consistent comparison the sample contains 54 observations, i.e. 1999Q3-2012Q4; F – F test statistics; ll – Maximum likelihood test statistics.

In order to assess the role of fundamentals in the context of other determinants, we estimate several different specifications for the short-term dynamics of investment, see table 1 Columns (2)-(4). The benchmark model is augmented to include indicators of euro area short-term output gap expectations $\Delta \hat{y}^e_{Euro}$, unemployment uncertainty $\phi^{e(95\%-5\%)Euro}$, the spread between Italian and German long-term government bonds $R^{Long(IT-DE)}$ and Italian business confidence in the short-term y^e_{IT} . These are forward looking indicators linked to demand expectations, which might be influencing investment decisions over and above the information provided by the observed data. Evidence of the significance of those indicators and the model specifications at the 1% significance level show that this is indeed the case. The incorporation of these demand expectations and uncertainty measures improves the explanatory power of the short-term model to 74%-78% (i.e. by 15%-18%).

All fundamental factors also remain significant, with the inclusion of additional factors mostly reducing the role of aggregate demand in the short-term, but not the user cost of capital to labour. This is understandable since the additional factors are mostly linked to demand expectations and uncertainty, rather than to supply. Additional factors have become particularly important during the global financial and economic crisis, which explains their usefulness for improving the predictability of investment changes towards the end of the analysed period, see Figure 5. The benchmark fundamentals model performs relatively well, but after mid 2010 tends to over-predict short-term investment.¹⁷

For robustness, we explore the time-variation in the equilibrium dynamics of investment, as in Equation (12), through rolling regressions with an expanding window from 2003Q1. The results show that the relationship between investment and its fundamental equilibrium determinants is relatively stable. However, while in the latter part of the sample, the link between user cost and investment remains relatively unchanged, the importance of aggregate demand increases after 2009. Before the Great Recession there

17. Because all fiscal incentive schemes are announced as temporary, we also explored the possibility of non-linear calendar effects on investment at the beginning and/or end of each period by the incorporation of time dummies. However, we could not find systematic evidence on the importance of calendar effects on investment.

was substantial stability of the coefficient of aggregate demand at about 1.6, while after the recession the demand coefficient tends to rise to the estimated value of 2.7 at the end of the sample. This suggests that the role of demand factors for explaining longer term investment has increased over the past several years while the role of supply factors, such as our indicator for the user cost of capital to labour, seems to have remained largely unchanged.

4.3. Assessing the historical role of corporate tax reforms

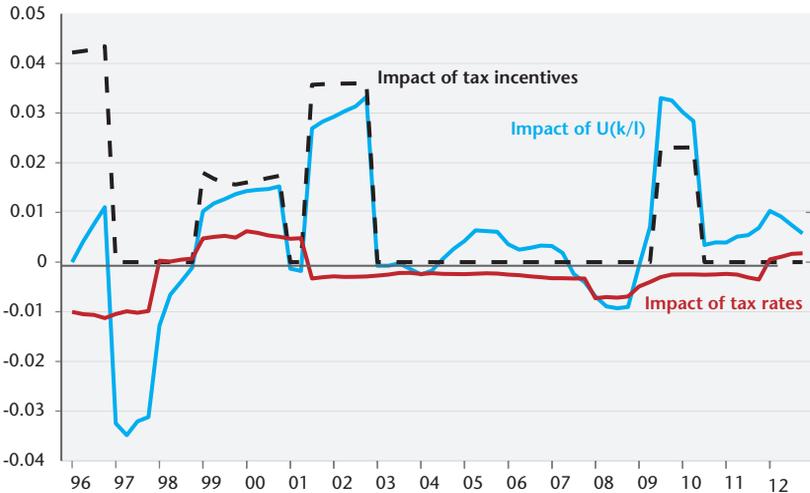
Given the solid evidence for the significance of the relationship between our measure of the user cost of capital to labour $U^{k/l}$ and the investment dynamics within the overall model of fundamental determinants of investment demand estimated in the previous sub-section, we need to distinguish the influence among the various underlying components of the user cost of capital to labour. This implies discerning the impacts of taxation system policy from that of monetary policy and relative price movements, as well as the contribution of temporary tax incentives from changes in tax rates and/or tax bases. We use the Prometeia macro-economic quarterly model to evaluate the overall contribution to economic activity within the context of complex endogenous multi-sector inter-linkages incorporated in that large-scale model.

We conduct several counterfactual assessments on the basis of our measure of user cost of capital to labour and its various components, incorporating them in the estimated model of investment demand and the Prometeia quarterly macro-econometric model. We assess the models' predictions keeping the estimated parameters fixed, for three additional scenarios: (1) assuming a constant user cost of capital to labour, i.e. the model's predictions reflect all factors except variation in the user cost of capital to labour; (2) assuming a measure of user cost of capital to labour that excludes temporary tax incentives; (3) assuming a user cost of capital to labour that excludes the influence of taxes, i.e. includes only the influence of monetary policy and relative price movements. The impact of the user cost of capital to labour is quantified by the difference between the predictions of the overall models and scenario (1). The contribution of incentives is estimated as the difference between the models' predictions and scenario (2). The

influence of tax rates is measured as the difference between the predictions of scenario (2) and scenario (3).

Figure 6 shows the evolution in the contribution of the user cost of capital to labour and its components to expected investment demand equilibrium. According to estimates based on the econometric model of equilibrium demand, the user cost of capital has an important influence on investment. Over the analysed period, the contribution of the user cost of capital to labour, over and above that of consumption and other determining factors, ranged between +4% and -4%.¹⁸

Figure 6. Impact of the tax system on predicted equilibrium investment demand



The high user cost of capital to labour was acting to discourage investment demand during 1997, under the influence of a relatively high user cost of capital due to permanent tax rates and expiry of the first round of Tremonti's temporary tax incentives in 1996. In 2008, the user cost of capital to labour suppressed equilibrium investment demand by about 1%. In most other periods, the user cost of capital to labour mostly contributed positively to investment demand. These positive effects were most pronounced in periods when fiscal incentives were implemented, with contri-

18. Since the respective contributions to short-term predictions are similar, their dynamics is not reported separately.

butions close to 1.5% during Visco's incentives (1999-2000), 3.5% during both Tremonti-bis and Tremonti-ter.

During periods of fiscal incentives, they dominated the impact of the entire user cost of capital to labour. The first Tremonti incentive plan (1994-1996) had a powerful effect on its own; its contribution to equilibrium investment hovered at above 4%. However, the overall impact of the user cost of capital to labour was suppressed by the negative impact of the overall tax rates and the unfavourable contribution of real interest rates and relative prices. Tax rates generally depress aggregate investment, which is consistent with the fact that taxes inevitably burden enterprises with higher costs. However, this negative contribution to equilibrium investment was quite small, and reversed to modestly encourage investment during the period of Visco's reform and the last two quarters of the period analysed.

Evaluating the contribution of taxation system policies using Prometeia's quarterly economic model, we find that Visco's reform enhanced quarterly GDP by 0.15 percentage points. During Tremonti-bis and Tremonti-ter, the tax system increased quarterly GDP by 0.2 percentage points. During the first round of Tremonti's incentives in 1996, quarterly GDP in Italy would have been 0.4 percentage points higher, had it not been for the negative offsetting impact of tax rates, monetary policy and relative prices.

Figure 6 shows that there is very little impact on investment demand from the user cost of capital to labour that could not be attributed to the two taxation components. This leaves a very limited role for the impact of monetary policy and relative price movements. This finding is confirmed by simulations of the Prometeia quarterly macro model. This is an important finding, given the key role attributed to the user cost of capital in transmitting monetary policy impulses to the real economy. It implies that fiscal policies, inclusive of tax incentives and tax rates, represent a more effective policy alternative to influence economic activity over the business cycle and over the longer-term.

4.4. Assessing the impact of future corporate tax reforms

In the current context of the Great Recession, fiscal spending constraints and international capital mobility, proposals for further

reductions in corporate taxes to support economic growth and fiscal sustainability are frequent in policy debates. In this section, we evaluate the macro-economic effects of two possible alternatives in that direction – a permanent reduction in the *tax rates on corporate income* (IRES) and the *regional tax on corporate activity* (IRAP), each at an amount equivalent to 1% of Italian GDP. We make a standard assumption of unfunded, i.e. deficit-financed, policy changes, in order to look into their effect independently. Alternative assumptions of funding such as increased revenues, including government debt, or reduced expenditures in other sectors, would have involved the evaluation of an entire fiscal package and could have potentially altered the final quantitative results.

We assess the Prometeia empirical quarterly macroeconomic model for Italy incorporating within its multi-sectoral structure the investment transmission channel of taxation policy that was estimated and explained above. The expected changes are evaluated taking the model's structure and the last period of analysis as the initial conditions.

To enable policy relevant judgements, we adjust the shocks to be ex-ante fiscally neutral in terms of generating revenue for the government.¹⁹ In practice, these adjustments are minor because the two tax schemes currently are rather similar. For example, in 2013 the revenue from IRES amounted to 36 billion euro and from IRAP to 32 billion euro, of which 10 billion euro was paid by the government administration. However, the bases of these two taxes are different and, consequently, so are their statutory rates. Thus, shocks are estimated to be similar in relation to their ex-ante effect on public deficit, namely 1% of GDP.

In both cases the user cost of capital to labour $U^{k/l}$ decreases. However, the reduction is less substantial for IRAP because its tax base includes both corporate profit and labour cost. Therefore, the tax rate reduction affects both the nominator and the denominator of the user cost $U^{k/l}$ and some part of the effect is cancelled out. For example, a 1 percentage point decline in IRAP would cause a 0.8 percentage point decline in the user cost of capital to labour $U^{k/l}$, as result of a -1.4 percentage points change in the user cost of

19. Inevitably, our predictions abstract from ex-post budgetary effects of reduced taxes on economic activity and budget revenues.

capital U^k and a -0.59 percentage points change in the user cost of labour U^l . A corresponding change in IRES would translate into a 1.3 percentage points decline in the user cost of capital to labour $U^{k/l}$, which would be due entirely to the reduction in the user cost of capital U^k .

Table 2. Macroeconomic effects of reduced corporate taxes and increased public investment equivalent to 1% of GDP

Changes in →	Δ IRAP		Δ IRES		Δ Public investment	
	After 1 year	After 4 years	After 1 year	After 4 years	After 1 year	After 4 years
Effects on ↓						
Δ I	0.67	1.78	1.83	2.27	0.28	0.64
Δ Total Investment	0.38	1.36	1.08	1.33	7.38	7.0
Δ GDP	0.10	0.59	0.20	0.19	1.14	1.35
Δ Consumption	0.12	0.87	0.00	-0.06	0.05	0.47
Δ Employment	0.10	0.97	-0.07	-0.23	0.48	0.99
Δ Consumer prices	-0.27	0.59	-0.01	-0.1	0.02	0.05

Note: Results are evaluated on the basis of the Prometeia quarterly macroeconomic model for Italy and expressed in percentage deviation from the model's baseline. As explained in the data sub-section I denotes investment (in equipment, machinery and intangibles); Total Investment includes additionally public investment (in construction).

According to the simulations, a decline in the statutory IRAP rate of 1% of GDP results in a rise in Italian GDP of 0.10 percentage points after one year and 0.59 percentage points after four years, see table 2. Note that this is equivalent to a policy shift reducing the statutory rate by 2.9 percentage points, from the current 3.9% to 1%. The main drivers of the increase in economic activity are investment and household consumption.

This policy reduces the user cost of capital to labour, exercising upward pressure on investment demand in terms of both its equilibrium desired investment level and its short-term adjustments. Taking into account the endogenous inter-linkages in the macro-model, this materialises as a 0.67 percentage points rise in investment after one year, and a 1.78 percentage points rise after four years.

Because the policy reduces the unit cost of labour U^l by about 4 percentage points for the whole economy, increased investment activity is accompanied also by higher demand for labour. Employment increases gradually, by 0.10 percentage points during the first year and by 0.97 percentage points after four years. This contributes to increased disposable income, internal demand and

domestic consumption, the latter increasing by 0.12 percentage points after one year and 0.87 percentage points after four years. The reduced production costs exert downward pressure on consumer prices, accumulating to a consumer price reduction of 0.59 percentage points after four years. In addition, competitiveness improves, which strengthens exports.

The reduction in IRAP is relatively more favourable to employment in the service sector, which increases by 1.72 percentage points after four years. In contrast, employment in manufacturing increases by only 0.17 percentage points after four years. The difference in transmission is due to the higher contribution of labour to value-added in the services sector.

Alternatively, a decline in IRES equivalent to 1% of GDP implies a reduction in its statutory rate of 13 percentage points, from the current 27.5% to 14.5%. Based on current historical experience, this is a sizeable reduction. Note that a 10 percentage points cut in IRES took 20 years to materialise with only a single case of a 5 percentage points revision in the tax rate in 2008Q1.

In this scenario, the model predicts that the decline of IRES would be counterproductive, because it would cause reduction in labour demand by companies. Investment would still increase with respect to the baseline, by 1.83 percentage point in the first year and by 2.27 percentage points after four years. Compared to the reduction in IRAP scenario, the boost to private investment is stronger due to the larger decline in the user cost of capital (user cost of labour being unaffected) generating stronger demand for investment in capital. However, this produces a degree of substitution between capital and labour, resulting in a modest reduction in employment, by 0.7 percentage points after one year and 0.23 percentage points after four years. This policy leaves disposable income and consumption almost unchanged. Overall, GDP increases, but only by about 0.2 percentage points in the first year and thereafter. This has obvious negative implications for the expected sustainability of public debt.

In the transmission of this policy change labour demand plays a key role, which justifies a more detailed look into its determinants. The Prometeia model incorporates disaggregated equations for the determination of labour demand (i.e. employment) in 5 different

sectors: agriculture, industry, construction, private services and public services. In each sector labour demand increases with production while decreases with unit labour costs and their ratio to capital costs. When IRES declines, the user cost of capital to labour also declines, while its inverse increases, exercising downward pressure on labour demand. Sectors with higher capital intensity such as industry would be more affected, with higher incentive to substitute labour with capital. Instead, the construction and private services sectors with lower capital intensity and moderate sensitivity to the price of capital would experience lesser pressure.

For comparison, we evaluate a fiscal policy scenario in which government chooses to boost the economy through an equivalent increase in public investment of 1% of GDP, rather than a reduction in corporate taxes, to stimulate private investment demand. In this case, the model predicts an increase in employment and internal demand and endogenous decline in the user cost of capital. This also encourages private investment, which increases by 0.28 percentage points after the first year and 0.64 percentage point after the fourth year. Potential output increases by 0.14 percentage points after one year and 1.22 percentage points after four years. This policy has an immediate and powerful effect on Italian GDP, which increases by 1.14 percentage points in the first year and 1.35 percentage points after four years. The higher economic growth generated is able to deliver budget surpluses after three years and sustainable gradual downward convergence in public debt.

5. Conclusion

This paper evaluates the transmission of corporate tax policies to factor costs in production, investment and economic activity. It contributes to the assessment of the usefulness of optimally designed growth-friendly policies in the longer-term and over the business cycle. The overall effects of reducing the corporate tax burden need to be assessed in a macroeconomic equilibrium context accounting for endogenous spillovers and feedback loops across various sectors of the economy.

This paper provides a detailed analysis of the taxation legislation in Italy over the past two decades, and proposes indicators for

the user cost of capital to labour that provide rigorous measures of the impact of the taxation system, including the effect of tax rates and tax incentives and underlying factors such as monetary policy and relative price movements. The historical and future influence of changes to the taxation system are studied on the basis of an estimated econometric model of the determinants of investment demand and the Prometeia quarterly macro model.

The results of the analysis show that changes to the taxation system have an important influence on the factor costs of production, investment and overall economic activity. Variation in the user cost of capital to labour is driven mostly by changes to the taxation system, leaving a very limited role for other factors such as monetary policy and relative prices. This variation is characterised by a slight downward trend and marked cyclical fluctuations. This dynamics is dominated by the user cost of capital, but the user cost of labour also plays an important part in dampening upward peaks in the cost of capital. While the cyclical fluctuation in the user cost of capital is attributable mostly to temporary fiscal incentives, tax rate policies determine its trend.

The econometric analysis demonstrates that reductions in the user cost of capital relative to labour have a significant and positive effect on investment, both in terms of its longer-term equilibrium and its short-term dynamics. Naturally, Keynesian type demand factors also play a role, such as aggregate demand (in the short and long-term), demand expectations and uncertainty (in the short-term). Over the years, temporary tax incentives have made an important contribution to boosting investment and economic activity during downturns. Reductions in tax rates have had a smaller, but permanent effect imposing a minimal burden on economic activity.

The results of the macroeconomic assessment of further reductions in corporate tax rates in Italy shows that decreasing the regional tax on corporate activity (IRAP) would be more beneficial than a comparable decrease in corporate income tax (IRES). This is because, IRAP reduces the user cost of both capital and labour, which provides corporations with incentives not only to invest in new capital but also to increase employment. Reducing IRES would be counterproductive because it depresses labour demand. In this case cutting corporate taxes would encourage a degree of substitu-

tion between capital and labour, exerting downward pressure on employment and dampening the positive overall effect on economic activity. Although in this paper we focused on analysing cost factors, we do not ignore the importance of demand factors, which are shown to be very powerful. Assessment of an equivalent increase in public investment produces an overwhelmingly greater improvement in economic activity, with positive spillovers to investment and debt sustainability.

Corporate taxation policy and, especially, temporary fiscal incentives, seem to be more effective instruments for overcoming cyclical downturns than alternative tools, such as monetary policy, which does not appear to generate economically meaningful counter cyclical variation in the real rates of financing for Italian businesses. Temporary fiscal incentives generate important positive economic effects, with long-lasting consequences for economic dynamics and welfare. However, the gradual lowering of taxation rates has generally reduced the tax burden on companies to relatively minimal levels with valuable positive implications for longer-term economic growth. Nevertheless, consideration of future reductions to corporate tax rates should take account of the general macro-economic perspective and alternative options for achieving the economic growth and public debt sustainability offered by the rising power of Keynesian factors, including boosting aggregate demand and public investment.

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