DON'T JUDGE A BOOK BY THE COVER: AN ANALYSIS OF ITALIAN TAX REVENUES AFTER ADJUSTING FOR DISCRETIONARY MEASURES

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Abstract

The performance of tax receipts in Italy during the period 1978-2006 is analysed through the relationship between the growth of revenue and the evolution of the macroeconomic framework. Series of actual tax receipts are adjusted to take account of discretionary measures, transformed into implicit tax rates, and then broken down into the structural components. A regression analysis of the trend element shows that the performance of tax revenue depends not only on the main variables used in forecasting models, but also on a number of factors, some of which (interest rates, oil prices, the output gap, and inflation) have a direct impact on implicit tax rates. Other factors (the share of profits of banks and listed companies, the proportion of energy consumption in total spending, and purchases of durable goods) indirectly effect the incidence of taxation by causing shifts in the tax base among sectors with different opportunities for tax evasion.

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Contents

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1. Introduction

It is increasingly common, in assessing the soundness of a country's public finances, to rely on cyclically adjusted budget indicators. Internationally comparable estimates of cyclical effects have been released regularly for more than a decade now by the European Commission, the IMF and the OECD[1].

The most commonly used adjustment methods essentially modify tax revenue, assuming a stable relationship between revenues and macroeconomic performance that can be satisfactorily traced by a limited number of variables. The methodologies can be distinguished into those based on an aggregate elasticity of total revenue with respect to GDP, on the implicit assumption that changes in the composition of output do not have significant effects, and those based on separate elasticities for the main revenue items, each with respect to one of the main macroeconomic variables that determine the composition of GDP (consumption, gross wages, gross operating surplus).

In connection with the emergence of unexpected revenue in many countries in 2006 and 2007 (revenue windfalls), some empirical studies have highlighted the shortcomings of these assumptions and shown that oversimplified models may generate short-term forecasting errors and an incorrect evaluation of the fiscal policy stance[2]. In particular, the hypothesis of constant elasticity of revenue to the main macroeconomic tax base aggregates have been tested using econometric models that distinguish between short and long term. The problem of adequate representation of the macroeconomic framework has also been addressed, lengthening the list of exogenous variables for revenue by adding, for instance, factors indicating trends in the property and share markets[3].

The present essay enters the discussion with a thorough analysis of the dynamics of tax revenue in Italy over the last thirty years. It is set apart from most of the recent literature by its econometric methodology, which uses filtering techniques and static equations rather than error-correction models.

The various time series of tax revenue were subjected to two preliminary adjustments. First, they were corrected to exclude the effects of rules changes. The main measures enacted since 1978 were reconstructed, providing a gauge of the financial effects of tax policy in Italy that is

[1] For the methodology used by the European Commission and by OECD, see European Commission (1995), Giorno et al. (1995). For the methods used within the ECB see Bouthevillain et al. (2001). For Italy see also Momigliano e Staderini (1999), Ginepri (2005).

[2] This kind of literature started with Groves and Kahn (1952); important contributes were given by Fox and Campbell (1984), and by Sobel and Holcombe (1996).

[3] While Wolswijk (2007) and Swiston et al. (2007) focused on the difference between short and long term elasticity, Morris and Schuknecht (2007) and Martinez Montagay at al. (2007) introduced new exogenous variables. See also European Commission (2008).

unprecedented in the literature both in its temporal extension and in its detailed breakdown to the level of individual taxes[4]. Second, a statistical filter was applied to eliminate the cyclical component and erratic factors.

The work is organized as follows. The next section briefly describes the data and the main tax measures, both transitory and permanent. Section 3 analyzes the data series statistically. Section 4 comments on the trends in adjusted implicit tax rates. Section 5 discusses the results.

2. Adjustment for discretionary measures

2.1. Data

We set to analyze an aggregate of tax revenues which includes revenue recorded in the central government budget in cash terms and some local taxes (IRAP and Irpef surtaxes)[5]. This aggregate comprises approximately 85 per cent of tax revenues reported in the general government accounts. We chose this kind of revenues, instead of the ones of the general government account, because they allow to determine accrual taxes even for enterprises, and this simplifies much the analysis of the relationship between tax revenues and the macroeconomic variables taken as proxy for the tax basis[6].

We carry out our analysis on four distinct taxes: i) personal income tax (Irpef) paid (as withholding tax) by employees; ii) Irpef paid by self-assessment (mainly paid by small business and self employed workers); iii) corporate income tax (Irpeg-Ires; Ires hereforth); 7 iv) VAT. Irpef on employee and VAT were selected due to their sheer volume (they account for about 50 per cent respectively of direct and indirect taxation); taxes on enterprises (self assessed Irpef and Ires) for their high volatilty. In addition we analyzed the aggregates, that is the total of direct taxes and that of indirect taxes. Each one of the two components accounts for about 50 per cent of the total tax revenue.

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[4] In Marino et al (2008) revenue are adjusted for discretionary measures, but for a shorter time span and with reference to a different aggregate of revenues.

[5] We do not consider moreover the proceeds for lottery, which are included in the tax revenues of the central government budget.

[6] For every year *t*, the proceeds for the personal income tax (both for the part self-assessed and for the one levied as withholding tax on dependent workers) and for the corporation tax were obtained by adding to the payment on account (made in year *t*) the settlement payment (made in year *t+1*).

[7] Ires, a tax on businesses' profits, was called Irpeg before the 2004 reform.

2.2 Discretionary measures implemented, 1978-2006

The series of tax revenues were corrected to exclude the effects of rule changes. The method implemented – adding to the actual yearly yield the cumulated impact of the measures implemented from that year up to 2006 – makes it possible to clean the series from the level shifts caused by new rules coming into force[8]. The impact of each measure is rendered in Table 1. On the other hand, this method does not allow to account for those changes that affect the reactivity of each tax to its basis – as is the case of alterations in the degree of progression in the personal income tax – or that depend on changes in the tax-payer behaviour – as for the degree of tax compliance.

Wherever possible, we took data of revenue recorded in the budget to account for the impact of each measure (for one-off taxes); when ex ante estimates were used, their reliability was examined against comments ex post, taken from publications of the time.[9]

During the period examined (1978-2006), the Italian tax legislation was the object of endless revisions, with significant repercussions on revenue dynamics. The reconstruction of the discretionary measures implemented highlights tax policy's different phases.

During the Eighties, measures concerning indirect taxation were predominant. The first wave concerned VAT rates, in connection to the convergence process of rates at the European level, and the excises on energy (tax burdens proportional to quantity), as a reaction to the fluctuations of oil prices and to high inflation. During the second stage, begun in 1987, tax policy measures were explicitly aimed at shifting the tax burden on indirect taxation: on one hand, raising the rates of the main taxes (excises on mineral oils, energy, methane, duties on business) and, on the other, easing the burden of the personal income tax (reorganization of tax brackets and rates in 1989, introduction in 1990 of a mechanism for the automatic correction of fiscal drag[10]).

In 1988-1990, higher indirect tax rates yielded yearly additional proceeds of approximately 0.8 per cent of GDP.[11] Ending the Eighties, a process of consolidation of public finance started to be implemented, that strengthened in the first half of the Nineties, marked by significant tax increases.[12]

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[8] The value of the effect of a measure was discounted back using as discounted rate the rate of increase of the specific tax involved (net of temporary measures). The choice of the discounted rate reflects the fact that in this way we only change the dynamics of the time series in the year of the introduction of the tax change.

[9] Reference is made, in particular, to the Banca d'Italia publications (Annual Report and Economic Bulletin). Details concerning the Eighties have also been drawn from Morcaldo (2005).

[10] This mechanism was in force completely only in the years 1990 and 1991, see table 4 for more details.

[11] It's worth recalling that, in those years, excise rates on oil by-products were the subject of constant changes, of which it is not easy to always find evidence. Just to exemplify, in 1991 the government changed the rate of the excise tax on gasoline six times (three increases and three abatements).

[12] For an in-depth analysis of the debate at the time, see Ceriani *et al.* (1992) and Morcaldo (2005).

During the two years 1992-3, interventions on direct taxation reverted to prevail. In particular, permanent changes were brought to the tax burden on enterprises and on self-employed workers, while indirect taxation was rationalized and simplified. To begin with, in 1993, some minor excises were done away with, followed in 1994-5 by some items of the government licence levy. The contribution of permanent tax tightenings to revenue growth dropped around the mid-Nineties, to then exhaust at the end of the decade: once secured the participation to the Monetary Union, tax policy could pursue objectives such as the rationalization the system and the improvement of the neutrality of tax system. Suitable examples are the introduction of DIT in 1997,[13] that of IRAP[14] in 1998 and reform of the taxation on financial activities. The steps taken regarding taxation proved consistent with the general intent of fiscal policies, that mirrored the conviction of policy makers that the consolidation of public finance was a fait accompli.[15]

This awareness, coupled with the need to implement an expansive budget policy to counteract the heavy decline of Italian economy, brought about a hiatus of tax reliefs for families and enterprises, matching what was happening in the other European countries.[16] As for families, tax allowances were granted thanks to permanent changes to personal income tax and initially concerned increases of deductions and marginal changes to the rate and, from 2003, to the structure of the tax.[17] Firms, on the other hand, benefited mainly from the reduction of the rate of Ires, gradually lowered from 37 per cent in 2000 to 33 per cent in 2004.[18]

In 2005 new measures were passed to tighten the tax,[19] particularly targeting enterprises.[20] All in all, in the period 2000-05 reductions were granted amounting to about 0.4 per cent of GDP per annum.

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[13] For the 1997-8 reform, see Staderini (2001).

[14] It was not the need to get additional revenue that led to the creation of IRAP: instead, this tax was due to take the place of some duties and of that component of social taxes destined to finance health care; it was presented as neutral with respect to the aggregate yield. First up, the reform would bring about a reduction of revenues, estimated in 1998 in about 0.4 percentage points of GDP. In this paper, the adjustment for discretionary measures did not concern this reform.

[15] On policies pursuing the balancing of public accounts in the Nineties, see Spaventa and Chiorazzo (2000), Degni *et al.* (2001) and Balassone *et al.* (2002).

[16] For a review of the fiscal policies implemented by Euro-area countries after the introduction of the common currency, see Balassone *et al.* (2003).

[17] For a description and an appraisal of the impact of changes to the personal income tax in the period 2000-05, see Marino *et al.* (2007) and Marino and Staderini (2006).

[18] For a complete outline of tax measures taken in favour of enterprises, see Monacelli *et al.* (2001) and Gennari *et al.* (2005).

[19] In July 2005 the EU Council presented Italy with a notification of excessive deficit and set a six-month deadline for the adoption of measures aimed at bringing net borrowing below the 3 per cent threshold in 2007.

[20] In 2005 fiscal reliefs for families became effective (the so-called "second package" of the reform of tax on physical subjects), together with enlargements of the taxable basis of Ires. These latter, introduced by the planning document for 2006, were perceived for the first time upon settlement of taxes due by enterprises in 2006. However, thanks to the method used in this paper to report taxation on businesses, which includes the settlement paid in year $t+1$ in the duties of year t, they are already noticeable in our data for 2005.

In the time span under examination, measures aimed at contrasting tax avoidance and evasion were frequently implemented. The impact expected from this kind of measures in terms of larger revenues have not been included in the reappraisal of the discretionary measures carried out in this paper because of the unfeasibility to evaluate – even ex post – the adequacy of quantitative estimates drawn ex ante.

In recent years, a contribution to the growth of revenues was provided by the introduction and development of a new system of reporting taxable base for small business and self employed workers (*studi di settore*), created by a 1993 law, enforced since 1998[21] and the object of a updating in 2005-06. The contribution to the increase of revenues provided by *studi di settore* seems to be confirmed in the dynamics of revenues both of personal income tax on small business and of VAT: the former records a steady growth in 1999-2000;[22] the second in 1999, 2000 and 2006. The effectiveness of *studi di settore* seems to wither in the years following a revision: the experience suggests that tax-payers, after having adjusted their taxable income to the rise, develop greater means to take advantage of those instruments to dodge the tax.[23]

Summing up, permanent changes to the tax system, merely occasional until the mid-Eighties, became part of the public finance consolidation policies, bringing about a substantial increase in the tax burden, especially in the first half of the Nineties. In 2001-05 the measures were aimed at reducing the tax burden. Since 2005 provisions went back to tighten tax burden, contextual to the last personal income tax abatements.

The resort to temporary measures intensified in the Nineties, in connection with the strengthening of public finance consolidation. Since 1992, in particular, temporary revenues have become a staple of Italian tax policy. In the period 1992-2006 such proceeds have accounted for approximately 0.8 per cent of GDP yearly.[24]

Among temporary measures, special emphasis was given to tax amnesties: during the time span of our analysis, four wide-scope amnesties were introduced with sizeable results yielded in 1983-4, 1992-93, 1995-96 and 2003-04.[25]

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[21] Between 1998 and 2000 more than 50 per cent of studies were enforced, affecting 75 per cent of tax-payers. For a backtracking of the introduction of *studi di settore* in our system, see Longobardi (2001).

[22] On this topic see Abritta *et al.* (2003).

[23] On this subject see Santoro (2006).

[24] In this paper are considered *una tantum* provisions: 1) extraordinary taxes whose yield is accounted for by special items in the budget; 2) *una tantum* revenue rises pertinent to permanent taxes, only if substantial, because of the difficulty to separate those of modest entity within the yields of the chapters relative to permanent taxes.

[25] For a review of the economic theory of amnesties and an estimate of the impact on the overall yield provided by amnesties, see Bernasconi and La Pecorella (2006).

3. Adjustment for erratic and cyclical factors

3.1Structural models with unobserved components

To pick up the trend in the revenue generated by the main taxes, we decompose the time series into their structural components. This approach, described in depth by Harvey[26], identifies the constituent elements of a data series – the trend, the cycle, the seasonal pattern and "noise," i.e. the purely erratic part bound up with high-frequency fluctuations – and isolates the longer-term trends.

The model we use is the following

(1) $y_t = \mu_t + \psi_t + \varepsilon_t$

in which μ_t is the trend of the series, ψ_t is the cycle and ψ_t is the idiosyncratic error term. For ε_t it is assumed that

(2) $\mu_t = \mu_{t-1} + \beta_{t-1} + \eta_t$
$\beta_t = \beta_{t-1} + \zeta_t$

where η_t and ζ_t are independent innovations of zero mean and constant variance, equal respectively to σ^2_η and σ^2_ζ. The trend is represented by an integrated second order *random walk with drift*, in which level and slope are random variables. To model the cyclical component we use the cosine function and stochastic disturbances, which generate erratic fluctuations around an otherwise deterministic oscillatory trend. This is called the "*local linear trend*"; particular cases are obtained by imposing restrictions on the volatility of η_t, ζ_t or ψ_t.

Because both the cyclical and the trend components are Markov processes, the model has a representation in the state space. If the errors have Gaussian distribution, then applying the Kalman filter and decomposing the forecasting error we can calculate the model's likelihood function and estimate the value of the unknown hyperparameters. The model that gives the best interpolation of the data is selected by analyzing the properties of the residuals .

Over the thirty years studied the statistical properties of the tax revenue series have been altered by measures modifying the collection procedures and the structure of the tax. There were three important instances: (i) in 1993, with the abolition of customs collection of VAT on EU imports; (ii) in 1996, with the change in the taxation of income on bonds; and (iii) in 1998, with the introduction of the Regional Tax on Productive Activities (IRAP). In these three cases, as the

[26] Harvey (1989).

revenue figures could not be corrected directly, the model was modified by inserting "intervention dummies". Decomposition into structural components was therefore effected not on the observed series y_t but on the residual $y_t - \delta d_t$, where d_t represents the dummy variable (or vector of variables), δ its coefficient.

3.2 Model selection and results

The most suitable decomposition model was selected by comparing four specifications: the general model; that in which the trend slope is not stochastic ($\sigma^2_{\zeta} = 0$); that in which the level of μ_t is fixed ($\sigma^2_{\eta} = 0$); and that with no cyclical component ($\sigma^2_{\kappa} = \sigma^2_{\kappa^*} = 0$). The first filter eliminated models whose residuals were non-Gaussian or serially correlated. The final selection was the specification with the fewest parameters and the best fit with the data, gauged by the standard error and the determination coefficient.

We analyzed the six components of tax revenue for three different definitions of receipts: actual receipts as in the State budget, receipts net of one-off taxes, and receipts adjusted for the set of discretional measures, both one-off and permanent.

For each variable we considered the log form and the implicit rate, obtained by dividing revenue by the macroeconomic variable that most closely approximates the tax based for that levy. The proxy variables here were: for direct taxes, GDP; for VAT and indirect taxes, nominal consumption; for employee withholding tax, total wages and salaries; for corporate income tax and self-assessed personal income tax of the self-employed, gross operating profit of the private sector. For the numerator variables, taxes are reconstructed on an accrual basis, which gives implicit tax rates as the incidence of the tax on the tax base. In all, then, 36 models were estimated. The results are given in Tables 2a-2c and 3a-3c.

The following analysis bears on the implicit tax rates for the series adjusted for discretionary measures and produces the results detailed below.

(i) First, when tax receipts are expressed as a ratio to tax base, there is no specification that clearly dominates the others, and differences in *goodness of fit* between models are smaller than for series expressed in log scale. The specification most frequently selected is the one that assumes non-stochastic slope, but in about half the cases the unrestricted or the smooth trend model seems to produce better results. Though it is impossible to trace sharp boundary lines, our results suggest that a model with $\sigma_{\zeta} = 0$ is more appropriate for series – like tax rates – that fluctuate around a constant mean, while variable slope ($\sigma_{\zeta} \neq 0$) is better suited to variables – such as log of tax revenue – that rise constantly.

(ii) Second, the cyclical component, although it explains only a limited part of the tax series' volatility, cannot be left out of the decomposition without seriously worsening the *fitting*. For variables expressed as a ratio to tax base, the small weight of the cyclical component is explained by the fact that the fluctuations in the numerator and those in the denominator annul one another, which greatly reduces the contribution to total variance of waves between 2 and 8 years in length.

Once the best specification was found, the series were purged of the cyclical and erratic components.

4. Implicit tax rates: A tool for analyzing elasticity

The implicit tax rate is a useful analytical tool, more clearly highlighting the relation between revenue and the performance of the economy. Even limiting ourselves to a graphic analysis, it emerges that the implicit rates give a fuller picture of revenue trends than actual tax proceeds. For instance, looking only at proceeds shows a marked deceleration in revenue starting in the mid-1980s and intensifying in 2001-2005, and then an acceleration starting in 2006 (Figure 2a and, for the trend component, Figure 3a). When revenue is adjusted for discretionary measures, the stagnation of 2001-2005 is attenuated (owing to the tax reliefs enacted in the first years of the decade and, to a lesser extent, the tax credits accrued on managed assets in 2001). The slowdown since the mid-1980s remains, however, in response to the overall economic context (Figures 2b, 2c and, for the trend component, 3b and 3c). Over the past quarter-century, in fact, inflation and the dynamics of potential economic growth have both diminished considerably. Whereas in the first half of the 1980s nominal GDP rose by more than 10 per cent per year, between 2001 and 2006 it averaged only 3.6 per cent.

When tax revenue is considered as a ratio to a macroeconomic variable correlated with the tax base, the picture changes drastically (Figures 2d, 2e and 2f); with the extraction of the trend, the situation is open to immediate interpretation (Figures 3d, 3e and 3f). Specifically, taking economic developments into account there is no slowdown in the tax system's capacity to generate receipts; indeed, it is clear that the incidence of taxation has been rising for some years now and has reached historically high levels[27].

Analysis of structural tax receipts (the trend component of the series corrected for temporary and permanent discretionary measures) is especially important. Constant implicit tax

[27] The difference between the trend and the corresponding implicit tax rate series since 1998 is connected to the reform of 1998 (introduction of IRAP – an indirect tax – and abolition of several direct taxes).

rates over time correspond to the assumption of an elasticity of 1 with respect to the tax base (GDP, consumption, wages and salaries, gross operating profit), which is posited by the models most commonly used to adjust tax revenue for cyclical effects[28]. Graphic analysis of the implicit tax rate (Figure 3f) shows, instead, that that elasticity fluctuates significantly.

Withholding taxes on emplyees rises constantly throughout the period studied, given the progressive structure of the income tax, which is accentuated in periods of rapid inflation, as in most cases measures to offset fiscal drag have been only partial. The trend change in the tax rate, however, does not rise montonically, suggesting that elasticity is not only greater than 1 but also variable, in connection with measures altering the structure of the tax, which have changed the degree of progressiveness (Table 4). It is worth repeating that the methodology we use here to adjust for discretionary measures picks up the revenue effect only in the year the intervention is made; it cannot adjust for changes in the degree of progressiveness.

For business taxes (self-assessed income tax on the self-employed and small business and the one on corporation income tax), the implicit tax rate fluctuates more markedly, owing in part to the difficulty of identifying a macroeconomic variable that corresponds closely enough to the tax base. Both taxes have been rising in recent years, beginning in the 1990s for the self-employed and more recently for corporation tax[29]. For the former, the rise in the implicit rate may be related to the introduction of *studi di settore* by the revenue service. Interestingly the rising incidence of corporation tax on gross operating profit has been observed in other advanced economies as well. Comparative analysis on the tax burden on firms in the main OECD countries has found that the reduction in nominal tax rates induced by fiscal competition has not actually diminished tax revenue; indeed, on average this has increased. Empirical studies have found that the rise in revenue is related to trends in the prices of real and financial assets[30] and to the rising GDP share of profits, due in particular to the relatively faster growth of profitability in banking and insurance[31].

For total direct taxes, the upward trend in the implicit tax rate would appear to be led mainly by withholding on emplyees, albeit with greater variability owing to the presence of self-assessed taxes and to the set of substitute taxes on investment income. The latter component, which accounted for nearly 10 per cent of total tax revenue until 1996 before falling to around 4 per cent, is extremely variable, depending as it does on interest rates and given the countless changes in rates and payment procedures (see the reconstruction in Table 4, columns 6 and 7). Total direct tax

[28] In general, since implicit tax rate τ is defined as the ratio of revenue E to tax base B, we have that $d\ ln\ \tau = d\ ln\ E - d\ ln\ B$. For the elasticity η we have $\eta = d\ ln\ E / d\ ln\ B$. As a consequence, an increase (decrease) of the implicit tax rate is equivalent to an increase (decrease) of the elasticity.
[29] On Ires recent trends see Cerini (2006).
[30] Morris and Schuknecht (2007).
[31] See Deveruex and Klemm (2004).

revenue rose very considerably through the 1980s, mainly because of the interaction between high inflation rates and the progressive personal income tax. It also benefited from new, more effective tax collection procedures (withholding, self-settlement, payments on account). In the 1990s, by contrast, the rate fell for several years and the trend component stabilized. This tendency was sharply inverted in the late 1990s, the implicit rate returning to the highest levels recorded over the three decades.

Among indirect taxes, the implicit VAT rate has trended sharply upward since 1999 after falling by nearly two points in the previous two decades. Changes in the implicit rate may reflect changes in the composition of consumption between goods taxed at different rates and between sectors with different possibilities of evasion.

For total indirect tax revenue, the long-term trend in the implicit rate indicates that in the absence of discretionary measures revenue would have risen much more slowly than nominal consumption until 1997, reflecting the presence of taxes levied on volume (energy product excise duties, stamp taxes and the like). In reconstructing discretionary measures, we have also taken account of the interventions on these taxes, to adjust revenue to price trends. The role of fixed-sum taxes in the downtrend in the implicit rate is confirmed by the fact that the decline was due only minimally to VAT (the implicit VAT rate fell by less than 2 percentage points between 1980 and 1997, compared with a 7-point fall for total indirect taxes). For indirect taxes too, the incidence of the levy turned upward again in the late 1990s.

The fluctuations of the trend component of the implicit tax rate indicate that the hypothesis of constant elasticity of revenue to the macroeconomic variable proxying the tax base constitutes quite an unrealistic assumption. It also indicates that revenue dynamics are determined by other variables in addition to those that are used to calculate the denominator of the implicit rates and that are ordinarily taken into account in forecasting models and cyclical budget adjustment techniques. The rest of the analysis here is given over to these additional variables.

Our examination of the structural component of the overall implicit tax rate (direct plus indirect taxes), net of discretionary measures, offers quite an interesting picture. There are three sub-periods, each with its own dynamics (Figure 4):

- all of the 1980s, when the tax system produced rising revenue, regularly outpacing GDP growth; the increase was driven by high inflation;
- the following decade, when the incidence of taxation would have diminished in the absence of discretionary interventions, above all owing to the presence of volume levies (excises and stamp taxes), which are set in nominal terms and therefore require discretionary action merely to retain their real value;

- the period since the turn of the century, when the previous decade's downtrend was reversed and the tax incidence began to rise again. The data on effective revenue show that this recovery emerged forcefully only in 2006, but the trend of the series net of discretionary measures indicates that the increase of tax revenue in proportion to GDP actually began around 2000. However, it was not reflected immediately in actual revenue owing to tax reliefs enacted during the period and to the loss of a part of the substitute tax on investment income in connection with the tax credits accrued by investment funds in 2001.

5. Econometric analysis

So far, we have seen that the ratio of tax revenue to the macroeconomic tax base is not constant over time, even after adjusting for discretionary measures and erratic and cyclical factors. To explain the variance of implicit tax rates, we have performed a number of regressions, one for each of the six components of revenue. The dependent variable is the trend in the implicit rate. The choice of regressors was heuristic: rather than taking a specification consistent with some theoretical model, we elected to take the variables best suited to capture changes in the tax incidence. On the whole the equations estimated show a satisfactory fit and offer results whose economic interpretation is convincing (Table 5a).

The incidence of withholding tax on total wages and salaries, the component whose trend growth outpaces that of the tax base, is strongly correlated with a variable representing the interaction between inflation and the degree of progression of the tax[32]. This variable captures the effects of fiscal drag, which remain significant even after correcting for discretionary measures. The importance of this regressor offers further confirmation that measures to offset fiscal drag have generally been only partial, as Table 4 shows. The implicit rate is also significantly correlated with the portion of pensions in total wages and salaries. This is not surprising, as pensions are a component of the legal tax base subject to withholding but are not included in the denominator used in calculating this rate. The regressors also include an indicator of the degree of inequality in the distribution of reported incomes, which is important because of the progressive structure of the tax[33]. The specification of the model also includes a dummy for 1983, the year of a major reform of the tax structure whose effects were only partially captured by the adjustment for discretionary measures.

[32] The degree of progression was measured by and index of Liability Progression (LP), calculated for levels of incomes of a scale of income equivalent in real terms.
[33] The inequality was measured by the share of income reported by the 5 per cent richest tax payers.

The business income taxes are harder to model, in part because of the greater divergence between their actual tax base and the macroeconomic proxy used. The incidence of self-assessed income tax on gross operating surplus confirms the positive correlation with inflation and the degree of progression of the tax. However, income inequality did not prove significant, so it was excluded from the definitive model. Finally, part of the variance of this component of income tax is explained – negatively – by the proceeds of tax amnesties and one-off substitute levies, such as the tax on the revaluation of firms' assets. The proceeds from these taxes are not included in the tax rate numerator, because they are eliminated in the adjustment for one-off measures. In addition to a negative impact on tax compliance, this variable might also capture the effects of possible liquidity constraints induced by extraordinary payments in connection with amnesties and condonations. The variable proved to be significant for self-assessed income tax but not for the corporation tax, suggesting that smaller firms have greater possibilities for evasion, which produces a closer correlation with institutional factors, such as the payment of amounts due for amnesties, than with the economic cycle.

A measure of the output gap for the private sector was excluded from the self-assessed income tax equation because it was insignificant. But it was factored into the equation for the corporate income tax, which stands confirmed as the revenue component most responsive to the economic cycle. The incidence of the tax is also affected by the way the tax base is distributed among sectors and taxpayers characterized by differing possibility of evasion. We considered three segments: listed firms, banks, and major retailers. The latter did not prove to be significant, presumably owing to difficulty in finding an adequate proxy over such an extended period of time. An important role in explaining the implicit tax rate was played by the profitability (ROE) of banks and that of listed firms (dividends). Finally, there was a negative correlation with the price of oil, a variable that could represent the energy costs for firms and external shocks to the economy[34].

The equation for total direct tax revenue is broadly consistent with those for its three main components. The importance of inflation, combined with the progression of the tax, stands confirmed, as does that of the degree of income inequality, owing to its effect on the proceeds of withholding tax on dependent workers. The importance of tax amnesties is confirmed, owing to the negative effect on the self-assessed income tax of the self-employed, as is that of bank profitability, which is correlated with the trend in corporate income tax receipts. In addition to the variables already used in the regressions of the three components, a positive role is also played by a variable proxying for market interest rates, owing to its effects on the substitute tax on investment income.

[34] Among the exogenous variables it was initially included also an index of prices of financial assets, but the relative coefficients was not significant. The same result for Italy was obtained also by Morris and Schuknecht (2007).

Turning to indirect taxes, the equation for VAT shows that its incidence on consumption is positively and significantly correlated with public investment, a component of the tax base that is excluded from the denominator of the implicit tax rate. There is also a positive and significant correlation with the private-sector output gap. In deciding on the regressors, we hypothesized that the implicit VAT rate can be affected by changes in the composition of consumption between sectors with different possibilities for evasion, considering such sectors as retail chains, durable goods and energy. Only this latter factor showed a variable adequately capturing the phenomenon: the positive correlation of the implicit tax rate with the price of oil can be read as a shift in the composition of consumption towards products – energy – that are less subject to evasion.

For total indirect tax revenue, the variance of the endogenous variable is explained by two factors that proved significant in the equation for VAT receipts (VAT accounts for over 50 per cent of total indirect taxes): i) public investment; and ii) the price of oil. Two other variables potentially correlated with VAT proved to be significant only in this equation, where their importance is probably amplified by the fact that they also affect the revenue generated by other indirect taxes. These are the share of durable goods in total household consumption and the intermediate consumption of general government. The coefficient of inflation, which appears with a negative sign, is also significantly different from zero, because in periods of rapid inflation the receipts from excise taxes decrease in relative importance.

Trends in implicit tax rates are also affected by changes in tax compliance. To take this factor into account, initially the six equations included a variable representing the degree of consistency between reported personal incomes and the corresponding national accounts aggregate. In the final estimates this variable was omitted, in part because it was not exogenous and in part because it could not be used for any non-tautological explanation of the evolution of tax incidence.

In contrast to findings for other countries, house prices appear to have no influence on trends in tax revenue.

6. Conclusion

To analyze the evolution of tax revenue in Italy between 1978 and 2006, we first purged the time series both of discretionary measures (reconstructed for the entire period, tax by tax) and of erratic and cyclical factors. The adjusted series were then each put in relation with a macroeconomic variable proxying for its legal tax base; this generated implicit tax rates, whose trend component was isolated.

The data on actual revenue show a sharp deceleration beginning in the mid-1980s and intensifying between 2001 and 2005. Adjusting for discretionary measures attenuates this recent stagnation. Transforming in implicit tax rates and eliminating the cyclical and erratic components, the deceleration of revenue in the mid-1980s disappears, and it appears that the incidence of taxation rose continually from the start of that decade to reach historically high levels.

Regressions on the trend of implicit rates offer additional indications concerning the elasticity of revenue to the tax base. We reach four principal conclusions.

1) Once adjusted for discretionary measures and erratic components, tax revenue rises in line with the tax base but is also affected by other factors. Some of these gauge the divergence between the legal tax base and its macroeconomic proxy, which helps to reduce measurement error. Others capture changes in the structure of the economy that affect tax incidence.

2) The increase in revenue outpaces that of the tax base in certain circumstances: accelerating inflation (in connection with fiscal drag); increase in the share of bank profits, in the volume of listed firms' dividends, in the share of household spending allocated to durables or energy (factors that signal a shift in the composition of value added towards sectors with less opportunity for tax evasion); rising nominal interest rates (owing to the role of the flat-rate withholding tax on investment interest income); and increasing income inequality (owing to the progressive structure of the income tax).

3) There is a difference between the conduct of large corporations (subject to the corporate income tax) and that of small businesses and self-employed workers (who mainly pay personal income tax). For the former the empirical evidence indicates that the tax on corporate earnings is the revenue component most responsive to economic trends. It increases at a higher rate than the tax base during expansive phases and at a lower rate during recessive ones. And the incidence of this tax is negatively correlated with the price of oil. For small businesses and the self-employed, tax revenue depends more on institutional factors than on cyclical conditions.

4) The empirical evidence thus shows that the time series for revenues, adjusted for discretionary measures and erratic factors, are explained effectively by models that, even while assuming constant elasticity with respect to the tax base, factor in other variables as well. Basically, our analysis tends to attribute the variability of tax elasticities, on which the empirical literature has focused of late, to the omission of variables that appreciably influence the system's revenue capacity.

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Table 1 - Effects of discretionary measures

(amounts in billion of euros)

	Temporary measures		Permanent measures					
	Total	of which concerning permanent taxes	Total direct taxes (1)	Withholding tax on employees (1)	Self-assessed personal income tax (1)	Corporate income tax Irpeg/Ires (1)	Total indirect taxes (2)	VAT
1978	0.3	0.2	0.2	0.0	0.0	0.0	0.6	0.2
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.3
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.3
1982	2.5	0.3	-0.1	-0.5	0.0	0.0	1.5	0.4
1983	4.3	0.0	-1.2	-1.9	-0.5	0.5	5.4	2.5
1984	1.2	0.0	1.8	0.0	0.0	0.8	0.5	0.0
1985	0.5	0.0	1.8	0.0	0.8	0.0	0.8	0.4
1986	0.3	0.0	-2.0	-2.2	-0.3	0.0	3.2	0.5
1987	0.1	0.0	0.0	0.0	0.0	0.0	1.3	0.5
1988	2.3	1.9	0.5	-0.6	0.0	0.0	4.3	2.3
1989	0.9	0.0	-1.3	-2.5	0.2	0.8	4.6	2.1
1990	0.2	0.0	-0.4	-1.0	0.0	0.0	5.1	0.0
1991	4.4	1.3	-0.1	-0.2	0.6	0.3	5.4	0.3
1992	15.3	0.0	8.4	3.7	3.5	1.2	1.8	0.0
1993	7.8	0.0	-1.2	0.0	0.0	0.5	0.6	1.1
1994	4.7	1.3	0.9	0.0	0.0	0.9	1.3	0.6
1995	10.0	0.7	1.0	0.0	0.5	0.5	4.5	1.9
1996	8.1	1.8	1.1	-0.5	0.3	1.4	1.9	0.0
1997	14.3	3.1	0.0	0.0	0.0	0.0	0.7	0.4
1998	7.8	0.0	7.4	3.0	1.9	1.5	3.6	3.6
1999	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	1.0	0.0	-8.8	-5.4	-3.4	0.0	-0.7	0.0
2001	9.3	0.0	-5.9	-1.9	-1.0	-0.8	-0.4	0.0
2002	9.3	0.0	-2.5	-1.3	-1.0	0.0	0.0	0.0
2003	17.3	0.0	-8.4	-4.3	-2.1	-1.7	0.2	0.0
2004	19.5	1.1	0.7	0.0	0.8	0.0	0.0	0.0
2005	2.2	0.0	-2.1	-4.0	-0.9	2.8	1.6	0.0
2006	8.9	2.4	4.7	0.0	1.7	3.0	0.0	0.0
2007	1.9	0.4	0.0	0.0	0.0	0.0	0.0	0.0

Sources: for permanent measures and for temporary effects concerning permanent taxes, information taken from ex-ante estimation included in the budget law (see Bank of Italy Bullettins, different years) matched with ex-post comments taken from Bank of Italy Annual Report (different years) and Morcaldo (2005). For temporary taxes, central government budget.

(1) The amonuts of the effects is consistent with the definition of revenues used in this paper (cash revenues of central government budget with firms' tax and dependet workers taxes calculated adding to the accounts of year t the settlement payment of year *t+1*); they cannot then be applied to the revenues of the general governement accout of the National Accounts statistics.

(2) It does not include the effects of measure concerning lottery, since this component of the revenue has not been included in the aggregate used in the analyses.

Table 2a - Choice of the model with the best fitting

(series concerning revenue as recorded in th budget)

	logarithmics				implict tax rate			
	σ	R^2_d	Q	Norm	σ	R^2_d	Q	Norm
Direct taxes								
LLTM	0.051	0.770	10.354	2.394	0.006	0.577	12.260	2.985
$\sigma_\varsigma=0$	0.077	0.417	8.701	0.088	**0.006**	**0.614**	**4.931**	**3.628**
$\sigma_\eta=0$	**0.051**	**0.770**	**6.249**	**2.394**	0.006	0.577	5.998	2.985
$\sigma_\omega=\sigma_{\omega^*}=0$	0.059	0.693	6.727	0.970	0.006	0.530	6.320	0.787
Indirect taxes								
LLTM	0.042	0.650	4.782	0.413	0.006	0.392	5.621	0.173
$\sigma_\varsigma=0$	0.063	0.199	4.806	1.681	0.006	0.392	3.186	0.173
$\sigma_\eta=0$	**0.042**	**0.650**	**4.156**	**0.413**	**0.006**	**0.449**	**3.303**	**0.078**
$\sigma_\omega=\sigma_{\omega^*}=0$	0.047	0.549	4.445	0.478	0.006	0.392	2.427	0.173
Withholding tax on employee								
LLTM	0.043	0.819	6.717	0.826	0.007	0.582	8.222	1.273
$\sigma_\varsigma=0$	0.087	0.270	8.684	2.261	**0.006**	**0.601**	**8.129**	**2.199**
$\sigma_\eta=0$	**0.043**	**0.819**	**5.636**	**0.826**	0.007	0.522	6.914	1.384
$\sigma_\omega=\sigma_{\omega^*}=0$	0.047	0.787	4.963	2.711	0.007	0.503	3.969	2.274
Self assessed personal tax (small business)								
LLTM	0.089	0.439	4.194	3.461	**0.003**	**0.398**	**4.516**	**0.198**
$\sigma_\varsigma=0$	0.108	0.171	6.109	1.117	0.003	0.292	7.809	0.096
$\sigma_\eta=0$	**0.086**	**0.475**	**2.986**	**2.343**	0.003	0.380	5.123	0.341
$\sigma_\omega=\sigma_{\omega^*}=0$	0.089	0.439	2.795	3.461	0.003	0.285	5.583	0.116
Corporate income tax								
LLTM	0.081	0.533	7.366	1.542	0.002	0.518	6.033	0.529
$\sigma_\varsigma=0$	0.089	0.438	6.949	0.341	**0.002**	**0.518**	**4.654**	**0.529**
$\sigma_\eta=0$	**0.080**	**0.546**	**5.073**	**1.505**	0.002	0.518	4.654	0.529
$\sigma_\omega=\sigma_{\omega^*}=0$	0.095	0.366	6.091	1.625	0.003	0.169	7.471	0.855
VAT								
LLTM	0.048	0.568	6.563	3.746	0.003	0.230	3.692	4.780
$\sigma_\varsigma=0$	0.072	0.049	4.496	4.397	**0.003**	**0.230**	**3.246**	**4.780**
$\sigma_\eta=0$	**0.046**	**0.611**	**4.634**	**4.563**	0.004	0.025	1.879	4.922
$\sigma_\omega=\sigma_{\omega^*}=0$	0.054	0.455	2.310	0.925	0.004	0.029	3.760	2.291

For each of the 6 aggregate of taxes, 4 models are estimated and the one with the best fitting is stressed with different colour. Equations are estimated ofr the years 1978-2007. LLTM is the local linear model without restrictions; σς=0 is the model with constant slope; ση=0 refer to a model in which the trend is a I(2) process; σω=σω*=0 eliminets the cycle. The fitting of each model has been done on the bases of 4 statistics: the standard error; the coefficient of determination; the test of autocorrelation Box-ljung; the test of normality of Doornik and Hansen.

Table 2b - Choice of the model with the best fitting

(series concerning revenue adjusted for temporary measures)

	logarthimcs				implicit tax rates			
	σ	R^2_d	Q	Norm	σ	R^2_d	Q	Norm
Direct taxes								
LLTM	0.049	0.752	7.055	1.667	0.005	0.444	6.200	0.314
$\sigma_\varsigma=0$	0.075	0.403	5.729	0.189	**0.005**	**0.506**	**5.510**	**0.216**
$\sigma_\eta=0$	**0.049**	**0.752**	**6.805**	**1.667**	0.005	0.444	5.943	0.314
$\sigma_\omega=\sigma_{\omega^*}=0$	0.056	0.674	8.732	3.357	0.006	0.317	10.453	0.637
Indirect taxes								
LLTM	0.039	0.675	8.762	1.623	0.005	0.624	5.559	2.158
$\sigma_\varsigma=0$	0.065	0.089	7.189	1.380	0.006	0.469	2.421	0.191
$\sigma_\eta=0$	**0.039**	**0.675**	**6.637**	**1.623**	**0.005**	**0.489**	**2.567**	**0.118**
$\sigma_\omega=\sigma_{\omega^*}=0$	0.044	0.589	5.387	0.717	0.006	0.469	2.159	0.191
Withholding tax on employee								
LLTM	0.043	0.820	6.819	0.729	0.007	0.586	7.772	1.246
$\sigma_\varsigma=0$	0.094	0.157	9.707	6.648	**0.006**	**0.604**	**7.550**	**2.479**
$\sigma_\eta=0$	**0.043**	**0.820**	**5.588**	**0.729**	0.007	0.526	6.274	1.297
$\sigma_\omega=\sigma_{\omega^*}=0$	0.047	0.790	4.980	2.827	0.007	0.511	3.736	2.487
Self assessed personal tax (small business)								
LLTM	0.089	0.439	4.194	3.461	**0.003**	**0.398**	**4.516**	**0.198**
$\sigma_\varsigma=0$	0.108	0.171	6.109	1.117	0.003	0.292	7.809	0.096
$\sigma_\eta=0$	**0.086**	**0.475**	**2.986**	**2.343**	0.003	0.380	5.123	0.341
$\sigma_\omega=\sigma_{\omega^*}=0$	0.089	0.439	2.795	3.461	0.003	0.285	5.583	0.116
Corporate income tax								
LLTM	0.083	0.524	6.074	1.832	0.002	0.548	6.258	0.543
$\sigma_\varsigma=0$	0.092	0.406	6.942	0.360	**0.002**	**0.548**	**5.278**	**0.543**
$\sigma_\eta=0$	**0.082**	**0.528**	**4.482**	**1.450**	0.002	0.548	5.278	0.543
$\sigma_\omega=\sigma_{\omega^*}=0$	0.092	0.409	4.800	2.615	0.003	0.258	7.389	1.335
VAT								
LLTM	0.049	0.560	5.378	5.132	**0.004**	**0.185**	**5.118**	**3.596**
$\sigma_\varsigma=0$	0.066	0.199	6.902	7.217	0.004	0.030	5.279	1.292
$\sigma_\eta=0$	**0.049**	**0.560**	**5.737**	**5.133**	0.004	0.012	4.260	1.681
$\sigma_\omega=\sigma_{\omega^*}=0$	0.056	0.419	4.635	2.261	0.004	0.030	5.061	1.292

For each of the 6 aggregate of taxes, 4 models are estimated and the one with the best fitting is stressed with different colour. Equations are estimated ofr the years 1978-2007. LLTM is the local linear model without restrictions; σς=0 is the model with constant slope; ση=0 refer to a model in which the trend is a I(2) process; σω=σω*=0 eliminets the cycle. The fitting of each model has been done on the bases of 4 statistics: the standard error; the coefficient of determination; the test of autocorrelation Box-ljung; the test of normality of Doornik and Hansen.

Table 2c - Choise of the model with the best fitting

(series concerning revenue adjusted for temporary and permanent measures)

	logaritmics				implict tax rate			
	σ	R^2_d	Q	Norm	σ	R^2_d	Q	Norm
Direct taxes								
LLTM	0.055	0.708	8.381	0.511	0.005	0.536	7.725	0.702
$\sigma_\varsigma=0$	0.076	0.443	10.827	1.252	**0.005**	**0.536**	**6.692**	**0.702**
$\sigma_\eta=0$	**0.055**	**0.708**	**7.876**	**0.511**	0.006	0.453	7.314	1.311
$\sigma_\omega=\sigma_{\omega^*}=0$	0.066	0.581	5.986	1.634	0.006	0.392	5.796	0.878
Indirect taxes								
LLTM	**0.034**	**0.664**	**10.169**	**0.388**	0.005	0.539	16.199	0.553
$\sigma_\varsigma=0$	0.051	0.256	10.221	0.588	0.006	0.421	9.369	0.555
$\sigma_\eta=0$	0.036	0.634	8.073	0.581	**0.005**	**0.539**	**13.878**	**0.553**
$\sigma_\omega=\sigma_{\omega^*}=0$	0.036	0.632	8.022	0.551	0.006	0.440	9.426	0.724
Withholding tax on employee								
LLTM	0.058	0.693	10.436	0.951	0.007	0.421	17.719	10.334
$\sigma_\varsigma=0$	0.088	0.305	7.701	1.892	**0.007**	**0.471**	**13.608**	**8.799**
$\sigma_\eta=0$	**0.058**	**0.693**	**9.415**	**1.444**	0.007	0.433	10.320	5.335
$\sigma_\omega=\sigma_{\omega^*}=0$	0.065	0.624	4.786	0.527	0.008	0.348	9.815	14.274
Self assessed personal tax (small business)								
LLTM	0.089	0.439	4.194	3.461	0.002	0.586	9.514	8.857
$\sigma_\varsigma=0$	0.108	0.171	6.109	1.117	0.002	0.586	9.278	8.857
$\sigma_\eta=0$	**0.086**	**0.475**	**2.986**	**2.343**	**0.002**	**0.588**	**7.771**	**3.512**
$\sigma_\omega=\sigma_{\omega^*}=0$	0.089	0.439	2.795	3.461	0.002	0.477	7.118	9.499
Corporate income tax								
LLTM	0.083	0.524	6.074	0.183	0.003	0.172	4.902	3.620
$\sigma_\varsigma=0$	0.092	0.406	6.942	0.360	**0.003**	**0.172**	**4.661**	**3.620**
$\sigma_\eta=0$	**0.082**	**0.528**	**4.482**	**1.450**	0.003	0.171	3.468	1.111
$\sigma_\omega=\sigma_{\omega^*}=0$	0.092	0.409	4.800	2.615	0.003	0.172	3.213	3.620
VAT								
LLTM	0.048	0.501	6.336	1.002	0.004	0.188	5.045	6.106
$\sigma_\varsigma=0$	0.065	0.090	2.401	12.449	0.004	0.028	3.252	3.827
$\sigma_\eta=0$	**0.048**	**0.501**	**5.333**	**1.002**	**0.004**	**0.188**	**5.034**	**6.106**
$\sigma_\omega=\sigma_{\omega^*}=0$	0.052	0.415	2.384	2.892	0.004	0.022	2.736	3.757

For each of the 6 aggregate of taxes, 4 models are estimated and the one with the best fitting is stressed with different colour. Equations are estimated ofr the years 1978-2007. LLTM is the local linear model without restrictions; σς=0 is the model with constant slope; ση=0 refer to a model in which the trend is a I(2) process; σω=σω*=0 eliminets the cycle. The fitting of each model has been done on the bases of 4 statistics: the standard error; the coefficient of determination; the test of autocorrelation Box-ljung; the test of normality of Doornik and Hansen.

Table 3a - Auxiliary residuals and regime changes

(logaritmics)

	ε_t		η_t		ζ_t	
	N	*K*	*N*	*K*	*N*	*K*
Direct taxes						
revenue as recorded in the budget	0.554	0.545	•	•	0.401	0.351
revenue adjusted for temporary measures	0.021	0.002	•	•	1.727	0.537
revenue adjusted for temp.and perm. measures	0.474	0.043	•	•	1.900	0.765
Indirect taxes						
revenue as recorded in the budget	0.569	0.281	•	•	0.507	0.003
revenue adjusted for temporary measures	0.851	0.313	•	•	0.673	0.361
revenue adjusted for temp.and perm. measures	0.504	0.453	0.928	0.037	0.613	0.577
Withholding taxes on employees						
revenue as recorded in the budget	0.965	0.857	•	•	0.824	0.335
revenue adjusted for temporary measures	0.896	0.779	•	•	0.833	0.321
revenue adjusted for temp.and perm. measures	0.716	0.065	•	•	2.109	0.149
Self assessed personal tax (small business)						
revenue as recorded in the budget	0.922	0.814	4.288	0.941	1.856	0.034
revenue adjusted for temporary measures	0.922	0.814	4.288	0.941	1.856	0.034
revenue adjusted for temp.and perm. measures	0.922	0.814	4.288	0.941	1.856	0.034
Corporate income tax						
revenue as recorded in the budget	1.048	1.043	•	•	0.762	0.759
revenue adjusted for temporary measures	0.540	0.539	•	•	0.861	0.827
revenue adjusted for temp.and perm. measures	0.540	0.539	•	•	0.861	0.827
VAT						
revenue as recorded in the budget	0.029	0.022	•	•	0.735	0.563
revenue adjusted for temporary measures	0.291	0.063	•	•	0.679	0.423
revenue adjusted for temp.and perm. measures	0.792	0.223	•	•	0.765	0.651

The table presents the valueof the test of Normality (N) and Kurtosis (K) applied to the auxiliary residuals given by the decomposition in strustural components. The first two columns contains the results relative to the iiosincratic component, while the successive 4 refer to the shock to the level and to the slope of the trend.

Table 3b - Auxiliary residuals and regime changes

(implicit tax rate)

	ε_t		η_t		ζ_t	
	N	*K*	*N*	*K*	*N*	*K*
Direct taxes						
revenue as recorded in the budget	0.738	0.505	1.287	0.043	●	●
revenue adjusted for temporary measures	0.349	0.268	0.065	0.029	●	●
revenue adjusted for temp.and perm. measures	2.964	0.500	0.197	0.097	●	●
Indirect taxes						
revenue as recorded in the budget	0.968	0.637	●	●	0.464	0.414
revenue adjusted for temporary measures	1.128	0.985	●	●	0.774	0.704
revenue adjusted for temp.and perm. measures	0.349	0.202	●	●	0.775	0.607
Withholding taxes on employees						
revenue as recorded in the budget	0.555	0.550	4.062	1.258	●	●
revenue adjusted for temporary measures	0.462	0.443	4.181	1.394	●	●
revenue adjusted for temp.and perm. measures	0.915	0.190	3.589	3.501	●	●
Self assessed personal tax (small business)						
revenue as recorded in the budget	1.473	0.328	1.131	1.076	0.364	0.331
revenue adjusted for temporary measures	1.473	0.328	1.131	1.076	0.364	0.331
revenue adjusted for temp.and perm. measures	13.839**	11.28**	●	●	1.674	1.522
Corporate income tax						
revenue as recorded in the budget	1.236	0.302	0.046	0.003	●	●
revenue adjusted for temporary measures	0.408	0.238	0.061	0.035	●	●
revenue adjusted for temp.and perm. measures	0.270	0.121	0.333	0.063	●	●
VAT						
revenue as recorded in the budget	0.189	0.135	3.634	1.247	●	●
revenue adjusted for temporary measures	0.506	0.106	0.954	0.583	1.710	1.580
revenue adjusted for temp.and perm. measures	0.651	0.237	●	●	2.162	0.840

The table presents the valueof the test of Normality (N) and Kurtosis (K) applied to the auxiliary residuals given by the decomposition in strustural components. The first two columns contains the results relative to the iiosincratic component, while the successive 4 refer to the shock to the level and to the slope of the trend.

Table 4 - Measures for pers. income tax and withholding taxes on investment income

(billion of euros)

	Personal income tax					Withholding tax on investment income (1)	
	increase in tax credit for family dependents	increase in tax credit for kinds of income	selective increase of some tax credits	change in the tax schedule	index of progression (2)	change in the rate	change in the payment
1978				no	1.9	yes	yes
1979			yes	no	1.9	no	no
1980	yes	yes	yes	no	1.9	no	yes
1981	yes	yes	yes	no	1.9	yes	no
1982	yes	yes	yes	no	1.8	yes	yes
1983	yes	yes		structural reform	1.6	yes	no
1984	yes	yes		no	1.9	no	yes
1985	yes	yes		no	1.8	no	no
1986	yes	yes		structural reform	1.7	yes	yes
1987	yes			no	1.7	no	no
1988	yes	yes	yes	no	1.6	yes	yes
1989	yes	yes	yes	structural reform	1.6	no	no
1990	yes			yes	1.7	no	no
1991	yes		yes	yes	1.7	no	yes
1992				structural reform	1.8	no	no
1993			yes	no	1.7	no	yes
1994	yes		yes	no	1.7	no	no
1995			yes	no	1.7	yes	no
1996			yes	no	1.6	yes	yes
1997			yes	no	1.6	no	yes
1998	yes	yes		structural reform	1.6	yes	no
1999			yes	no	1.6	no	yes
2000	yes	yes	yes	yes	1.7	no	no
2001			yes	structural reform	1.7	no	no
2002			yes	no	1.7	no	no
2003	no	yes		structural reform	2.1	no	no
2004				no	2.1	no	no
2005	yes			structural reform	2.0	no	no
2006				no	2.0	no	no
2007	yes	yes		structural reform		no	no

(1) In Italy investment income is subjetc to a proportional withholding tax; only in few limited cases it is included in the personal income tax.

(2) It has been calculated as average of local progressivity indexes (LP) calculated for levels of income equivalent in real terms.

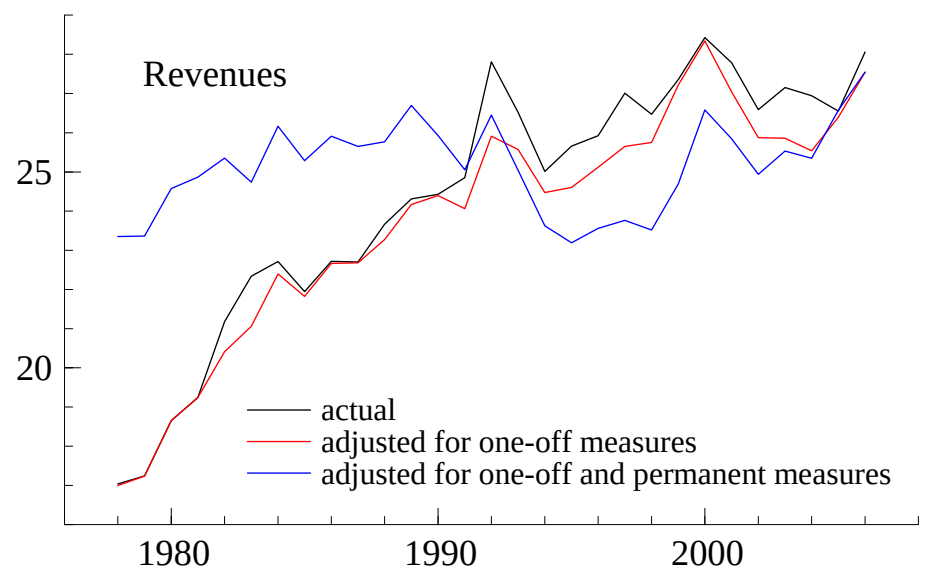
Table 5 - Implicit tax rate trend estimation

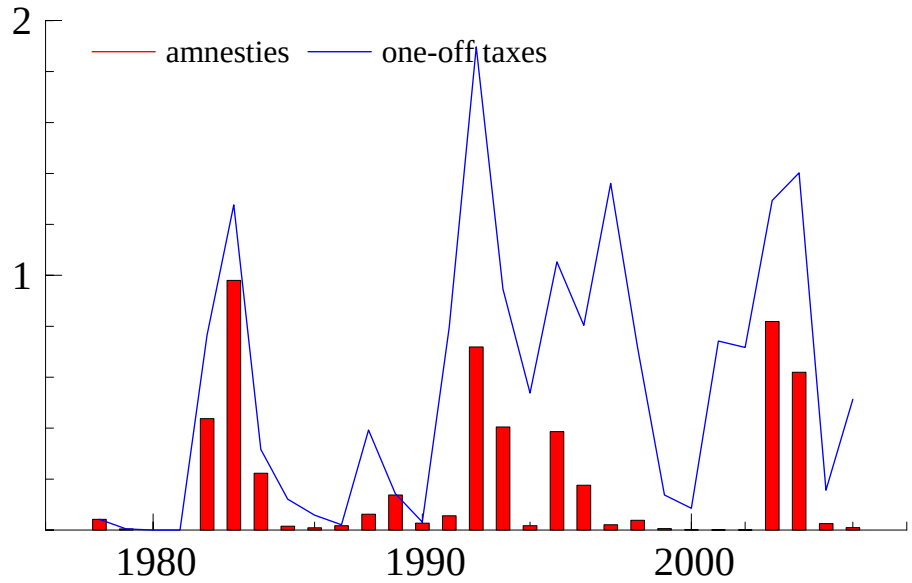
	endogenously variables					
	Total direct taxes	Withholding tax on employees	Self-assessed personal income tax	Corporate income tax	Total indirect taxes	VAT
Constant	-0.002	-0.067	-0.002	0.033	0.146	0.039
	(-0.118)	*(-3.062)*	*(-0.604)*	*(22.611)*	*(8.980)*	*(6.452)*
Output gap (private sector)				0.049		0.077
				(2.009)		*(3.189)*
Inflation			0.005		-0.052	
			(8.589)		*(-13.247)*	
Petrol price				0.000	0.011	0.0152
				(-6.5426)	*(5.595)*	*(11.816)*
Amnesties and temporary taxes on firms	-0.132		-0.047			
	(-2.015)		*(-1.803)*			
ROE for Italian banks	0.115			0.076		
	(5.260)			*(4.670)*		
Ineterest rate	0.000					
	(3.811)					
Listed corporations dividend				0.180		
				(4.129)		
Inflation by progression index	0.011	0.031				
	(5.597)	*(11.513)*				
Progression index			0.012			
			(6.629)			
Share of income of the 5% richest	0.405	1.309				
	(4.709)	*(8.973)*				
Share of pensions in total wages and salaries		-0.092				
		(-4.294)				
Publlic investement					0.329	0.249
					(5.030)	*(7.714)*
Public counsumption / total consumption					0.962	
					(3.565)	
Share of durables goods					0.21	
					(2.247)	
Dummy year 1983		0.017				
		(2.938)				
Dummy year 1979						0,009
						(3.242)
R2	0.98	0.989	0.82	0.808	0.98	0.90
autocorrelation test	0.58	0.04	0.10	0.11	0,09	0.16

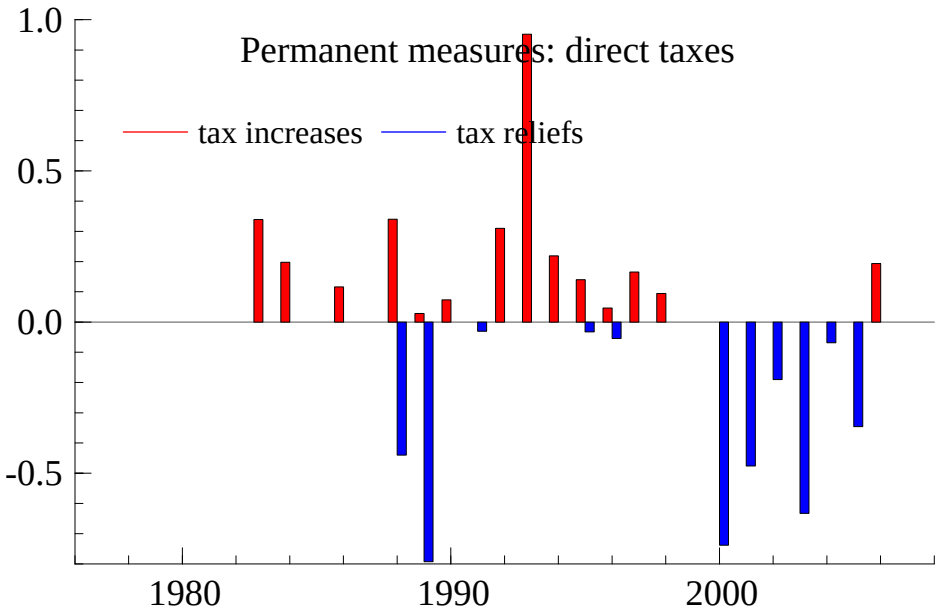
NOTE: OLS Estimation. t-ratio in brakets.

Fig.1 - Revenues, one-off and permanent discretionary measures in the years 1978-2006

(as a percentage of GDP)







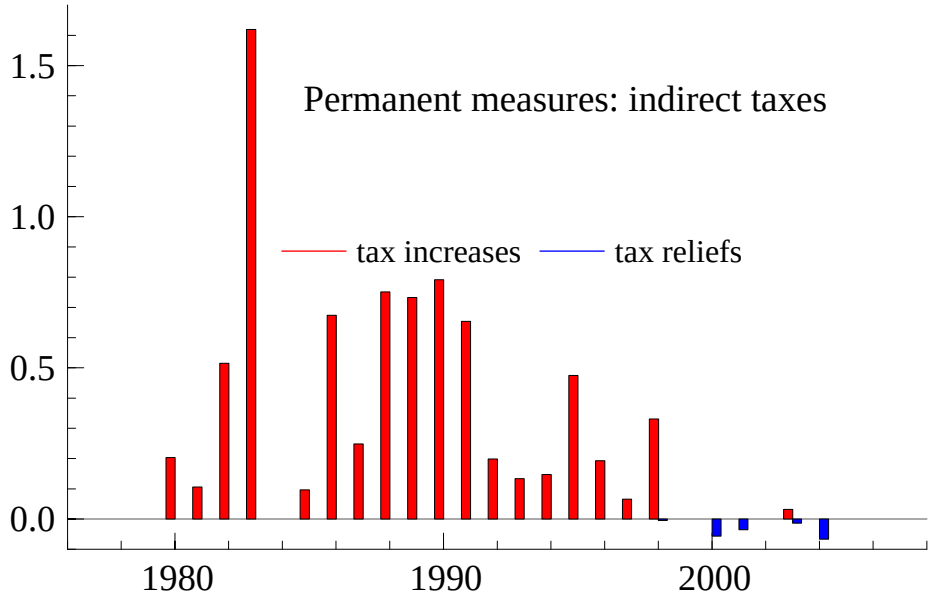


Fig.2a: Actual revenues in the years 1978-2006

(all series are logarithms)

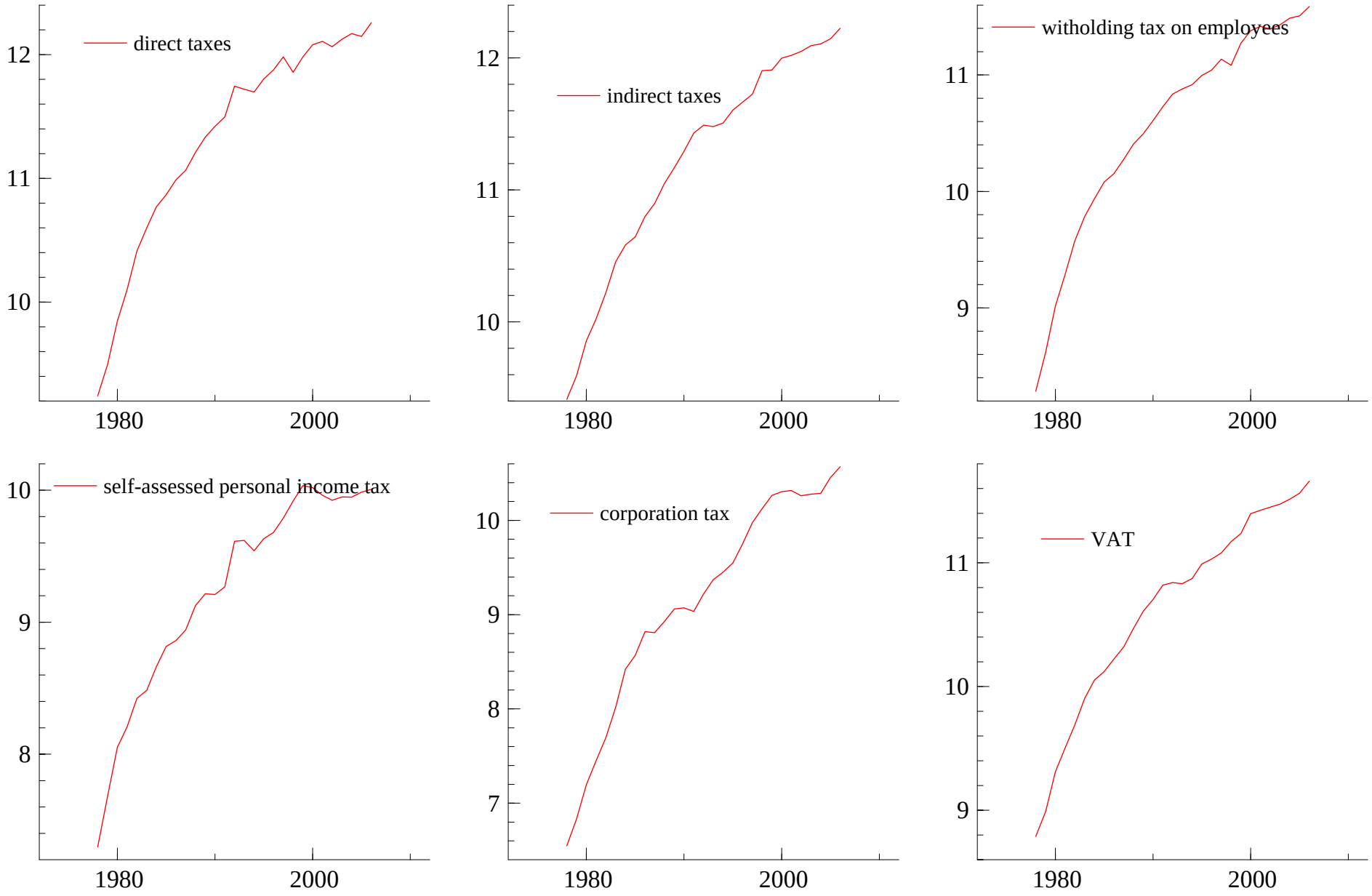


Fig.2b: Revenues adjusted for one-off measures in the years 1978-2006

(all series are logarithms)

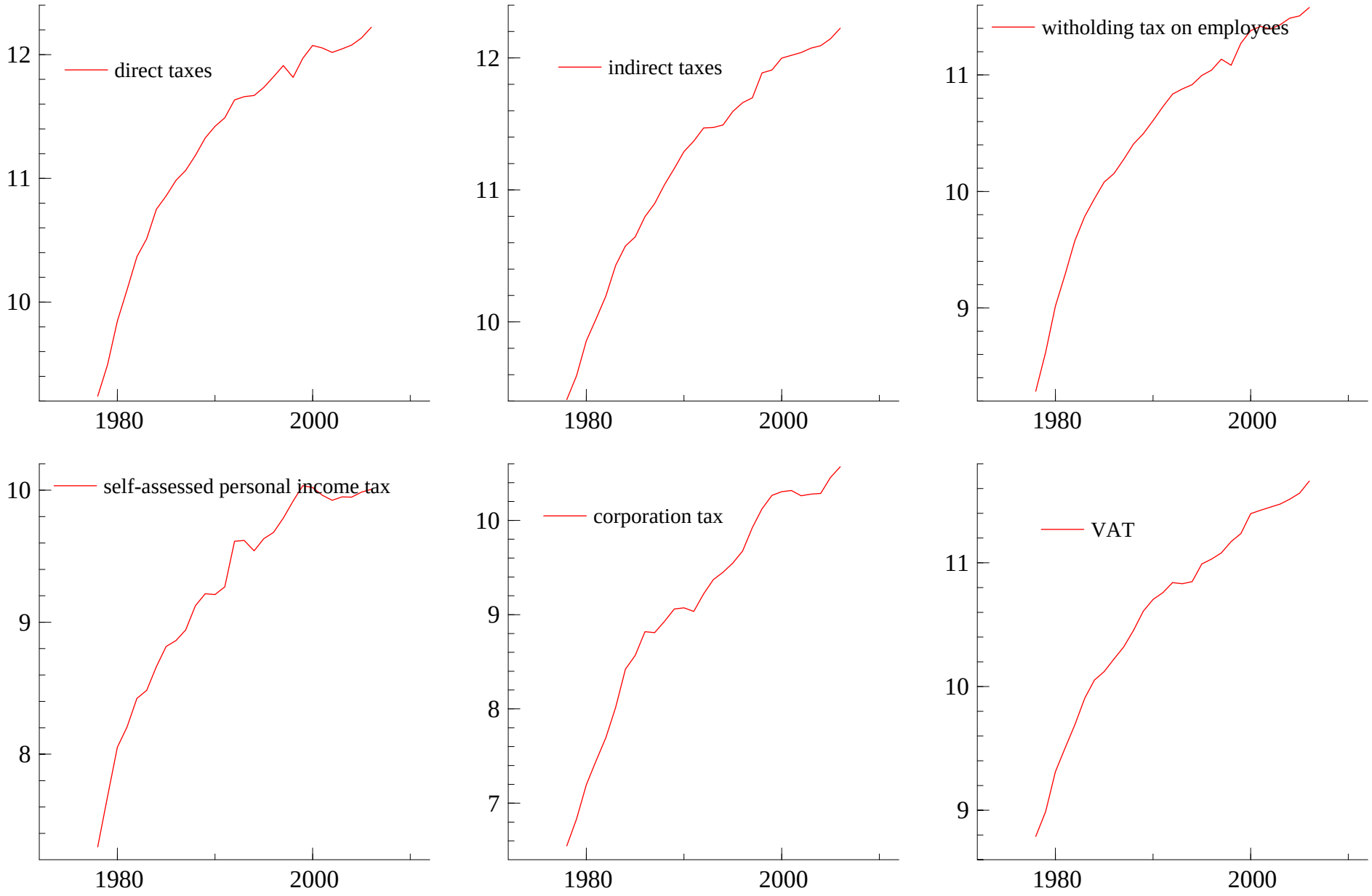


Fig.2c: Revenues adjusted for one-off and permanent measures in the years 1978-2006

(all the series are logarithms)

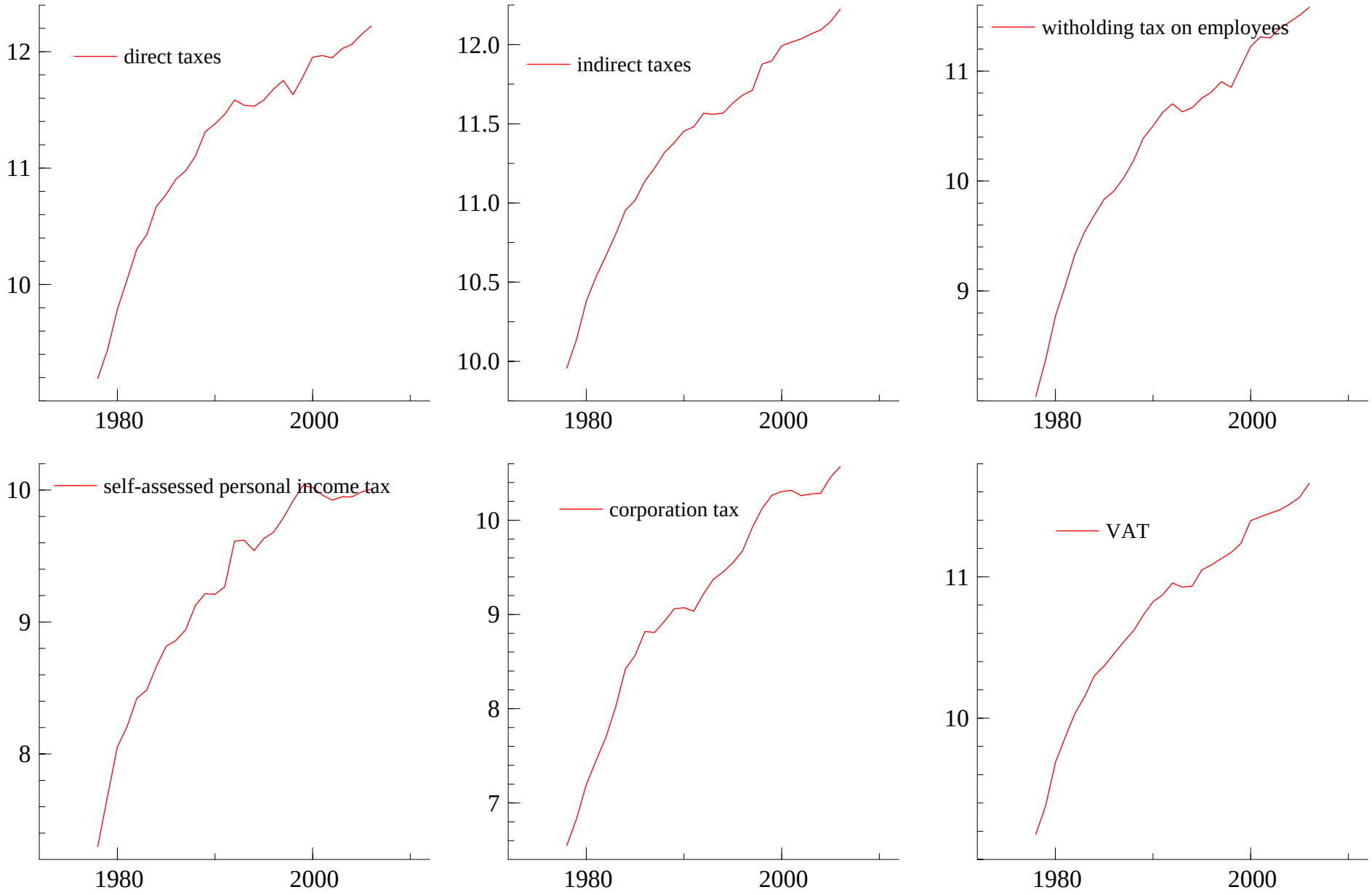
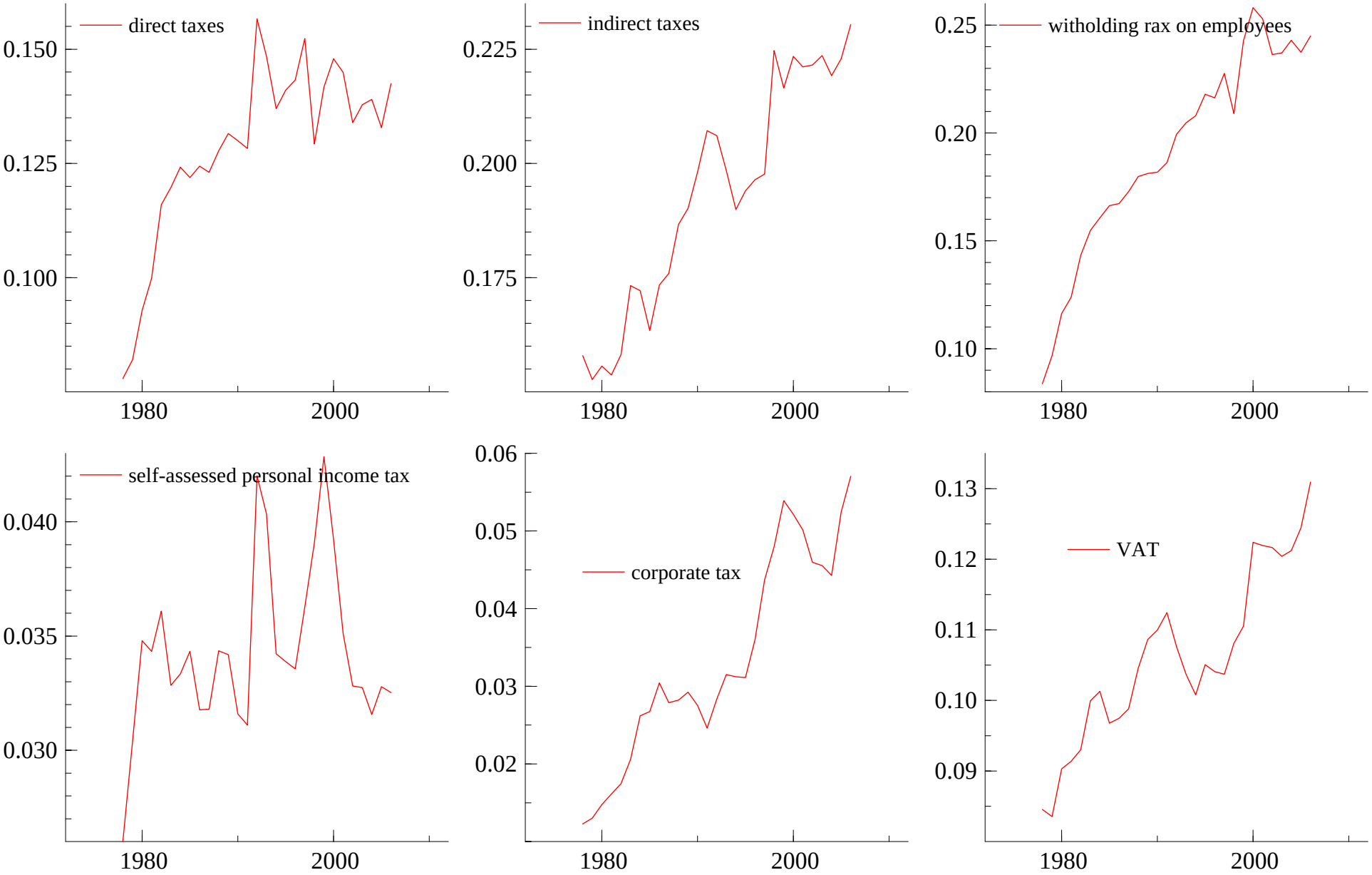


Fig.2d: Actual revenues in the years 1978-2006

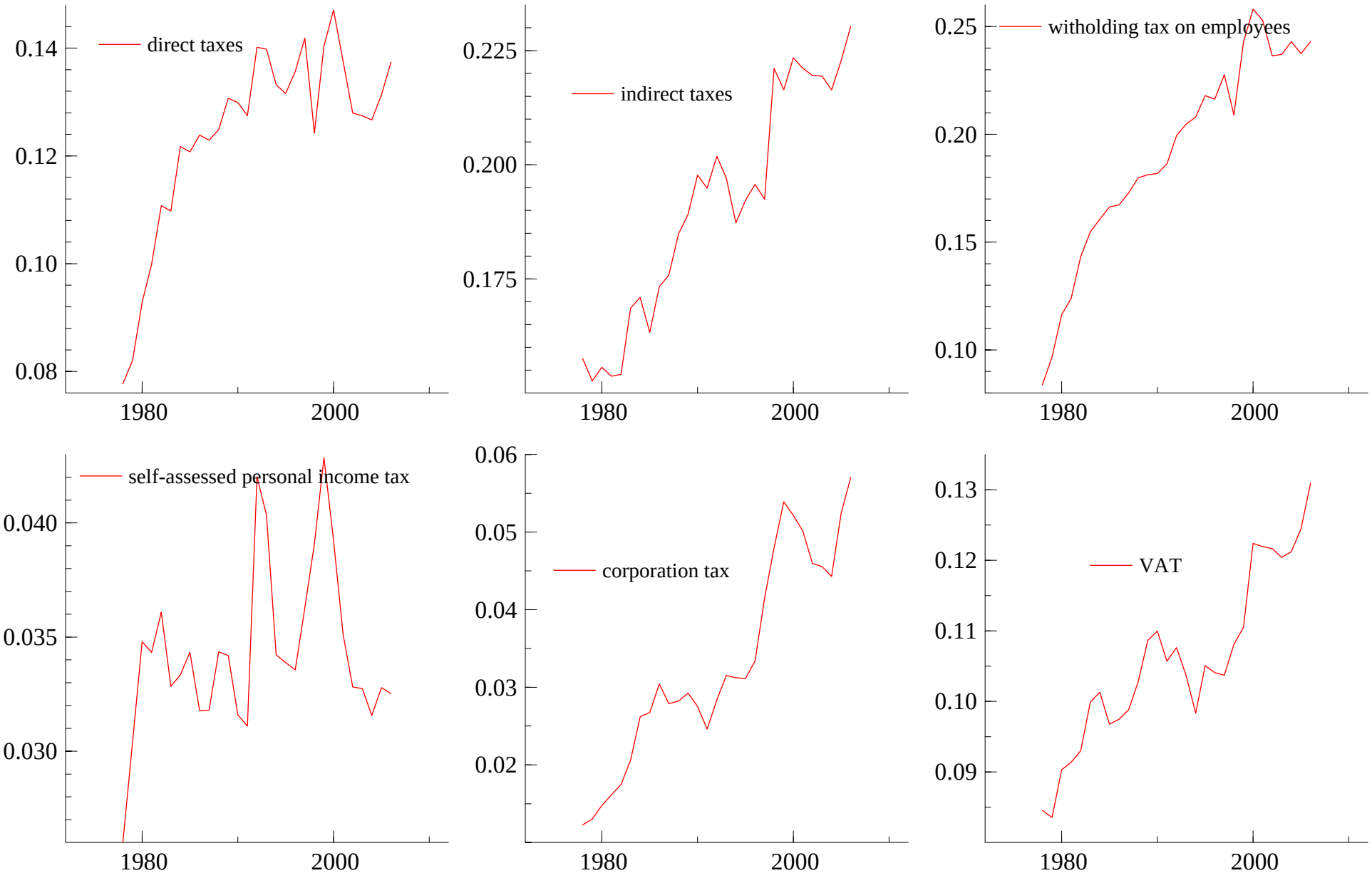
(implicit tax rates)



NB: the tax base for each revenue item is indicated in section 4

Fig.2e: Revenues adjusted for one-off measures in the years 1978-2006

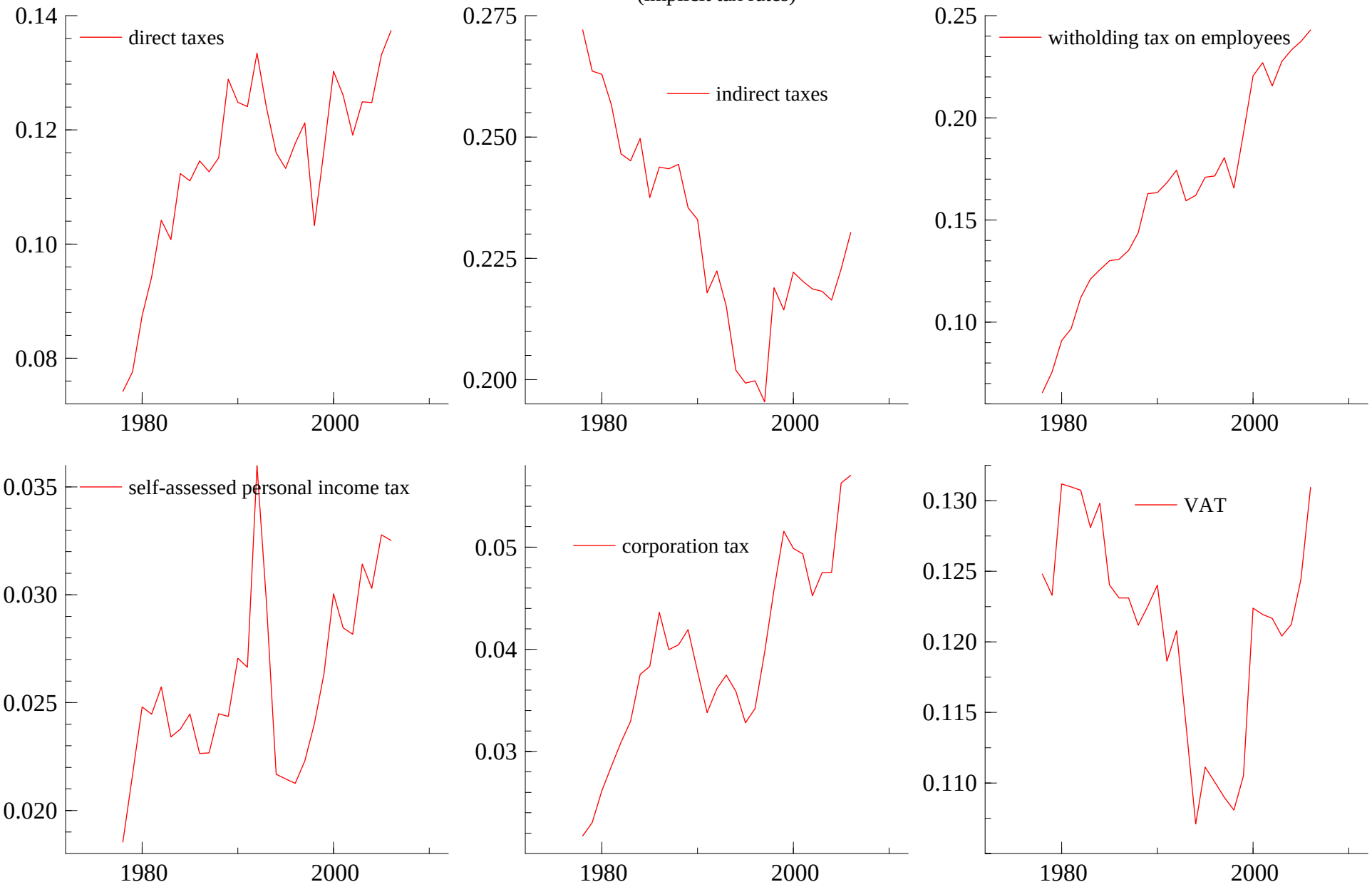
(implicit tax rates)



NB: the tax base for each revenue item is indicated in section 4

Fig.2f: Revenues adjusted for one-off and permanent measures in the years 1978-2006

(implicit tax rates)



NB: the tax base for each revenue item is indicated in section 4

Fig.3a: Revenues and trend components

(all the series are expressed in logarithms)

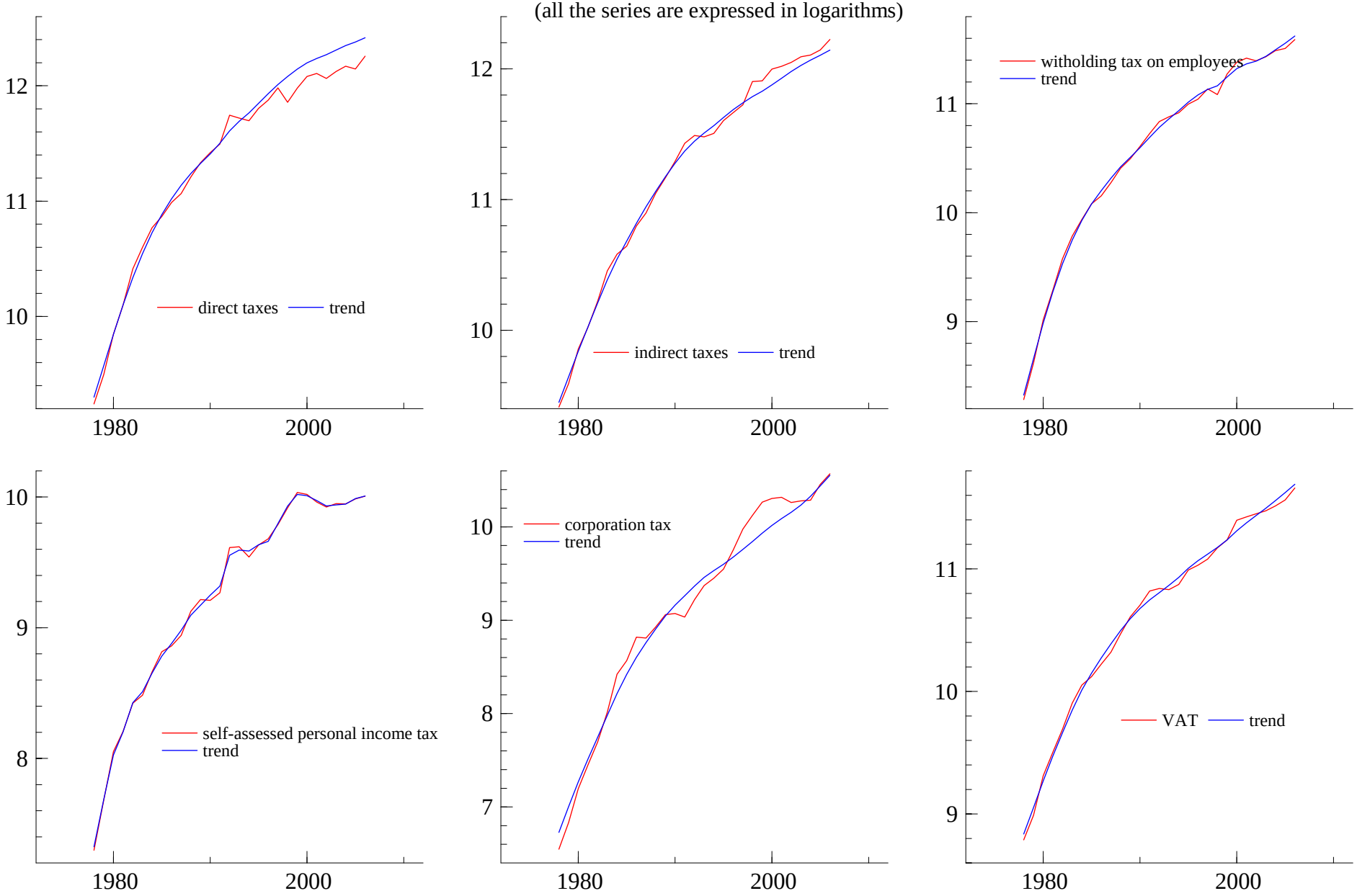


Fig.3b: Revenues adjusted for one-off measures and trend components

(all the series are expressed in logarithms)

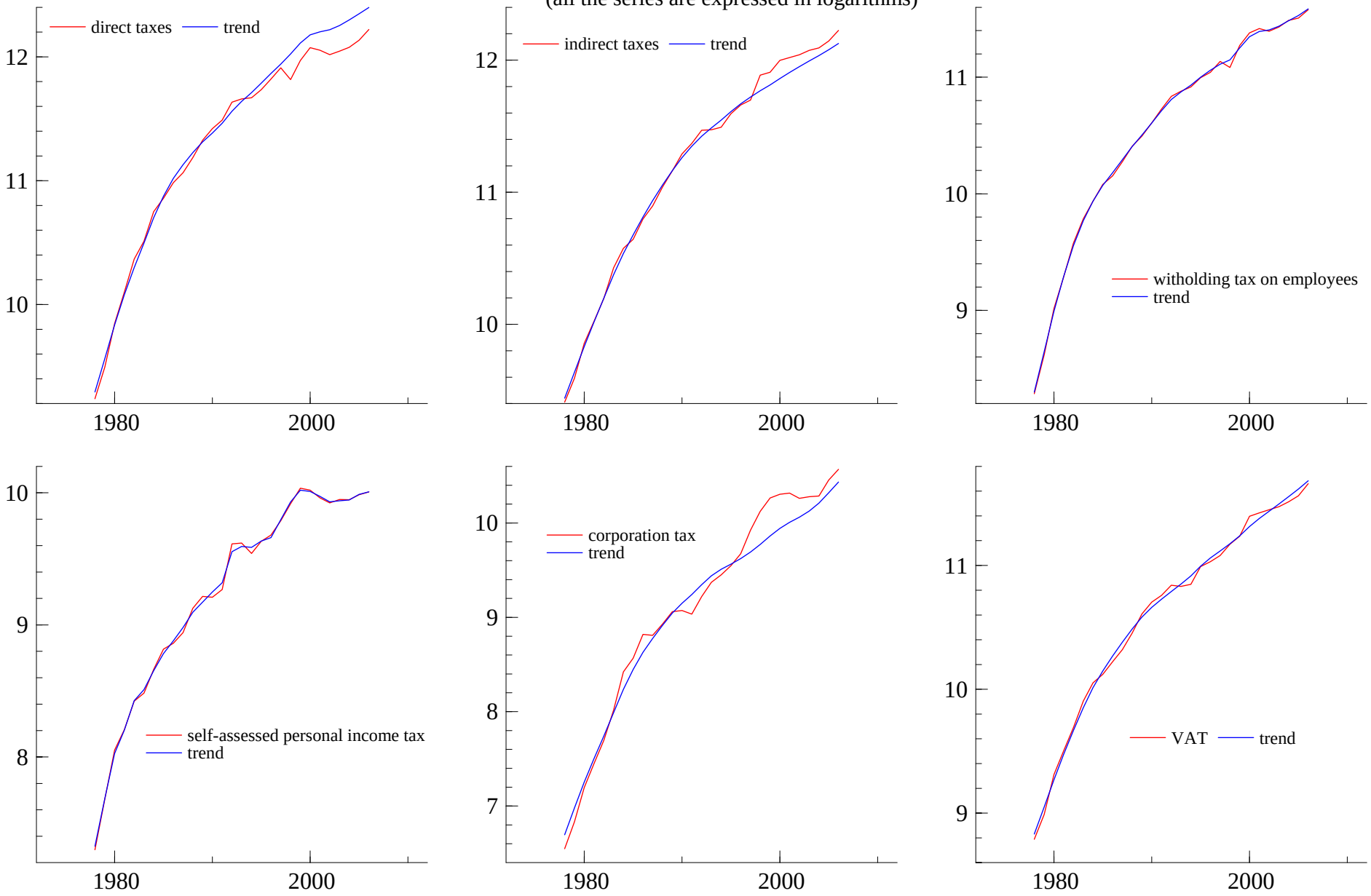


Fig.3c: Revenues adjusted for the one-off and permanent measures and trend components

(all the series are expressed in logarithms)

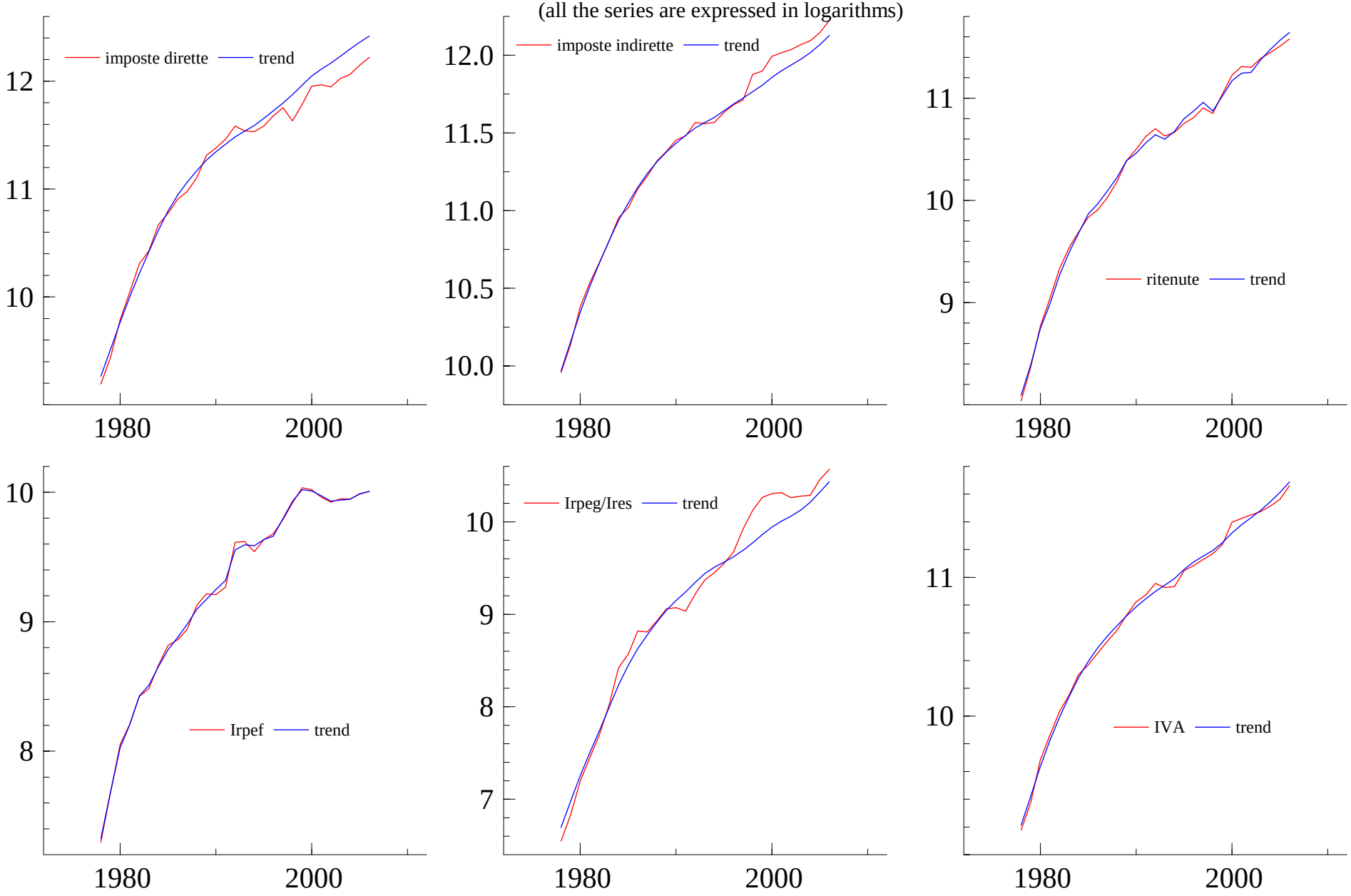
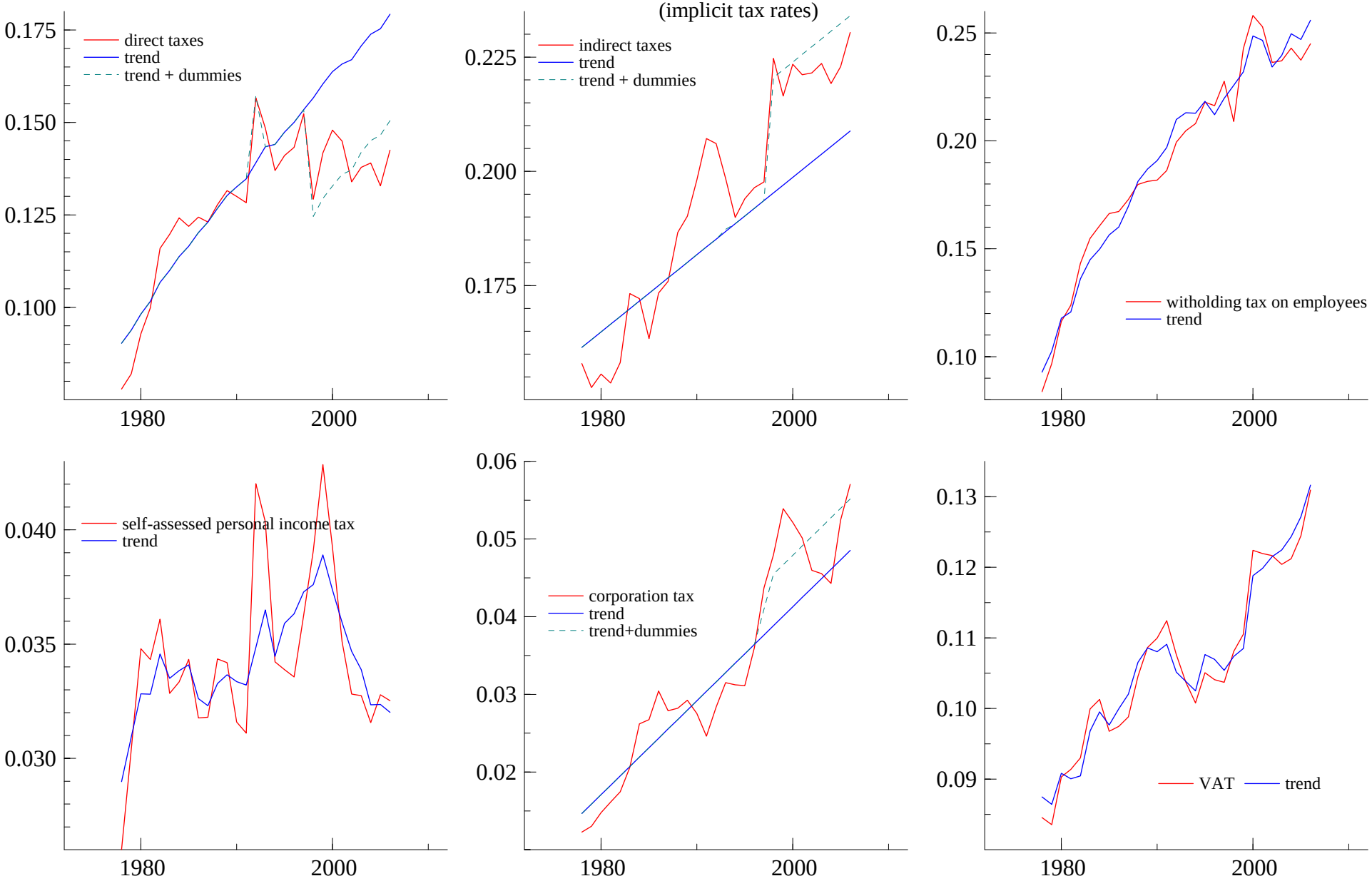


Fig.3d: Actual revenues and trend components

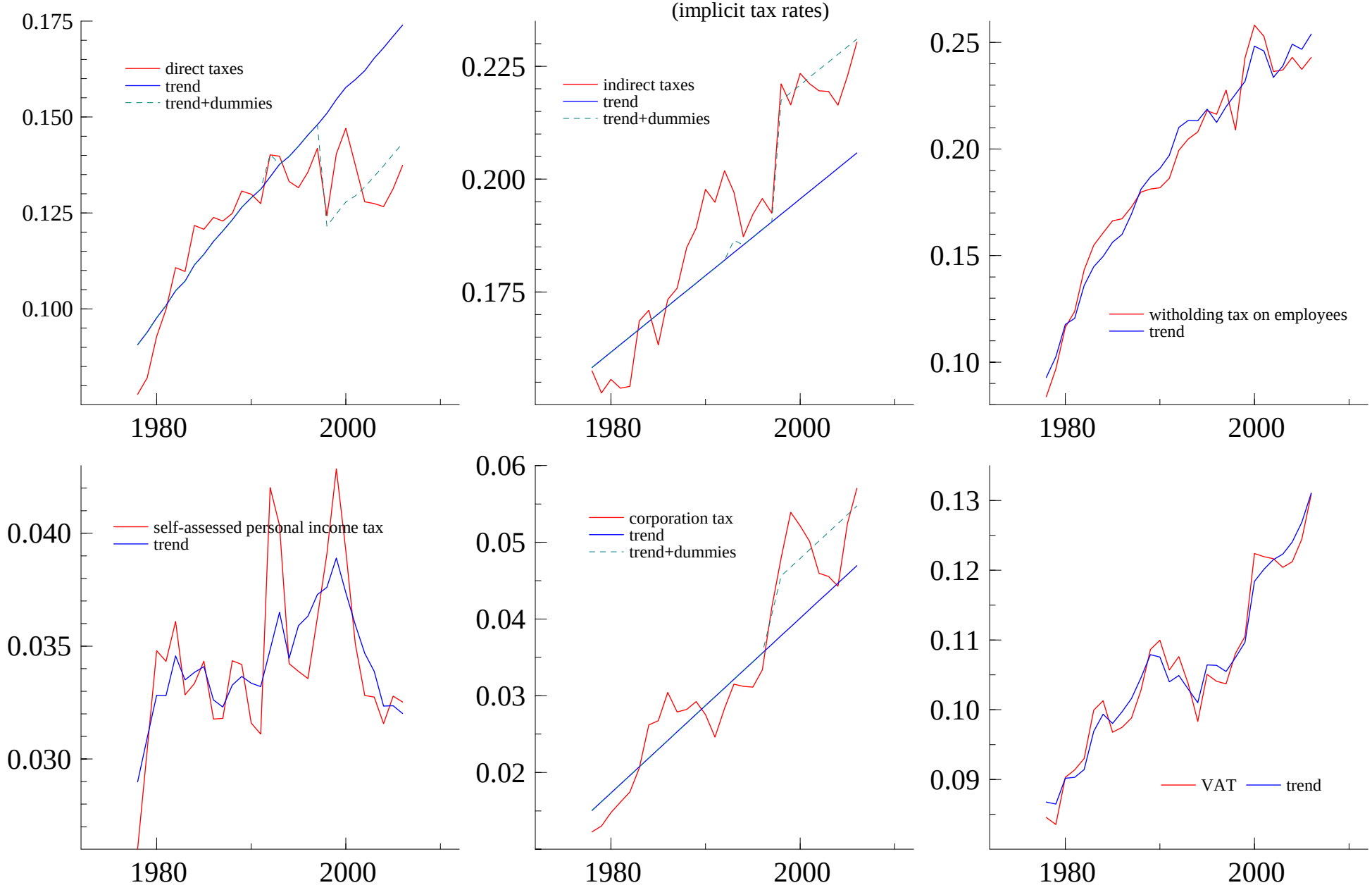
(implicit tax rates)



NB: the tax base for each revenue item is indicated in section 4

Fig.3e: Revenues adjusted for one-off measures and trend components

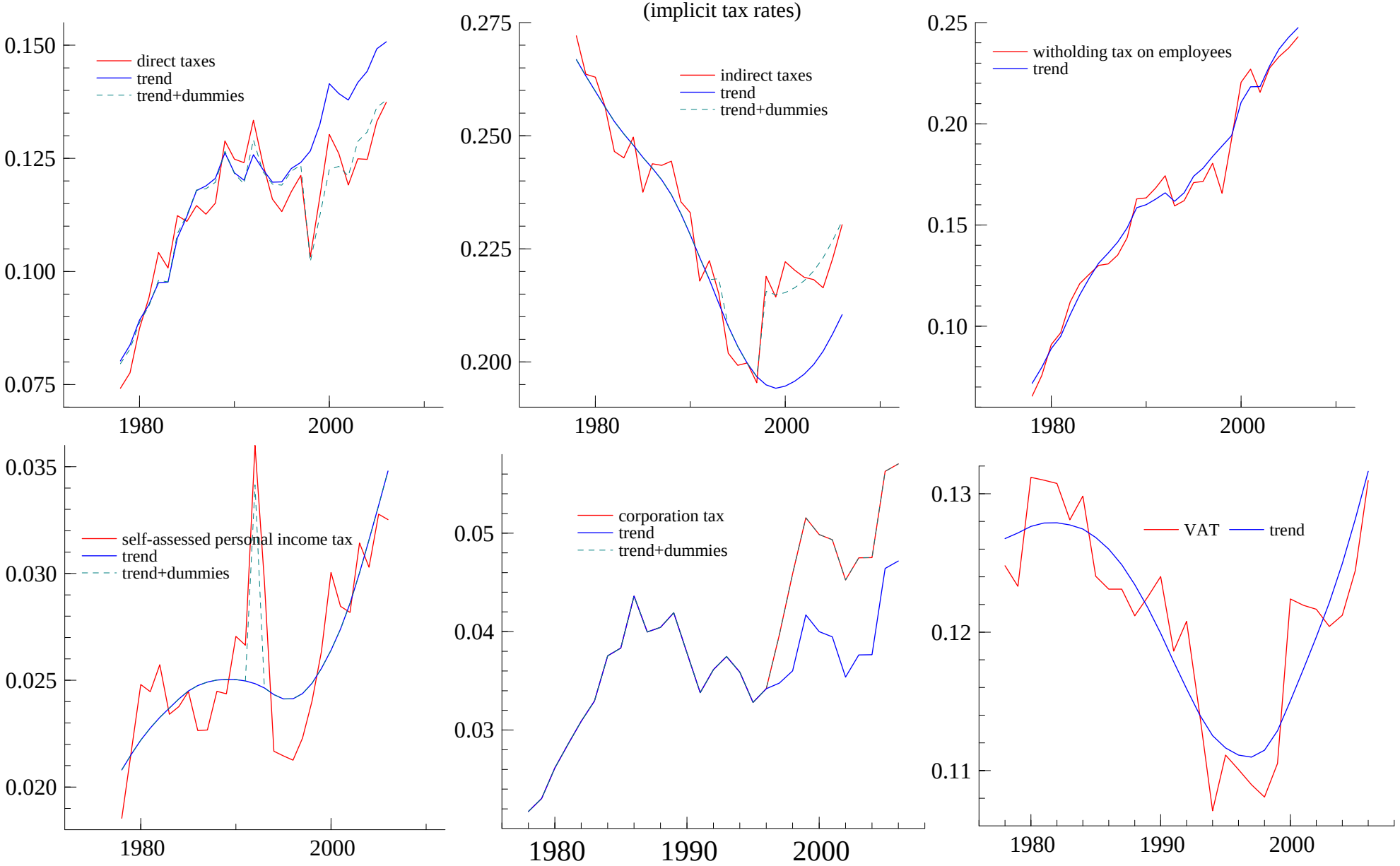
(implicit tax rates)



NB: the tax base for each revenue item is indicated in section 4

Fig.3f: Revenues adjusted for one-off and permanent measures and trend components

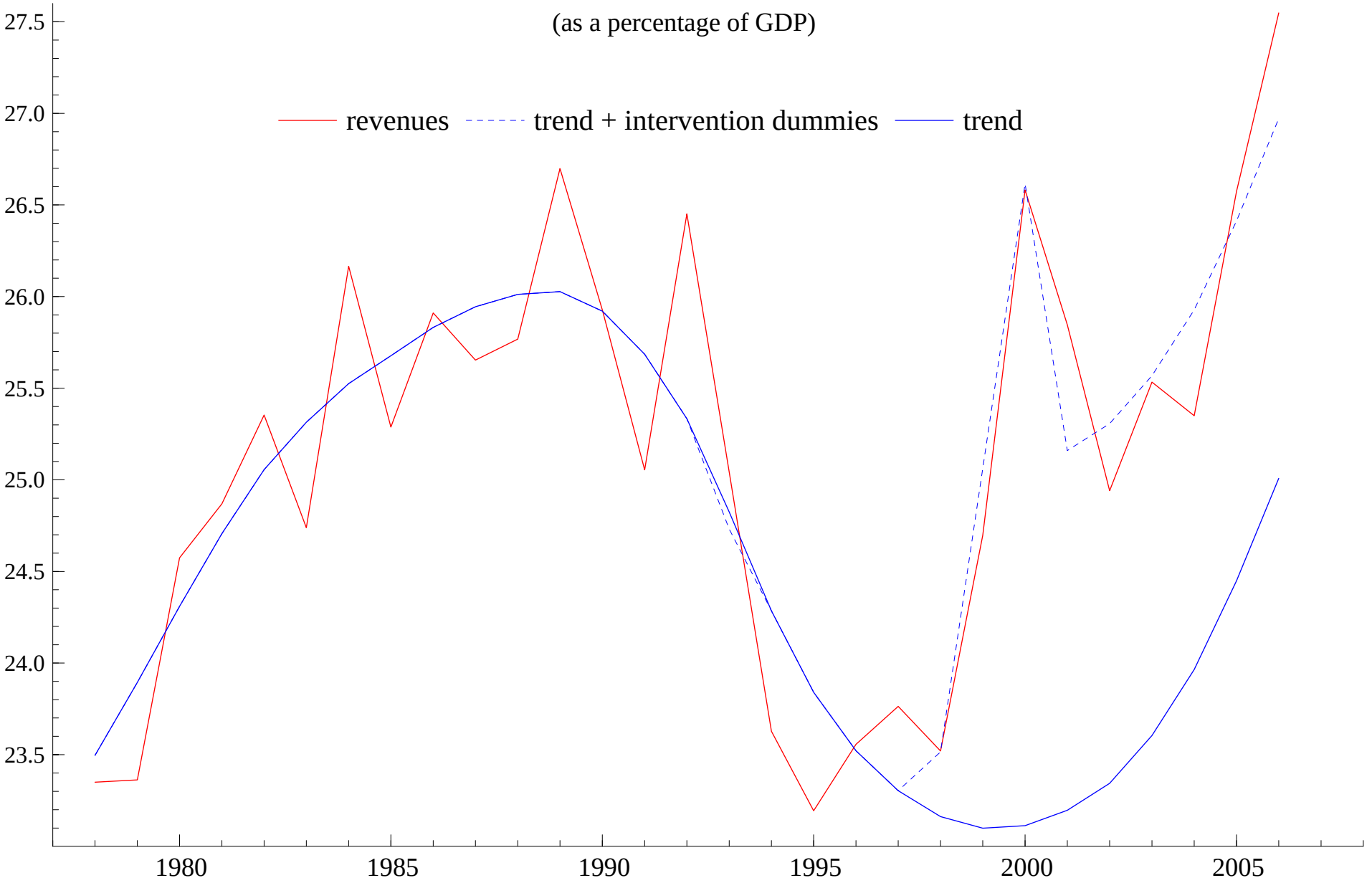
(implicit tax rates)



NB: the tax base for each revenue item is indicated in section 4

Fig.4: Adjusted revenues and trend components

(as a percentage of GDP)



NB: revenues are adjusted for one-off and permanent measures