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CYCLICALLY ADJUSTED LOCAL GOVERNMENT BALANCES

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Abstract

The paper provides an analysis of cyclically-adjusted budget balances of local governments in Italy for the period 2002-07. We find that local government balances appear to be relatively sensitive to the business cycle. In particular, a shock of 1 per cent in GDP changes their resources by approximately 0.6 billion. Within the sample period, both central and local policies concerning local government budgets had a sizeable impact on local government balances in cyclically-adjusted terms.

JEL Classification: E32, E62, H71.

Keywords: local public finance, budget sensitivity, business cycle, tax elasticity.

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1. Introduction

This paper analyses the effects of the business cycle on the public finances of the Italian local governments. A better understanding of the sensitivities of local government balances to the business cycle is important for the ongoing debate on fiscal federalism and for the definition of the new cyclically-adjusted balanced budget rule introduced in the Constitution. Following the tradition of studies in this field inspired by Musgrave (1959), a well-designed system of local taxation should ensure an adequate degree of autonomy while preserving the equilibrium of local public finances over the business cycle.

We account for the fact that cyclical budgetary movements at the local level arise only from tax revenue. In the case of Italy, the main expenditure component responsive to the business cycle is represented by unemployment insurance, which is provided by the central government.

We use regional level data taken from the regional economic accounts compiled by the Italian National Institute of Statistics (Istat). Results for each region are then aggregated to evaluate the impact of the business cycle by macro-areas and at the national level. The Istat data cover the years 2002-07 and do not allow us to investigate the impact of the financial crisis on local public finance. However, the constitutional reform of the Italian system of local governance, which began in the early nineties, is fully embodied in our study.¹

As illustrated by Hagemann (1999), van den Noord (2000) and Girouard and André, (2005), in the majority of cases the estimates of the cyclically-adjusted balances are obtained by a two-step procedure. The first step identifies the cyclical gap of one or more macroeconomic variables with respect to their “normal” trend in order to assess the position of the economy over the business cycle. The second step computes the cyclical effect on each budget item as the product of three factors: the cyclical gap of the most directly relevant macroeconomic variable, the budget item in level and the

¹ The constitutional reform that began in the nineties was initially implemented through a series of legislative interventions in subjects ranging from the rationalization of local functions to the system of local taxation. The reform was finalized with the promulgation of Constitutional Law 3/2001, which provided for the required amendments to Title V, Part II of the Italian Constitution. A description of the legislative modifications more relevant for the purposes of the present paper is provided in the following sections.

elasticity of the budget item to the economic variable. Different approaches have been developed in the literature.² In this paper we follow the methodology adopted by the European System of Central Banks (ESCB) and described in Bouthevillain *et. al.* (2001). The ESCB approach differs from the one normally followed by other national and international institutions, mostly because the cyclical position of the economy is not summarized by the output gap and is instead identified with reference to a set of macroeconomic variables, chosen because they have sizeable effects on the relevant items of the government budget.³ The ESCB methodology is founded on the consideration that the standard procedure cannot fully capture composition effects arising from the differential growth of the relevant macroeconomic variables over the business cycle. We find this issue to be particularly important in our paper, where the analysis is performed on regional data. In addition, the application of the ESBC approach makes our results comparable with those provided in Marino, Momigliano and Rizza (2008) for the national balances.

According to our main findings local government budgets appear to be relatively sensitive to the business cycle. This result holds for all the government tiers although the cyclical component of regional budgets is on average more pronounced than the ones of Provinces and Municipalities. The difference is due to the higher elasticity of regional tax revenues (direct and indirect) and to the greater volatility of the corresponding tax bases. In addition, local government budget policies undertaken by both the central and the local governments are shown to have a sensible impact on local government balances.

The paper is structured as follows. Section 2 reviews the fiscal structure for the local tiers of government in Italy. Section 3 describes our estimates of the elasticity of local government taxes for the different levels of local government. These estimates are then used to evaluate the sensitivity of local budget balances to the business cycle. Section 4 identifies the macroeconomic bases relevant for the analysis of the cyclical components of the local budgets and reviews some of the main features of the business cycle during the sample period. Section 5 presents the analysis of the cyclical components of local

² Reviews of several approaches to the estimation of the output gap are provided in Richardson *et. al.* (2000), Cotis, Elmeskov and Mourogane (2003), Denis *et. al.* (2006) and D'Auria *et. al.* (2010).

³ A detailed comparison between the ESCB methodology and the standard approach based on output gap can be found in Marino, Momigliano and Rizza (2008).

government balances. Section 6 provides an interpretation of the evolution of cyclically-adjusted budget balances during the sample period. Conclusions are drawn in Section 7.

2. The institutional setting

The Italian local administration is organized in three tiers of government: Regions, Provinces and Municipalities. The institutions belonging to each level are autonomous entities with their own statutes, powers and functions, according to the principles defined in the Constitution. Each tier of government depends both on its own sources of financing – mainly tax revenues – and on transfers from the central administration.

At Regional level, it is important to distinguish between Ordinary Statute Regions (OSR) and Special Statute Regions (SSR). The OSR are fifteen, with similar fiscal structures and the same competences in terms of spending decision and taxation. The SSR are five, each with its own fiscal structure. For the purpose of our analysis, the main difference between these two categories is that the SSR withhold large part of the receipts of the most important central government taxes accruing within their territories. We note that more than fifty per cent of regional spending is devoted to the provision of health services.⁴

Each Region is formed by one or more Provinces which have competence on a limited number of subjects, mainly related to education, transportation and environment. Their number has increased from 95 at the beginning of the nineties to 110 in 2011.⁵

Finally, Municipalities are about 8,100, with a great variability in terms of both population and area; they provide most of public goods and services at the local level.⁶

⁴ Revenue-sharing agreements between the central government and the SSR are defined in the statute of each of the SSR. For all of the SSR, the statutes establish sharing agreements for personal income tax, corporate income tax, VAT and other central government taxes. The agreements define the share of the receipts of each tax accruing within the regional territory of each of the SSR. In most cases this share is greater than or equal to ninety per cent.

⁵ The system of Provinces is currently subject of an important process of revision. Recent legislative interventions envisage a reallocation of their administrative functions to the lower levels of government as well as a reordering of their organization as local constituencies.

⁶ Following the principle of subsidiarity, functions are allocated to the lower level of government, unless their scope and size requires the intervention of higher levels. Within the Italian constitutional framework, Municipalities provide the public goods and services not assigned to other levels of government. This ordering of administrative functions was introduced with the so-called Bassanini laws: Law 59/1997 and 127/1997. An interesting review of the principle of subsidiarity, in the context of the allocation of functions between the national and the European levels of government within the European Union, is provided by Alesina and Wacziarg (1999), Berglöf *et. al.* (2003) and Alesina,

Since the early nineties, the structure of local public finance in Italy has been subject to several transformations aimed at increasing the degree of fiscal independence of local governments. Moreover, functions have been progressively reallocated towards the lower levels of government.⁷

Despite the number of legislative interventions, the size of local institutions has not significantly changed. Table 1 shows that, between 2002 and 2007, both local expenditure and local revenue accounted for about 30 per cent of the expenditure and revenue of the public administration. The overall weight of Regions is about 20 per cent while Municipalities account for an additional 9 per cent.⁸

However, over the last two decades, the structure of revenue has progressively changed. In particular, the incidence of transfers from the central government diminished from about 25 per cent of public administration revenue in 1990 to 15 per cent. In the same period, tax revenues increased from 5 per cent to 15 per cent. The most important legislative acts during the period include the introduction of the municipal property tax (ICI) in 1992, the institution of the regional tax on productive activities (IRAP) in 1997 and the introduction of the regional and municipal personal income surtaxes. Also, motor vehicle taxes were assigned to Provinces in 1997. Moreover, these legislative innovations were followed by the reassessment of the transfer system from central government and the introduction of the share of value added tax (VAT) for the OSR (2000).⁹

During the last decade, the structure of local revenues has remained substantially stable. Table 2 shows that direct taxation accounted, on average, for almost 27 per cent of local government tax revenue, while the share of indirect taxation hovered about 73 per cent. The remaining category of wealth taxes had only a minor incidence. Within direct taxation, the most important source of revenue for Regions is given by the

Angeloni and Schuknecht (2005). A review of the political economy on this subject can be found in Persson and Tabellini (2000).

⁷ A broad perspective on the changes that occurred during the period can be found, for instance, in Giarda (2001, 2009), Petretto (2003) and Franco, Messina and Zotteri (2004).

⁸ The share of OSR is about 15 per cent for both revenue and expenditure, while the incidence of SSR is around 5 per cent.

⁹ ICI was introduced by Legislative Decree 504/1992, with delegation of Law 421/1992. IRAP and the regional personal income surtax were instituted with the so-called Visco reform by Legislative Decree 446/1997, with Delegation of Law 662/1996, the same decree assigned motor vehicle taxes to the level of government of Provinces. The reform also instituted the municipal personal income surtax by Legislative Decree 360/1998, with Delegation of Law 449/1997. The share of VAT was introduced by Legislative Decree 56/2000, with Delegation of Law 133/1999.

regional personal income surtax, which accounts for about 14 per cent of the tax receipts of OSR. For indirect taxes, the most important source of revenue is IRAP, which represents about 75 per cent of the tax resources of these regions. These figures are much smaller for the SSR, since they withhold the receipts of the most important central government taxes raised on their territories.

Provinces rely exclusively on indirect taxation; their main source of revenue are motor vehicles taxes and the electricity consumption surtax. The most important source of direct taxation for Municipalities is the municipal personal income surtax, which ensures about 9 per cent of tax revenue, while ICI is the most relevant indirect tax, providing almost 59 per cent of tax revenue.

In the sample period, the fiscal autonomy of local governments was limited by the fact that modification of local tax rates had to remain within predetermined ranges. Moreover, the possibility of fine-tuning local tax rates has been restricted, in various instances, by legislative acts of the central government.¹⁰

3. Elasticity of local government taxes

For the purpose of the estimation of the elasticity of local government taxes, we exclude from the computation of the cyclical budget component those taxes whose tax-base does not vary with the business cycle. We also consider that revenues which change with the level of economic activity can, instead, vary either proportionally or more than proportionally to the business cycle. For the former category of taxes, we set the elasticity equal to one, while for the latter the elasticity has been computed considering the specific features of each source of taxation.

In our analysis, we keep the usual distinction between direct and indirect taxation, with the former encompassing both personal income and corporate income taxation. Following the methodology adopted by national and international economic agencies,

¹⁰ With reference to the sample period of the paper, the most important interventions include the suspension of the possibility of modification of the tax rates of IRAP and of the personal income surtaxes disposed by the Finance Law for 2003 (Law 289/2002), the increase of the rates of IRAP and of the regional personal income surtax to the maximum allowed under national law for Regions showing a health care deficit and lacking the implementation of the Re-entry Plan disposed by the Finance Law for 2006 (Law 266/2005) and the reintroduction of the possibility of modification of the tax rates of the municipal personal income surtax provided by the Finance Law for 2007 (Law 296/2006).

the elasticity of each tax component, with respect to the relevant tax base, has been compiled accounting for the relevant tax legislation and fiscal data.¹¹

For personal income taxes, we concentrated on the personal income tax (Irpef), which accrues exclusively to RSS as a form of revenue sharing, the regional personal income surtax and the municipal personal income surtax. The calculations account separately for the contribution of average earnings per employee and employment.¹²

The progressivity of the personal income tax by income brackets implies that its elasticity to average earnings is greater than one. Following Marino, Momigliano and Rizza (2008) we use a value of 1.6. In order to compute this elasticity, average and marginal tax rates are compiled for each tax bracket. The elasticity is then calculated as the ratio of the weighted average of marginal tax rates and the weighted average of average tax rates. The weights in the calculation are obtained from fiscal data on the distribution of earnings or of income by tax bracket.

With regard to the regional personal income surtax, it is necessary to explicitly consider the regional breakdown of the tax structure. This tax takes a proportional character in most regions, while some introduced a limited progressivity, either by tax class or tax bracket, in its structure. In regions where the tax is proportional or the progressivity is by tax class, the elasticity of the tax receipts with respect to average earnings was set equal to one. For regions where the progressivity is by tax bracket, the elasticity with respect to average earnings ranges from 1.16 to 1.18. The pattern of elasticity of the regional personal income surtax by region and macro-area is reported in Table 3.¹³

¹¹ The methodology employed by the most important organizations is specified with reference to the one defined by the Organization for Economic Cooperation and Development (OECD) within the Output Gap Working Group (OGWG). The European Commission and the IMF adopt the OECD estimates of the budget items elasticities, integrating this data with information provided by country desk offices. In Italy, the OECD methodology is the one adopted by the Ministry of Economy and Finance in the yearly financial planning documents.

¹² These computations do not take into account the elasticity of the receipts of the shares of Irpef accruing to Provinces and Municipalities. Although Irpef revenue sharing represents an important source of income for these levels of government, the revenue sharing measures are usually rolled over every year with the Finance Law. Following the guidelines defined by the European Commission (2006), these sources of revenue are usually classified as discretionary at the national level and we applied the same rule in the context of the paper.

¹³ Following the institution of the regional personal income surtax, progressivity by tax bracket has been introduced by Lombardy and Marche. A system of progressive tax rates by tax class has been adopted by Piedmont, Liguria, Emilia Romagna, Umbria and Apulia. Veneto adopted the former system between 2002 and 2004, reverting subsequently to a progressivity by tax class. Some relevant aspects of the distinction between the two types of progressivity are provided in Appendix A.

For the municipal personal income surtax, the elasticity with respect to average earnings was assumed to be equal to one, because municipalities did not apply any progressivity scheme during the sample period of the study.

Finally, the elasticity with respect to employment was set equal to one for all three types of personal income taxes.

Corporate income tax and indirect taxes are both levied on a proportional basis, therefore following a conventional specification they can be assumed to have a unit elasticity.¹⁴

Within the category of indirect taxes some specific considerations hold with regard to IRAP, which is levied on productive activities with a tax base defined by their value added. Similarly to the corporate income tax, IRAP is levied at a uniform rate, with differentiation by sector of economic activity. Following the applications at national level, we therefore assumed an elasticity equal to one for IRAP.¹⁵

In addition, among indirect taxes we assigned an elasticity equal to zero to ICI, since its base is the administrative property value, which makes the tax receipts not responsive to the business cycle.¹⁶

The estimates of the tax elasticities by level of local government are summarized in Table 4. In the estimation, we accounted for the fraction of tax receipts attributable to public sector employment in the case of both personal income taxes and IRAP. In particular, we assumed an elasticity of public sector-related revenue equal to zero.

The elasticity of direct taxes is estimated equal to 0.69, the one of indirect taxes at 0.63. In addition, the elasticity of direct taxes is relatively lower for the OSR and higher for the SSR. This result is determined by the relative importance of personal income tax as a source of revenue for the latter Regions. Similarly, the contribution of the

¹⁴ The differentiation of tax rates by sector of economic activity for both the corporate tax and VAT implies, that changes in sector shares over the business cycle may result in an effective value of the elasticity significantly different from one. These composition effects are, however, usually assumed away in actual applications to the analysis of national balances.

¹⁵ The validity of this assumption has been confirmed in econometric analysis on the basis of data on declarations for the 2002-07 period released by the Finance Department of the Ministry of Economy and Finance. The econometric analysis for IRAP is reported in Appendix B. From an economic viewpoint the characteristics of IRAP can be analysed using conventional taxation theory, as reviewed for instance in Kaplow (2008).

¹⁶ As for personal income taxes, the calculations for indirect taxes do not account for the elasticity of the share of VAT. Since the revenue sharing assignment is set yearly by the Finance Law, the share of VAT can be classified as a discretionary source of revenue for the OSR. Instead, the elasticity of the receipts of indirect taxes accruing to the SSR as revenue sharing is included in the calculations, since these sources of income pertain to local government tax revenue.

municipal personal income surtax implies a lower than average elasticity for the level of government of Municipalities.

Turning to indirect taxes, in the case of Regions the value of this elasticity is close to that of direct taxes, although there is a noticeable difference between OSR and SSR. The share of indirect taxes withheld by the OSR is relatively low and is made up mainly by IRAP. For the SSR, instead, the relatively lower importance of IRAP as a source of revenue implies an elasticity closer to one. Estimates for Provinces and Municipalities tend to be smaller compared to those of Regions, because of the contribution of respectively inelastic motor vehicle taxes and ICI.

These results may be used to compute the semi-elasticity of the balance/GDP ratio with respect to GDP by tier of local government. This parameter is computed on the basis of a weighted average of the elasticities of each tax component with respect to GDP, using the tax shares on GDP as weights and correcting the computation for the level of the balance/GDP ratio. The elasticity of each individual tax component with respect to GDP can be defined as the product between the elasticity of the component with respect to its tax base and the elasticity of the macroeconomic base with respect to GDP. In the computations reported in the table, we assumed a symmetric shock and set the elasticity of each tax base to GDP equal to 1. The shares on GDP of each individual tax component are reported at the bottom of the table.

The budget semi-elasticity for the consolidated local government level is equal to 0.04. Regions display more budgetary sensitivity to the business cycle compared to Provinces and Municipalities. Moreover, there is a sizeable difference between OSR and SSR, since the sensitivity of the former is 0.02, while for the latter is 0.16. The relatively low value of the sensitivity of the government budget of Provinces and Municipalities depends both on the high shares of inelastic taxes such as motor vehicle taxes and ICI and on the relatively low share of tax revenue on GDP. In contrast, the sensitivity of the government budget of SSR is determined by the relative high share of central government taxes, which are more elastic.

4. The business cycle

For the measurement of the business cycle, we apply the ESCB methodology to the regional economic accounts. Data on regional economic accounts are provided by Istat for the 1980-2009 sample period, though in some cases they are available only until 2007. Regional economic accounts are usually provided in less detail than their national counterparts. This implies that sometimes we had to work at a greater level of aggregation.

Following the ESCB approach, for each type of tax revenue we selected the macroeconomic variable that appeared to be the best approximation of its tax base. Similarly to the analysis in previous sections, we divided tax revenue in two categories, direct and indirect taxes, distinguishing within the former between personal and corporate income taxes.

For personal income taxes we considered that tax progressivity entails a differential response of tax receipts to changes in average earnings per employee and changes in employment. Therefore, analysing the cyclical components of these taxes, it is necessary to distinguish between these two effects. For this purpose we computed the average earnings (as the ratio between gross wages and number of employees) and employment (as the sum of employees and self-employed workers). For corporate income taxes, we used gross operating surplus as a measure of the tax base.

For indirect taxes, we used GDP as the macroeconomic base for all taxes except VAT, for which we preferred final consumption expenditure. However, we made an exception for IRAP. We reasoned that the tax base for IRAP can be defined as a sum of wage and operating margin components. Moreover, at firm level, the partition of the tax by region is calculated in terms of the gross wages and salaries paid in each of the regions where the firm has a productive establishment. Therefore, we used gross earnings as the macroeconomic base for this tax, defining them as the product of average earnings per employee and employment.

For all variables, we used the time series at constant 2000 prices compiled in the national accounts on the basis of chain-type price deflators.

We estimate trend and cycle of each macroeconomic base using the Hodrick and Prescott (1980, 1997) (HP) filter. Following Bouthevillain *et. al.* (2001) and Marino, Momigliano and Rizza (2008), we assumed the λ parameter equal to 30. This choice

assigns the greatest weight to cyclical fluctuations of the time series with period in the 10- to 12-year range. We tested this procedure by producing estimates using two alternative values of λ commonly used in empirical applications, 10 and 100.¹⁷

In addition, in order to address some of the issues regarding the distortions produced by the HP filter, we compiled alternative estimates using the Band Pass (BP) filter of Baxter and King (1999). For the BP filter, we adopted the conventional specification for yearly data, which is compatible with our choice of λ for the HP filter.

An important feature of the use of the HP filter concerns the quality of the estimates at the beginning and the end of the sample period. Research on the properties of the HP filter has highlighted similarities with some classes of two-sided filters. In particular, the weighting structure of the HP filter implies, that the precision of the estimates of the cycle and trend components increases with the number of available sample observations at each tail. In order to improve accuracy of the estimates at the end of the sample period, we extended our time series forward until 2016 using a two-step procedure. First, we estimated ARIMA models for each time series. We introduced up to four lags and selected the model for each time series according to the Schwarz information criteria. Then, model estimates were made consistent with the forecasts of the Italian Treasury Econometric Model (ITEM) at the national level for the same period. For this purpose, the ARIMA model forecasts of each regional time series were rescaled in order to equalize the national aggregate resulting from the regional forecasts of each time series to the ITEM forecast of the corresponding national time series.

The estimates of the output gap obtained with the above procedure, with reference to the 1990-2007 period, are reported in Figure 1. Each displayed series represents the national output gap aggregate compiled after adding the trend and cycle estimated for each region, applying either the HP filter at different levels of λ or the BP filter.

The cyclical pattern is consistent with the historical record. In particular, the GDP series presents a trough in 1993, following the crisis of the European Exchange Rate Mechanism, and a peak in 2001, before the burst of the dotcom bubble. The estimates of

¹⁷ A review of the properties of the HP filter from the perspective of the statistical measurement of the business cycle is provided by Kaiser and Maravall (2001), while the underlying statistical methods are introduced in Harvey (1993). Some important aspects of the filter are described in King and Rebelo (1993) and applications of the HP filter and other filtering techniques to macroeconomic analysis are provided, for instance, in Canova (1998).

the output gap obtained with different parameter values for the HP filter and with the BP filter are relatively similar.

Figure 2 reproduces the cyclical components of each macroeconomic base used for the analysis of local government balances. Panel 2a compares the cycle of GDP with the one of final consumption expenditure and Panel 2b the cycle of GDP with the ones of average earnings, employment and gross operating surplus. Each of the displayed series represents the national aggregate compiled adding the estimates of the trend and cycle at the regional level. The aggregate cyclical components are represented as percentage changes with respect to the corresponding trend components.

The figure shows that the cyclical movements of final consumption expenditure are positively correlated and similar in size to the ones of GDP. Moreover, the correlation between the movements of average earnings per employee and employment and the ones of GDP is weaker, the variations of the former are more persistent and less pronounced. Finally, movements of gross operating surplus are positively associated with those of GDP and the former series appears to be the more volatile.¹⁸

5. The cyclical components of local government budgets

The estimation of the cyclical components of local government balances requires the identification of the cyclical factors of tax revenue. To illustrate the break-down methodology, let T be the receipts of a given tax and T^* the corresponding trend, or cyclically-adjusted component. Similarly, let X be the value of the macroeconomic tax base in the same period and X^* the corresponding trend component. Finally, let $\varepsilon_{T,X}$ be the elasticity of the tax with respect to its tax base. The cyclical component of the tax can thus be defined as follows:

$$\frac{T^*}{T} = \left(\frac{X^*}{X} \right)^{\varepsilon_{T,X}} \quad (5.1)$$

The cyclical components of a given tax category can then be calculated aggregating the individual tax factors.

¹⁸ The characteristics of the business cycle at national level are more properly analyzed applying the HP and BP filters to the national aggregates of the macroeconomic bases. Some additional computations show that the results obtained from the national aggregates are qualitatively similar to the ones resulting from the aggregation of the regional components. This outcome holds, in particular, with reference to our sample period, where the differences between national and regional aggregates at constant 2000 prices resulting from the chain deflation procedures are relatively small.

For the purposes of the present application, for each level of local government the cyclical components of tax revenue have been compiled on a regional basis, subsequently these regional components have been aggregated at national level. To account for the particular structural features of local government tax revenue, we introduced several corrections in our computations. We assumed a zero elasticity for the fraction of direct taxes and IRAP related to public sector employment, consistently throughout our study. Moreover, an important correction involves the regional personal income surtax, whose receipts are recorded in the local government accounts with a lag of one year. We accounted for this effect introducing a 1-year lag for the cycle of both of the macroeconomic bases used for the computation of this tax. Finally, we introduced a similar correction in order to account for the lags in the receipts of the corporate income tax and of capital income taxes which accrue to the SSR as a form of revenue sharing.¹⁹

Table 5 reports the resulting cyclical components by level of local government as a share of tax revenue for the 2002-07 period. For each level of local government, the factors of both direct and indirect taxes are provided, in addition to the overall cyclical component for tax revenue. The cyclical factors of direct taxes, indirect taxes and tax revenue for the consolidated local government level are reproduced in Figure 3. The cyclical factors of tax revenue are compiled on the basis of the cycle of the macroeconomic bases obtained applying the HP filter setting $\lambda=30$. The table shows that the cyclical components of local government tax revenue follow the business cycle. The estimated cyclical factors for the consolidated local government level range from -0.21 to 1.02 per cent as a share of tax revenue. More precisely, the cyclical components of local government revenue appear to be determined mainly by Regions. In addition, within this level of government, the cyclical factors for SSR tend to be greater than the ones for OSR, confirming expectations. Conversely, the cyclical components of Municipalities and Provinces are typically smaller.

¹⁹ According to the Italian tax code, firms are allowed to pay each year an advance of the corporate income tax based on previous year tax payments and on estimates of current corporate profits. The tax payment is finalized the following year according to the corporate profits actually realized. This introduces a lag of one year in the response of corporate income tax and capital income tax receipts to the business cycle. Further details on this particular feature of the Italian tax system are provided in Momigliano and Staderini (1999).

Table 6 reports the cyclical components of local government tax revenue by region and macro-area. The cyclical factors of each region and macro-area are displayed in Figure 4. The table and the figure show some variations across regions in the cyclical movements. However, the regional patterns and the cyclical components for each macro-area appear to be consistent with the cyclical path at the aggregate national level. This holds both during the recession towards the beginning of the sample and for the expansion occurred at its end.

The cyclical factors by region and macro-area are further analyzed in Table 7. The table reports the output gap and the cyclical components of local government tax revenue at the beginning and end of the sample period and at years of cyclical trough and peak. The table shows that in most regions the cyclical trough occurred in 2003. In the South and Islands macro-area, however, the trough occurred with a 1-year lag and the contraction was proportionally lower than in other macro-areas. In addition, the cyclical reduction in local government tax revenue at the trough year was greater than the national average, a result that can be attributed to the relative importance of the SSR in the aggregate economy of the area. In most regions, the cyclical peak occurred in 2007. For this year the cyclical growth of local government tax revenue appears to be relatively uniform across macro-areas.

In order to test the sensitivity of the above results to the choices made for the extraction of the cycle of the macroeconomic bases, we compiled a different set of estimates using the BP filter. We did not find substantial differences between the two sets. For reference purposes, the cyclical components of tax revenue for the consolidated local government level, compiled with a HP filter setting, $\lambda=30$ and with a BP filter, are reproduced in Figure 5.

6. Cyclically adjusted budget balances

We turn finally to the analysis of cyclically-adjusted budget balances. Table 8 reports the cyclically-adjusted budget balance as a share of trend GDP for the consolidated local government level for the period under examination. The table reports expenditure, revenue, distinguishing between tax revenue and transfers, and the local government balances. In addition, the bottom of the table reports the cyclically-adjusted local government balances as a share of local government revenue.

The actual and the cyclically-adjusted budget balances as a share of own revenue are reproduced in Figure 6. Panel 6a reports the primary balance and Panel 6b the net borrowing. These items are important for the analysis of local government balances, given the existing rules on the possibility for local governments to finance their budgets through debt issuance.²⁰ Note also that cyclical movements in economic activity have a distinguished impact on local government balances, reducing them in periods of economic expansion and increasing them in periods of contraction.

The cyclically-adjusted budget balances allow us to analyse the effects of economic policy during the sample period. We can identify two policy episodes with a significant impact on local government accounts. The first one occurred in 2003, as a consequence of the effective application by local governments of the right to change the tax rates for IRAP and the regional personal income surtax. Allowances for tax variation within predetermined ranges had been introduced in 2001 for IRAP and 2002 for the regional personal income surtax.²¹ Following these interventions, several local governments modified the tax rates, in particular for the regional personal income surtax, resulting in an increase of tax receipts in 2003. As shown in Table 8, cyclically-adjusted direct taxes increased by 0.2 percentage points of trend GDP, which contributed to about half of the primary balance reduction.

The second important change in primary balances of local governments occurred in 2007. In 2006 the central government started the drafting and adoption of a number of measures aimed at reducing the health sector deficit. Though the intervention of the central government was mainly aimed at controlling health expenditure, a number of tax measures were also implemented. After these steps, in 2007 several Regions adopted a Re-entry plan. For the same Regions, the Finance Law for 2007 prescribed the increase

²⁰ In Italy, the possibility of debt issue by local governments is granted by the Constitution, although it is limited to the financing of investment expenditure. The legislative framework for local government debt was provided by the Finance Law for 2004 (Law 350/2003) and integrated in subsequent years. The legislation currently imposes upper bounds on the possibility of debt issue by local governments. For each type of local government, these limits are defined in terms of various ratios between interest payments and local government revenue.

²¹ The possibility of tax variation by local government was then suspended by the Finance Law for 2003 (Law 289/2002). The suspension was confirmed by subsequent finance laws, with exemptions introduced by the Finance Law for 2005 (Law 311/2004) limited to the financing of the health sector for Regions running a health deficit.

of the tax rates of IRAP and of the regional personal income surtax to the maximum level allowed under national law.²²

The outcome reported in the table show that, following these measures, the primary balance becomes positive in cyclically-adjusted terms in 2007, while net borrowing as a share of trend GDP decreases by 0.8 percentage points. The shift in the cyclically-adjusted balance is due to a 0.4 p.p. decrease in expenditure and a 0.3 p.p. increase in cyclically-adjusted revenue, which was determined mainly by changes in tax revenue.²³

To provide evidence that changes in cyclically-adjusted tax revenue broadly identify changes in legislation, we directly evaluated the effects of changes in tax rates. Table 9 reports the results of this exercise. The first row of the table reports tax revenue as a share of GDP for the 1998-2007 period, the second and third rows report estimates of the effects of changes in the tax rates of IRAP and of the regional personal income surtax. The simulations for each of the two taxes are performed comparing the receipts of each tax prevailing at the effective tax rates during the 1998-2007 period with the receipts that would have been obtained at the base tax rates defined by the national law for the same period. The last rows of the table report the estimates of tax revenue resulting from the application of base rates for the two taxes and the overall effect of the tax change.

According to the results in the table, the increase in tax rates of the regional personal income surtax, which occurred in 2003, gives a contribution of 0.1 percentage points to the increase in tax receipts of the year. Similarly, the increase in the tax rates of IRAP and of the regional personal income surtax to the maximum rates allowed under national law, which occurred in 2006 and 2007, provides a contribution of 0.1 percentage points to the tax changes occurring during those years.

²² From 2007 onwards, ten Regions have signed a Re-entry plan: Abruzzo, Apulia, Calabria, Campania, Lazio, Liguria, Molise, Piedmont, Sardinia and Sicily. The increase in the tax rates of IRAP and of the Regional personal income tax to the maximum level allowed under national law was disposed for Abruzzo, Campania, Lazio, Molise and Sicily.

²³ Interpreting cyclically-adjusted tax movements, we note that the provisions for the increase of the tax rates of IRAP and of the regional personal income surtax called for an immediate application of the measures at the end of 2006. Therefore, the increase of the revenue from IRAP occurred in 2006, while, due to the lag in the national accounts, the increase of the receipts of the regional personal income surtax was recorded in 2007.

7. Conclusions

We presented an application of the ESBC methodology to the analysis of Italian local administrations' budgets, identifying the cyclical components of government balances.

The research was performed within the current framework of local governments in Italy. The paper reviews some of the most important features of the system of local autonomies following from the reforms started in the early nineties, and works out their implications for the analysis of local government budgets.

The estimates of the elasticities of local government budgets and the application to the 2002-07 sample period show that the cyclical components of local government budgets can have substantial effects on local government balances. The cyclical movements of tax revenue are wider for Regions than for Provinces and Municipalities, as a result of both the higher elasticity of tax revenue and the greater volatility of tax bases.

The central government has regulated the fiscal autonomy of local governments, legislating on the ability of local governments to modify local tax rates and, in some instances, requiring local tax rates to increase in order to reduce local government deficits.

Moreover, the central government maintains control over local government balances, mainly through the yearly implementation of the local government programs contained in the Finance Law. These programs appear to have been particularly relevant in the context of the present application. We have been able to relate changes in cyclically-adjusted local government budgets to specific policy actions

In our view, the results in the paper can be used to evaluate developments in local government budgets subsequent to the sample period under scrutiny and to appreciate the possible impact of the recent legislative reform of the Italian system of local autonomies, which may have a relevant effect on the cyclical component of local government balances.

Tables and Figures

Table 1

Local government balances

	2002	2003	2004	2005	2006	2007
	Shares of General Government					
Expenditure	31.1	30.6	32.2	32.0	31.7	31.1
Interest Payments	0.7	0.6	0.5	0.5	0.5	0.7
Revenue	31.3	32.0	32.5	33.2	31.9	31.9
Tax Revenue	14.2	14.7	14.4	14.4	14.2	14.4
Transfers	14.3	14.5	15.2	15.7	14.7	14.5
	Shares of Revenue					
Primary Balance	-3.5	-1.0	-5.1	-4.2	-5.0	1.4
Net Borrowing	-5.8	-3.1	-6.8	-5.7	-6.8	-0.8

Source: Authors' calculations from Istat, General Government Accounts, 1980-2009. Local government budget shares are reported as percentage rates.

Table 2

Tax shares by level of local government

	Direct Taxes						Indirect Taxes				Wealth Taxes	Tax Revenue
	Personal Income Taxes				Corporate Income Taxes	Consumption Taxes	Municipal Property Tax	IRAP				
	Personal Income Tax	Reg. Pers. Income Surtax	Mun. Pers. Income Surtax									
Local Government	10.2	6.8	1.7	18.7	1.6	26.7	5.3	11.6	37.4	72.7	0.6	100.0
Regions	13.6	9.2	-	22.8	2.2	31.5	7.1	-	50.2	67.9	0.7	100.0
OSR	-	13.7	-	13.7	-	22.1	-	-	74.8	77.3	0.6	100.0
SSR	33.5	2.3	-	35.8	5.3	46.2	17.5	-	12.8	53.1	0.7	100.0
Provinces	-	-	-	-	-	-	-	-	-	100.0	-	100.0
Municipalities	-	-	8.8	8.8	-	16.4	-	58.8	-	82.9	0.8	100.0

Source: Authors' calculations from Istat, General Government Accounts, 1980-2009 and Issirfa-Cnr, Regional Financial Observatory, 2002-09. The partition of tax revenue between OSR and SSR is computed on the basis of local government accounts data provided by Issirfa-Cnr. Average tax shares for the 2002-07 period are reported as percentage rates.

Table 3

Elasticity of regional personal income surtax by region and macro-area

Region	Tax Elasticity	Tax Share of GDP
Piedmont	1.00	0.63
Aosta Valley	1.00	0.40
Lombardy	1.18	0.52
Liguria	1.00	0.60
North West	1.11	0.56
Trentino Alto Adige	1.00	0.39
Veneto	1.00	0.49
Friuli Venezia Giulia	1.00	0.44
Emilia Romagna	1.00	0.62
North East	1.00	0.53
Tuscany	1.00	0.42
Umbria	1.00	0.52
Marche	1.16	0.46
Lazio	1.00	0.61
Centre	1.02	0.52
Abruzzo	1.00	0.65
Molise	1.00	0.61
Campania	1.00	0.63
Apulia	1.00	0.52
Basilicata	1.00	0.39
Calabria	1.00	0.57
Sicily	1.00	0.62
Sardinia	1.00	0.42
South and Islands	1.00	0.57
Italy	1.04	0.55

Source: Authors' calculations from Ministry of Economy and Finance, Finance Department, Personal Income Tax Declarations, 2009. Tax elasticity represents the percentage change in tax revenue resulting from a 1 per cent change in average personal income, net of tax benefits. Shaded rows correspond to regions with progressivity by tax bracket, light shaded rows to regions with progressivity by tax class.

Table 4

Tax elasticities by level of local government

	Direct Taxes			Indirect Taxes		Budget Balance
	Personal Income Taxes	Corporate Income Taxes		IRAP		
	Tax Elasticities					
Local Government	1.13	1.00	0.69	1.00	0.63	0.04
Regions	1.16	1.00	0.71	1.00	0.76	0.04
OSR	1.00	-	0.44	1.00	0.68	0.02
SSR	1.27	1.00	0.89	1.00	0.92	0.16
Provinces	-	-	-	-	0.46	0.002
Municipalities	1.00	-	0.58	-	0.31	0.004
	Tax Shares of GDP					
Local Government	0.87	0.29	1.57	1.45	3.51	-
Regions	0.74	0.29	1.40	1.45	2.27	-
OSR	0.36	-	0.66	1.49	1.57	-
SSR	3.37	2.30	6.52	1.19	7.12	-
Provinces	-	-	-	-	0.28	-
Municipalities	0.13	-	0.17	-	0.87	-

Source: Authors' calculations from Istat, General Government Accounts, 1980-2009, Istat, Regional Economic Accounts, 1980-2009 and Issirfa-Cnr, Regional Financial Observatory, 2002-09. For each tax component, tax elasticity represents the percentage change in tax revenue resulting from a 1 per cent change in the tax base. For the budget balance the percentage change in the balance/GDP ratio resulting from a 1 per cent change in GDP is reported. The budget semi-elasticity is computed assuming a symmetric 1 per cent response of all macroeconomic bases to the GDP shock. For each level of local government, tax elasticities are weighted using tax revenue data provided by Istat. The partition of expenditure, revenue and tax revenue between OSR and SSR is determined on the basis of local government accounts data provided by Issirfa-Cnr.

Cyclical components of local government tax revenue

	2002	2003	2004	2005	2006	2007	
			Local Government				
Direct Taxes	0.68	-0.09	-0.22	-0.11	0.60	0.54	
Indirect Taxes	0.26	-0.26	-0.19	0.02	0.91	1.21	
Tax Revenue	0.37	-0.21	-0.20	-0.01	0.83	1.02	
			Regions				
Direct Taxes	0.76	-0.07	-0.22	-0.12	0.59	0.50	
Indirect Taxes	0.30	-0.29	-0.29	0.02	1.08	1.33	
Tax Revenue	0.44	-0.21	-0.27	-0.02	0.93	1.06	
			OSR				
Direct Taxes	0.36	0.12	-0.17	-0.14	-0.01	0.50	
Indirect Taxes	0.29	-0.37	-0.34	-0.03	1.28	1.49	
Tax Revenue	0.31	-0.21	-0.28	-0.07	0.88	1.16	
			SSR				
Direct Taxes	1.44	-0.41	-0.32	-0.07	1.56	0.51	
Indirect Taxes	0.32	-0.14	-0.22	0.10	0.75	1.07	
Tax Revenue	0.66	-0.22	-0.25	0.05	1.00	0.89	
			Provinces				
Direct Taxes	-	-	-	-	-	-	
Indirect Taxes	0.23	-0.26	0.04	0.03	0.78	1.38	
Tax Revenue	0.23	-0.26	0.04	0.03	0.78	1.38	
			Municipalities				
Direct Taxes	0.15	-0.18	-0.20	-0.03	0.72	0.79	
Indirect Taxes	0.14	-0.18	0.03	0.02	0.49	0.85	
Tax Revenue	0.14	-0.18	-0.01	0.01	0.52	0.84	

Source: Authors' calculations from Istat, General Government Accounts, 1980-2009, Istat, Regional Economic Accounts, 1980-2009, Issirfa-Cnr, Regional Financial Observatory, 2002-09 and Ministry of Interior, Government Account Certificates of Municipalities and Provinces, 1998-2007. The data on direct and indirect taxes used to calculate the cyclical components are provided by Istat, General Government Accounts, 1980-2009. The macroeconomic bases used to identify the business cycle in each region are provided by Istat, Regional Economic Accounts, 1980-2009. For each level of local government, the cyclical components of direct and indirect taxes are computed by aggregating the regional components. The partition of the receipts of each tax by region is determined on the basis of local government accounts data provided by Issirfa-Cnr for the level of government of Regions and by Ministry of Interior for the level of government of Municipalities and Provinces. The cyclical components of the regional macroeconomic bases are estimated using an Hodrick-Prescott filter with parameter $\lambda=30$. Cyclical components are reported as percentage shares of tax revenue.

Table 6

Cyclical components of local government tax revenue by region and macro-area

	2002	2003	2004	2005	2006	2007
Piedmont	0.11	-0.77	-0.31	0.18	1.09	1.18
Aosta Valley	0.37	0.70	0.98	-0.95	-0.13	0.19
Lombardy	0.40	-0.01	-0.01	0.14	0.91	0.99
Liguria	0.71	-0.47	-0.89	-0.77	0.16	1.04
North West	0.35	-0.21	-0.11	0.02	0.86	1.01
Trentino Alto Adige	-0.09	-0.49	0.21	-0.21	0.41	0.28
Veneto	-0.18	-0.49	-0.31	-0.21	0.83	1.02
Friuli Venezia Giulia	0.75	-0.58	-0.60	-0.23	1.17	1.54
Emilia Romagna	0.35	-0.33	-0.80	-0.47	0.72	1.39
North East	0.14	-0.46	-0.33	-0.28	0.73	0.98
Tuscany	-0.09	-0.12	-0.07	-0.20	0.54	0.42
Umbria	-0.04	-0.90	-0.34	0.02	0.98	1.50
Marche	0.02	-0.19	-0.05	-0.02	1.08	0.73
Lazio	-0.12	-0.14	0.27	0.11	0.43	1.38
Centre	-0.09	-0.19	0.09	-0.01	0.57	1.05
Abruzzo	0.76	0.08	-1.06	-0.23	0.87	1.20
Molise	0.24	-0.19	-0.17	-0.84	0.63	1.07
Campania	1.00	0.39	0.03	0.26	1.06	1.43
Apulia	0.77	-0.18	-0.38	-0.26	0.64	1.13
Basilicata	0.29	-0.10	-0.15	-0.40	0.71	0.59
Calabria	0.43	0.15	0.44	0.23	0.87	0.60
Sicily	1.21	-0.25	-0.72	0.25	1.42	0.81
Sardinia	0.21	0.56	0.31	0.55	0.81	1.33
South and Islands	0.88	0.03	-0.34	0.19	1.07	1.07
Italy	0.37	-0.21	-0.20	-0.01	0.83	1.02

Source: Authors' calculations from Istat, General Government Accounts, 1980-2009, Istat, Regional Economic Accounts, 1980-2009, Issirfa-Cnr, Regional Financial Observatory, 2002-09 and Ministry of Interior, Government Account Certificates of Municipalities and Provinces, 1998-2007. The data on direct and indirect taxes used to calculate the cyclical components are provided by Istat, General Government Accounts, 1980-2009. The macroeconomic bases used to identify the business cycle in each region are provided by Istat, Regional Economic Accounts, 1980-2009. For each level of local government, the cyclical components of direct and indirect taxes are computed by aggregating the regional components. The partition of the receipts of each tax by region is determined on the basis of local government accounts data provided by Issirfa-Cnr for the level of government of Regions and by Ministry of Interior for the level of government of Municipalities and Provinces. The cyclical components of the regional macroeconomic bases are estimated using an Hodrick-Prescott filter with parameter $\lambda=30$. Cyclical components are reported as percentage shares of tax revenue.

Table 7

Changes in cyclical components of local government tax revenue by region and macro-area

	Beginning Year	Output Gap	Cyclical Component	Through Year	Output Gap	Cyclical Component	Peak Year	Output Gap	Cyclical Component	End Year	Output Gap	Cyclical Component
Piedmont	2002	-0.39	0.11	2003	-1.12	-0.77	2007	3.70	1.18	2007	3.70	1.18
Aosta Valley	2002	-0.30	0.37	2005	-0.77	-0.95	2004	1.56	0.98	2007	1.42	0.19
Lombardy	2002	0.57	0.40	2003	-0.29	-0.01	2007	3.77	0.99	2007	3.77	0.99
Liguria	2002	0.56	0.71	2005	-0.75	-0.77	2007	2.81	1.04	2007	2.81	1.04
North West	2002	0.32	0.35	2003	-0.50	-0.21	2007	3.64	1.01	2007	3.64	1.01
Trentino Alto Adige	2002	-0.31	-0.09	2003	-0.66	-0.49	2007	1.25	0.28	2007	1.25	0.28
Veneto	2002	-1.23	-0.18	2002	-1.23	-0.18	2007	3.03	1.02	2007	3.03	1.02
Friuli Venezia Giulia	2002	1.80	0.75	2004	-1.42	-0.60	2007	3.82	1.54	2007	3.82	1.54
Emilia Romagna	2002	0.25	0.35	2003	-1.26	-0.33	2007	3.97	1.39	2007	3.97	1.39
North East	2002	-0.26	0.14	2003	-1.16	-0.46	2007	3.31	0.98	2007	3.31	0.98
Tuscany	2002	0.68	-0.09	2005	-0.12	-0.20	2007	2.08	0.42	2007	2.08	0.42
Umbria	2002	0.22	-0.04	2003	-1.12	-0.90	2007	3.24	1.50	2007	3.24	1.50
Marche	2002	1.18	0.02	2003	-0.70	-0.19	2007	3.14	0.73	2007	3.14	0.73
Lazio	2002	0.63	-0.12	2003	-1.46	-0.14	2007	2.23	1.38	2007	2.23	1.38
Centre	2002	0.68	-0.09	2003	-0.90	-0.19	2007	2.36	1.05	2007	2.36	1.05
Abruzzo	2002	1.95	0.76	2004	-2.45	-1.06	2007	3.70	1.20	2007	3.70	1.20
Molise	2002	1.32	0.24	2003	-1.26	-0.19	2007	2.32	1.07	2007	2.32	1.07
Campania	2002	2.37	1.00	2005	0.25	0.26	2007	3.02	1.43	2007	3.02	1.43
Apulia	2002	0.82	0.77	2003	-0.97	-0.18	2007	2.49	1.13	2007	2.49	1.13
Basilicata	2002	0.35	0.29	2005	-1.96	-0.40	2007	2.05	0.59	2007	2.05	0.59
Calabria	2002	0.39	0.43	2005	0.00	0.23	2004	2.25	0.44	2007	1.46	0.60
Sicily	2002	0.97	1.21	2004	-0.96	-0.72	2007	2.27	0.81	2007	2.27	0.81
Sardinia	2002	-0.38	0.21	2002	-0.38	0.21	2007	1.95	1.33	2007	1.95	1.33
South and Islands	2002	1.20	0.88	2004	0.00	-0.34	2007	2.51	1.07	2007	2.51	1.07
Italy	2002	0.48	0.37	2003	-0.60	-0.21	2007	3.02	1.02	2007	3.02	1.02

Source: Authors' calculations from Istat, General Government Accounts, 1980-2009, Istat, Regional Economic Accounts, 1980-2009, Issirfa-Cnr, Regional Financial Observatory, 2002-09 and Ministry of Interior, Government Account Certificates of Municipalities and Provinces, 1998-2007. The data on direct and indirect taxes used to calculate the cyclical components are provided by Istat, General Government Accounts, 1980-2009. The macroeconomic bases used to identify the business cycle in each region are provided by Istat, Regional Economic Accounts, 1980-2009. For each level of local government, the cyclical components of direct and indirect taxes are computed by aggregating the regional components. The partition of the receipts of each tax by region is determined on the basis of local government accounts data provided by Issirfa-Cnr for the level of government of Regions and by Ministry of Interior for the level of government of Municipalities and Provinces. The cyclical components of the regional macroeconomic bases are estimated using an Hodrick-Prescott filter with parameter $\lambda=30$. Cyclical components are reported as percentage shares of tax revenue.

Table 8

Structural local government balances

	2002	2003	2004	2005	2006	2007
	Shares of Trend GDP					
Expenditure	14.8	14.8	15.5	15.5	15.9	15.5
Interest Payments	0.3	0.3	0.2	0.2	0.3	0.3
Revenue	13.9	14.4	14.5	14.7	14.6	14.9
Tax Revenue	6.3	6.6	6.4	6.4	6.5	6.7
Direct Taxes	1.6	1.8	1.8	1.7	1.7	1.9
Indirect Taxes	4.7	4.7	4.6	4.7	4.8	4.8
Transfers	6.4	6.5	6.8	7.0	6.8	7.0
Primary Balance	-0.5	-0.1	-0.7	-0.6	-0.8	0.1
Balance Before Transfers	-7.2	-7.0	-7.7	-7.8	-7.8	-7.0
Net Borrowing	-0.8	-0.4	-1.0	-0.8	-1.0	-0.2
	Shares of Revenue					
Primary Balance	-3.7	-0.9	-5.0	-4.2	-5.4	0.9
Net Borrowing	-5.9	-3.0	-6.7	-5.7	-7.1	-1.3

Source: Authors' calculations from Istat, General Government Accounts, 1980-2009, Istat, Regional Economic Accounts, 1980-2009, Issirfa-Cnr, Regional Financial Observatory, 2002-09 and Ministry of Interior, Government Account Certificates of Municipalities and Provinces, 1998-2007. The data on direct and indirect taxes used to calculate the cyclical components are provided by Istat, General Government Accounts, 1980-2009. The macroeconomic bases used to identify the business cycle in each region are provided by Istat, Regional Economic Accounts, 1980-2009. For each level of local government the cyclical components of direct and indirect taxes are computed by aggregating the regional components. The partition of the receipts of each tax by region is determined on the basis of local government accounts data provided by Issirfa-Cnr for the level of government of Regions and by Ministry of Interior for the level of government of Municipalities and Provinces. The cyclical components of the regional macroeconomic bases are estimated using an Hodrick-Prescott filter with parameter $\lambda=30$. Structural local government balances are reported as percentage rates.

Table 9

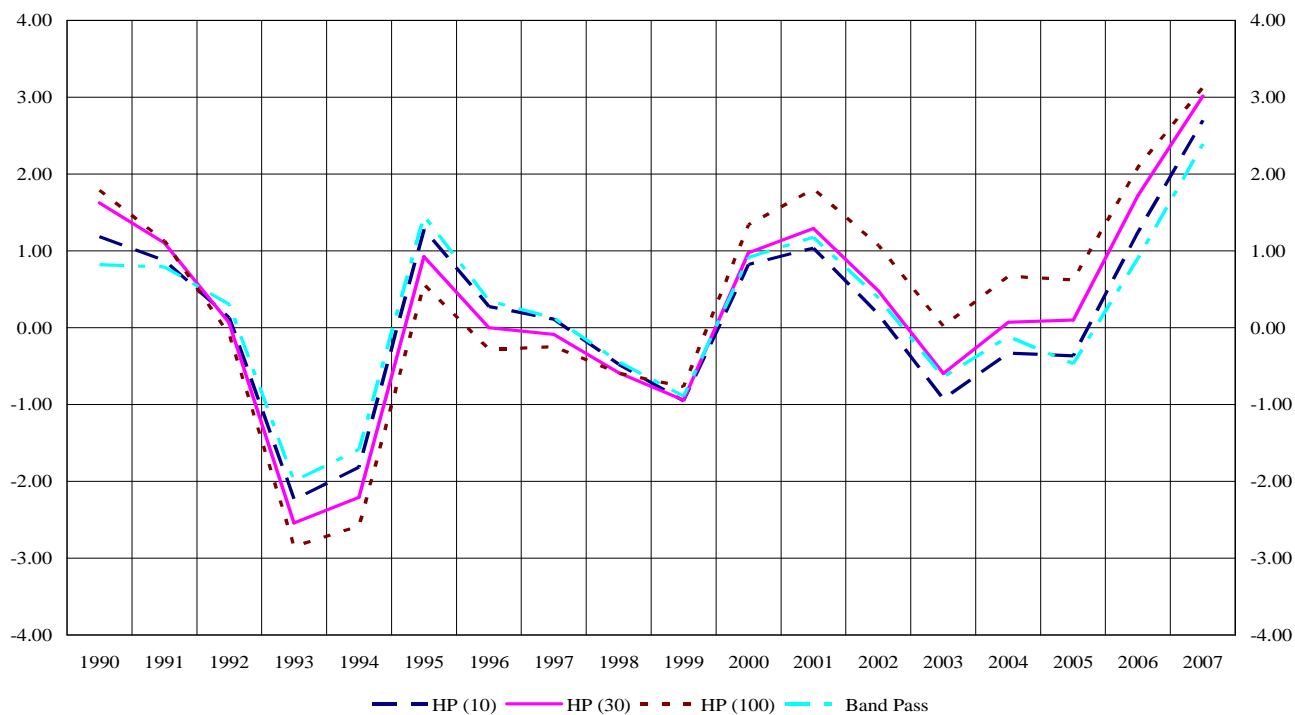
Effects of changes in local government tax rates

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Tax Revenue	5.7	5.3	6.0	6.2	6.3	6.6	6.4	6.4	6.5	6.8
IRAP	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.02	0.10	0.11
Regional Personal Income Surtax	-	0.00	0.00	0.00	0.00	0.08	0.08	0.07	0.07	0.12
Tax Revenue at Base Rates	5.7	5.3	6.0	6.2	6.3	6.5	6.3	6.3	6.3	6.5
Tax Changes	0.00	0.00	0.00	0.00	0.01	0.10	0.10	0.09	0.17	0.23

Source: Authors' calculations from Istat, General Government Accounts, 1980-2009 and Istat, Regional Economic Accounts, 1980-2009. The effects of changes in local government tax rates are computed comparing for each tax the receipts resulting from the application of the effective average tax rates and of the base tax rates to the approximation of the tax base represented by gross earnings. Gross earnings are defined as average earnings per employee times employment. Calculations are performed for each region and aggregated at national level. For IRAP, the differentiation of tax rates by sector of economic activity is taken into account. For each year, results are rescaled according to the effective revenue of each tax provided by Istat, General Government Accounts, 1980-2009. Tax revenue components are reported as percentage shares of GDP.

Figure 1

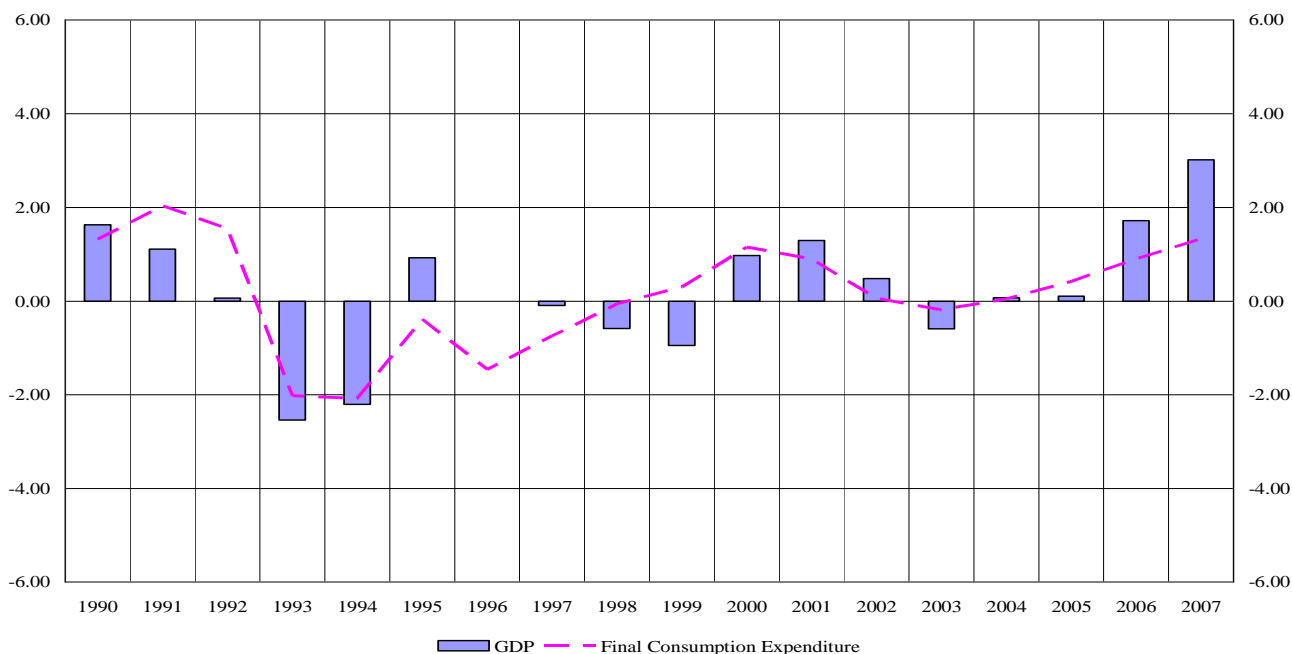
Output gap



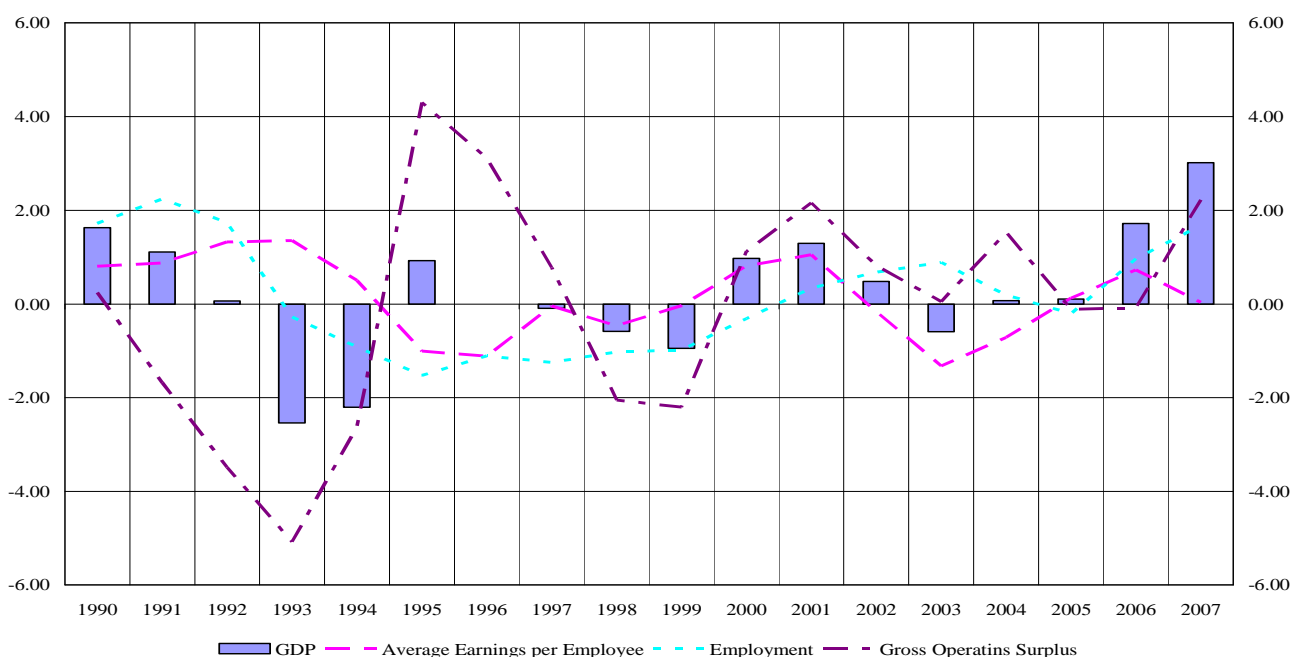
Source: Authors' calculations from Istat, Regional Economic Accounts, 1980-2009. The output gap is calculated as the ratio between the cycle and the trend of GDP with reference to the 1990-2007 period. The cyclical and trend component of GDP are calculated aggregating the regional components, estimated applying a Hodrick-Prescott filter with parameter $\lambda=10, 30$ and 100 and a Band Pass filter to the regional time series of GDP. The regional time series of GDP are extended to the 2010-16 period using the ARIMA modelling methodology. ARIMA forecasts of each series are rescaled according to the ITEM forecasts at the national level. Output gaps are reported as percentage rates.

Cyclical component of macroeconomic bases

Panel 2a



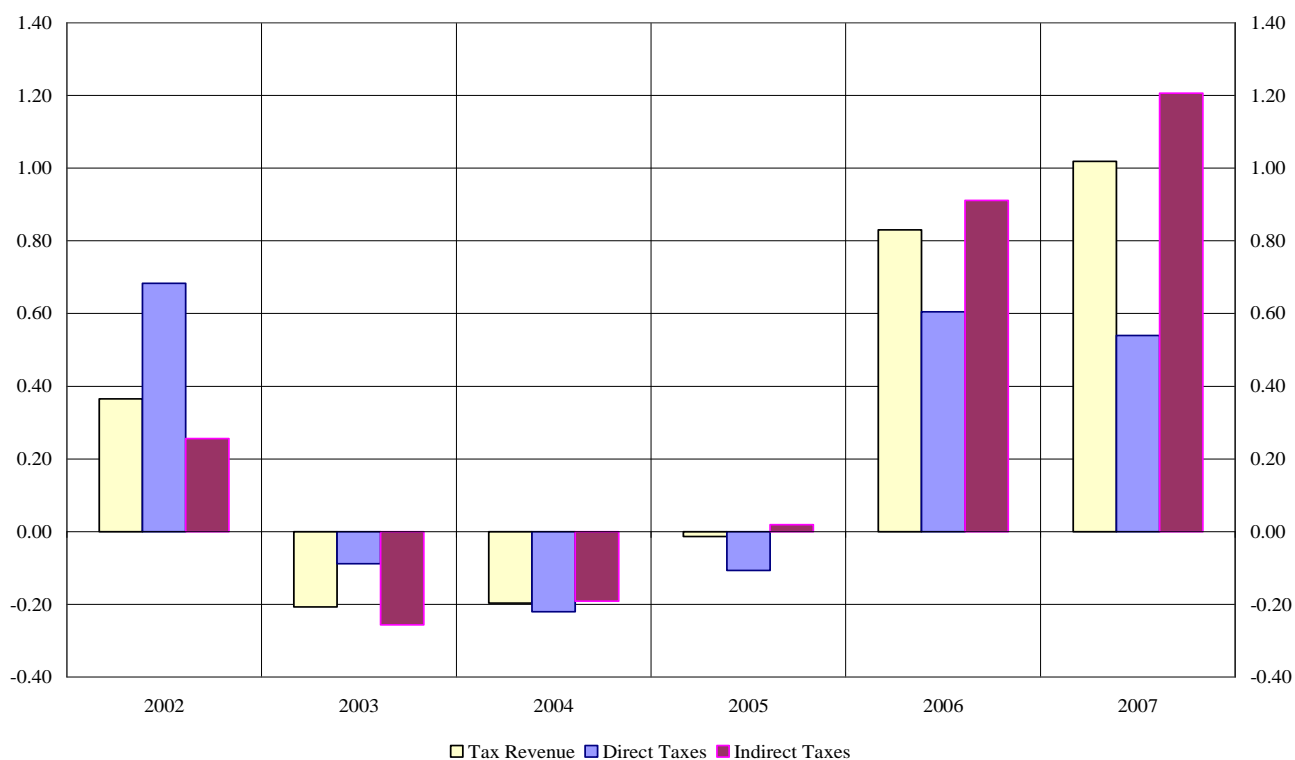
Panel 2b



Source: Authors' calculations from Istat, Regional Economic Accounts, 1980-2009. The cyclical component of each macroeconomic base is calculated as the ratio between the cycle and the trend with reference to the 1990-2007 period. The cyclical and trend component of each macroeconomic base are calculated aggregating the regional components, estimated applying a Hodrick-Prescott filter with parameter $\lambda=30$ to the regional time series. The regional time series of each macroeconomic base are extended to the 2010-16 period using the ARIMA modelling methodology. ARIMA forecasts of each series are rescaled according to the ITEM forecasts at the national level. Cyclical components are reported as percentage rates.

Figure 3

Cyclical components of local government direct and indirect taxes

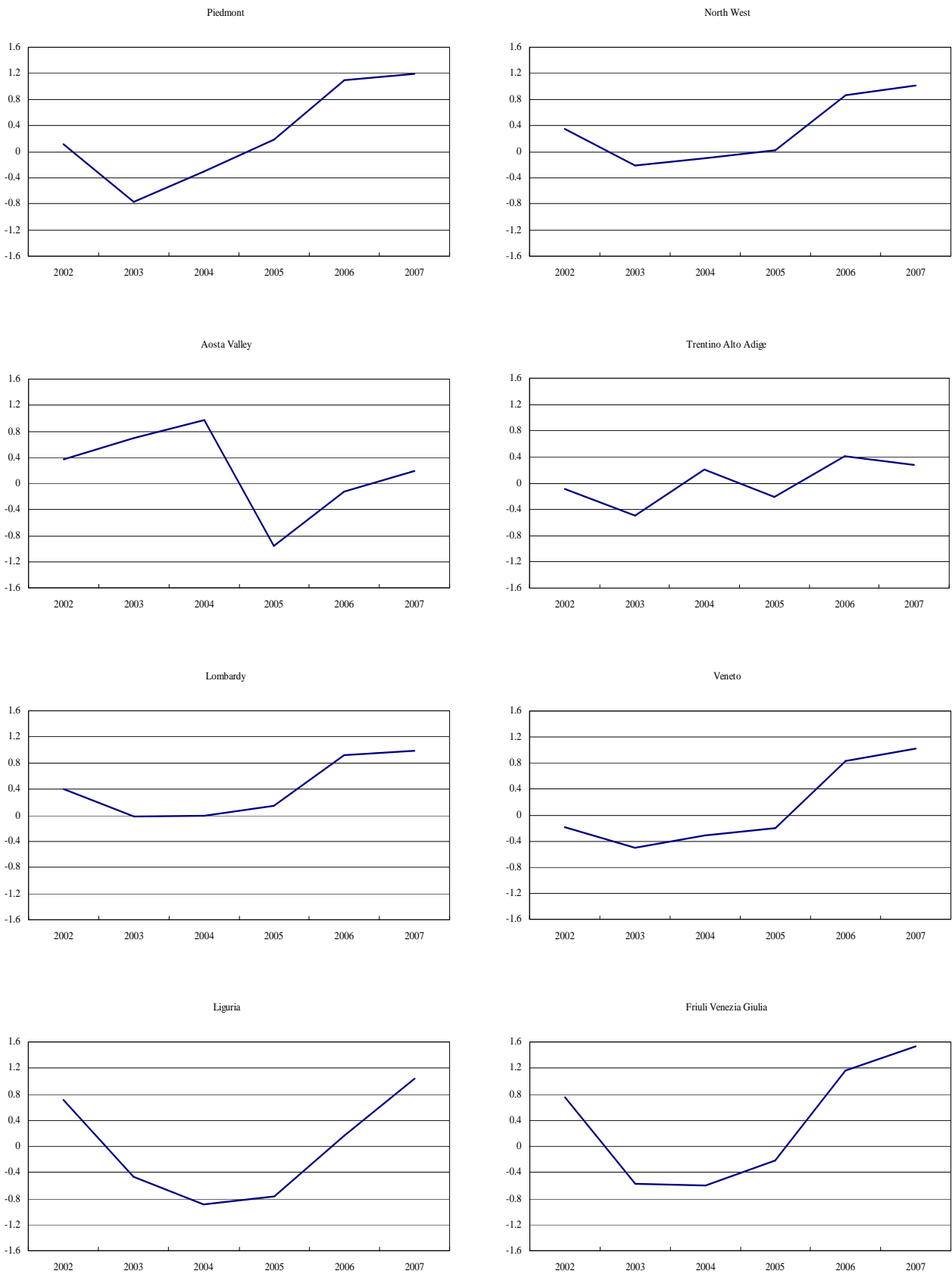


Source: Authors' calculations from Istat, General Government Accounts, 1980-2009, Istat, Regional Economic Accounts, 1980-2009, Issirfa-Cnr, Regional Financial Observatory, 2002-09 and Ministry of Interior, Government Account Certificates of Municipalities and Provinces, 1998-2007. The data on direct and indirect taxes used to calculate the cyclical components are provided by Istat, General Government Accounts, 1980-2009. The macroeconomic bases used to identify the business cycle in each region are provided by Istat, Regional Economic Accounts, 1980-2009. For each level of local government the cyclical components of direct and indirect taxes are calculated aggregating the regional components. The partition of the receipts of each tax by region is determined on the basis of local government accounts data provided by Issirfa-Cnr for the level of government of Regions and by the Ministry of Interior for the level of government of Municipalities and Provinces. The cyclical components of the regional macroeconomic bases are estimated using a Hodrick-Prescott filter with parameter $\lambda=30$. Cyclical components are reported as percentage shares of tax revenue.

Figure 4

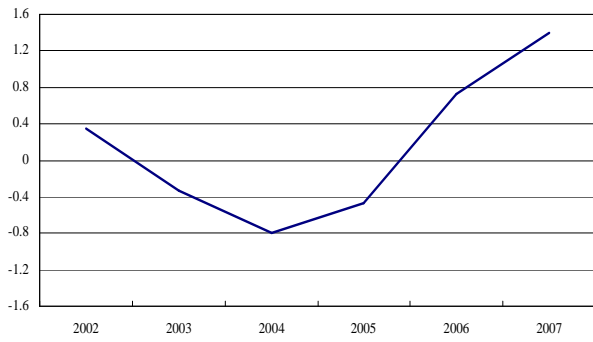
Cyclical components of local government tax revenue by region and macro-area

Panel 4a

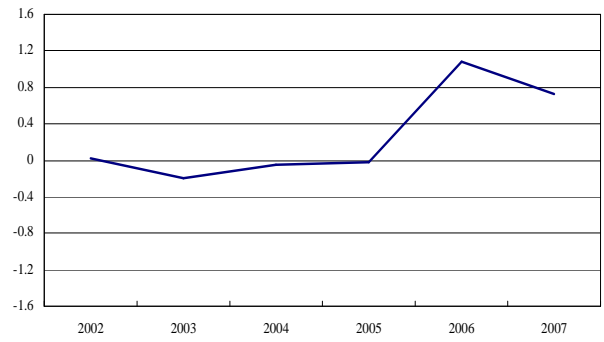


Panel 4b

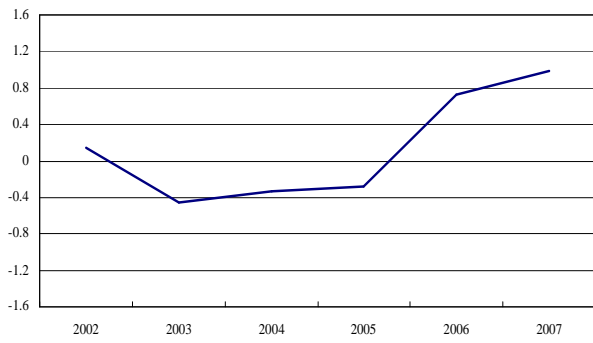
Emilia Romagna



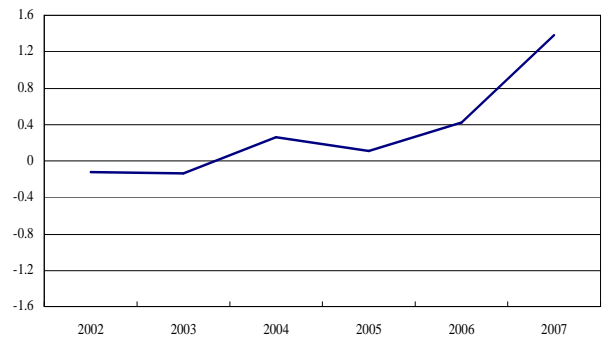
Marche



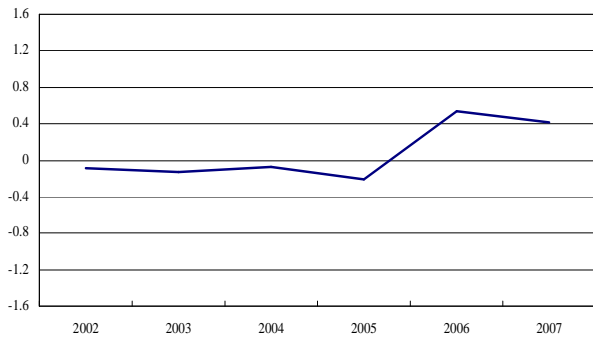
North East



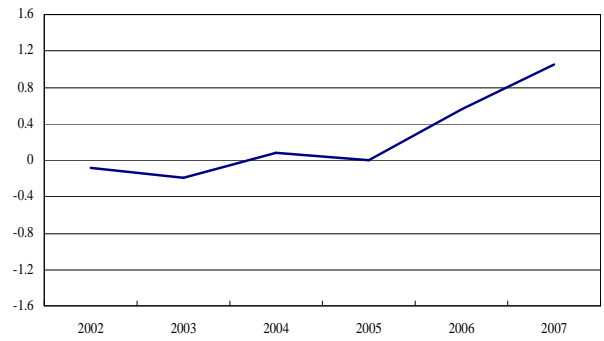
Lazio



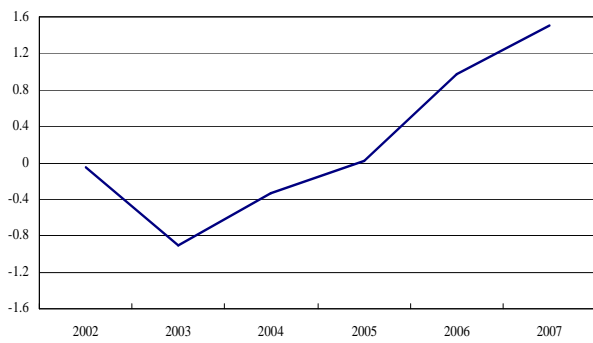
Tuscany



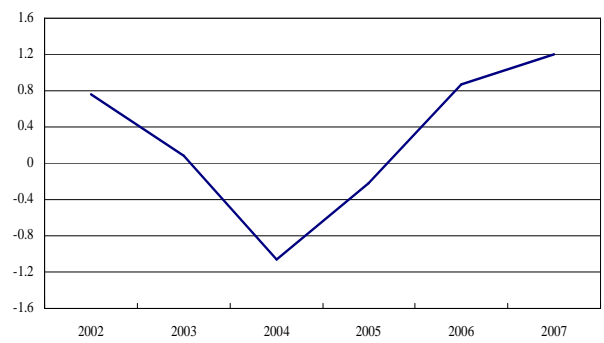
Centre



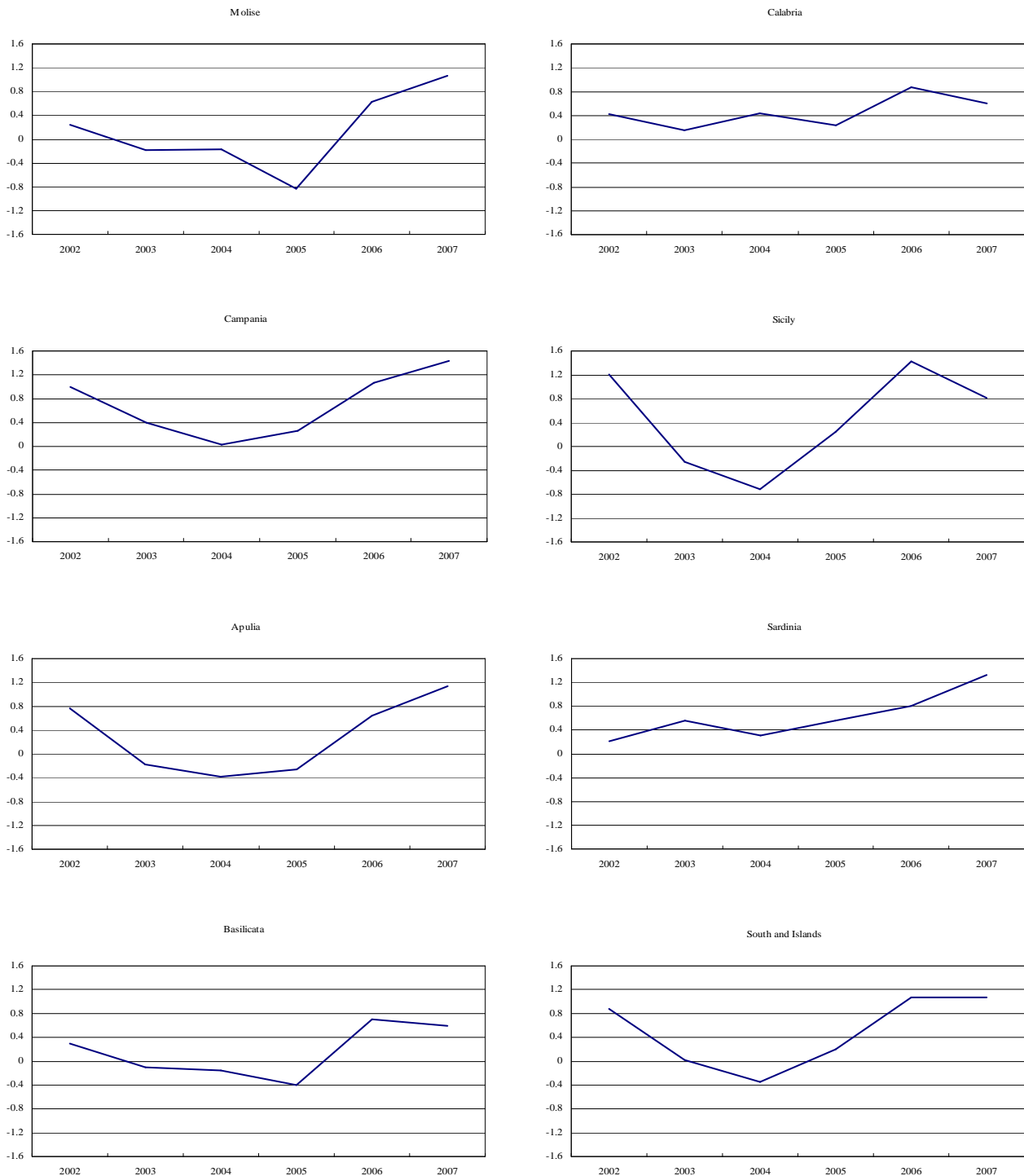
Umbria



Abruzzo

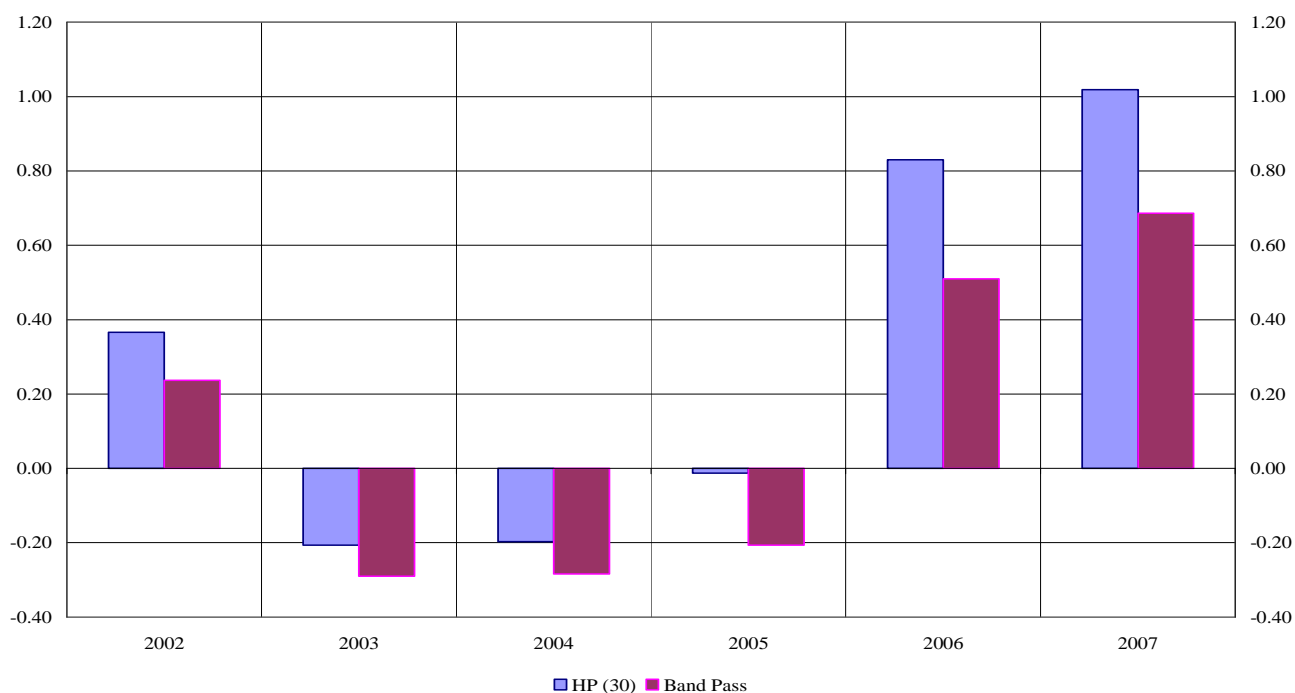


Panel 4c



Source: Authors' calculations from Istat, General Government Accounts, 1980-2009, Istat, Regional Economic Accounts, 1980-2009, Issirfa-Cnr, Regional Financial Observatory, 2002-09 and Ministry of Interior, Government Account Certificates of Municipalities and Provinces, 1998-2007. The data on direct and indirect taxes used to compile the cyclical components are provided by Istat, General Government Accounts, 1980-2009. The macroeconomic bases used to identify the business cycle in each region are provided by Istat, Regional Economic Accounts, 1980-2009. For each level of local government the cyclical components of direct and indirect taxes are calculated aggregating the regional components. The partition of the receipts of each tax by region is determined on the basis of local government accounts data provided by Issirfa-Cnr for the level of government of Regions and by the Ministry of Interior for the level of government of Municipalities and Provinces. The cyclical components of the regional macroeconomic bases are estimated using a Hodrick-Prescott filter with parameter $\lambda=30$. Cyclical components are reported as percentage shares of tax revenue.

Cyclical components of local government tax revenue



Source: Authors' calculations from Istat, General Government Accounts, 1980-2009, Istat, Regional Economic Accounts, 1980-2009, Issirfa-Cnr, Regional Financial Observatory, 2002-09 and Ministry of Interior, Government Account Certificates of Municipalities and Provinces, 1998-2007. The data on direct and indirect taxes used to calculate the cyclical components are provided by Istat, General Government Accounts, 1980-2009. The macroeconomic bases used to identify the business cycle in each region are provided by Istat, Regional Economic Accounts, 1980-2009. For each level of local government, the cyclical components of direct and indirect taxes are calculated aggregating the regional components. The partition of the receipts of each tax by region is determined on the basis of local government accounts data provided by Issirfa-Cnr for the level of government of Regions and by Ministry of Interior for the level of government of Municipalities and Provinces. The cyclical components of the regional macroeconomic bases are estimated using an Hodrick-Prescott filter with parameter $\lambda=30$ and a Band Pass filter. Cyclical components are reported as percentage shares of tax revenue.

Structural local government balances

Panel 6a



Panel 6b



Source: Authors' calculations from Istat, General Government Accounts, 1980-2009, Istat, Regional Economic Accounts, 1980-2009, Issirfa-Cnr, Regional Financial Observatory, 2002-09 and Ministry of Interior, Government Account Certificates of Municipalities and Provinces, 1998-2007. The data on direct and indirect taxes used to calculate the cyclical components are provided by Istat, General Government Accounts, 1980-2009. The macroeconomic bases used to identify the business cycle in each region are provided by Istat, Regional Economic Accounts, 1980-2009. For each level of local government, the cyclical components of direct and indirect taxes are calculated aggregating the regional components. The partition of the receipts of each tax by region is determined on the basis of local government accounts data provided by Issirfa-Cnr for the level of government of Regions and by Ministry of Interior for the level of government of Municipalities and Provinces. The cyclical components of the regional macroeconomic bases are estimated using a Hodrick-Prescott filter with parameter $\lambda=30$. Local government balances are reported as percentage shares of revenue.

Appendix A: Tax elasticities

The elasticity of a tax with respect to a macroeconomic variable is defined as the ratio between the rate of change of the tax revenue (T) and the rate of change of the macroeconomic variable (X):

$$\varepsilon_{T,X} = \frac{\Delta T}{T} \bigg/ \frac{\Delta X}{X} \quad (\text{A.1})$$

or as the product between the elasticity of the tax with respect to the tax base (Tb) and the elasticity of the tax base with respect to the macroeconomic reference variable:

$$\varepsilon_{T,X} = \varepsilon_{T,Tb} \cdot \varepsilon_{Tb,X} \quad (\text{A.2})$$

where the first elasticity is a function of the structure of the tax rates and the second one depends on the correlation between the tax base and the macroeconomic reference variable.

Assuming a perfect correlation between the latter two variables, or that the two variables are identical, yields $\varepsilon_{Tb,X} = 1$ and hence: $\varepsilon_{T,X} = \varepsilon_{T,Tb}$.

We note that:

$$\varepsilon_{T,Tb} = \frac{\Delta T}{\Delta Tb} \bigg/ \frac{T}{Tb} \quad (\text{A.3})$$

therefore the tax elasticity with respect to the tax base is equal to the ratio between the marginal and the average tax rate.

The tax elasticity with respect to the tax base is greater, equal or lower than 1 if the tax rate structure is respectively progressive, proportional or regressive.

In particular, denote by tb the individual tax base and suppose that the marginal tax rate is represented by the function $t_m(x)$, $x \in [0, tb]$. The individual tax revenue is

defined as: $T(tb) = \int_0^{tb} t_m(x) dx$. The average tax rate corresponding to a given individual revenue is therefore $t_a(tb) = T(tb)/tb$.

Assume now that the tax base is partitioned in a number n of tax classes or tax brackets and denote by γ_i^p and γ_i the corresponding population and income shares, for $i=1, \dots, n$. Further, denote by t_{mi} the marginal tax rate and with t_{ai} the average tax rate in class or bracket i , for $i=1, \dots, n$ compiled in correspondence with the average income in the class.

The calculation of the tax elasticity accounts for two effects: the increase of the tax base due to the increase of the individual tax base and the increase in the tax base due to the increase of the population.

We are able to show that, in the first case, $\Delta T / Tb = \sum_{i=1}^n \gamma_i^p t_{mi}$ and $T / Tb = \sum_{i=1}^n \gamma_i t_{ai}$. Hence, the tax elasticity with respect to a change in the individual tax base is given by:

$$\mathcal{E}_{T, Tb} = \frac{\sum_{i=1}^n \gamma_i^p t_{mi}}{\sum_{i=1}^n \gamma_i t_{ai}} \quad (\text{A.4})$$

In the case of the representative individual in equation (A.4), it is assumed that $\gamma_i^p = \gamma_i$, this is the approach followed, for instance, by Giorno *et. al.* (1995). In the case of progressivity by tax class, it can be further assumed that $t_{mi} = t_{ai}$ for all $i=1, \dots, n$. This yields an elasticity equal to 1.

Finally, assuming that the distribution of individual tax bases is stochastically independent from the population size, it is possible to show that the tax elasticity with respect to the population is equal to 1. Tax revenue is directly proportional to the population size:

$$\mathcal{E}_{T, Tb} = 1 \quad (\text{A.5})$$

The overall tax elasticity can be compiled as a weighted average of (A.4) and (A.5).

Appendix B: Econometric estimates of the elasticity of IRAP

We provide an econometric test of the assumption of a unitary elasticity for IRAP. This assumption is obtained applying the institutional approach on the basis of the analysis of the characteristics of this tax. For the purposes of the econometric test, we used data provided by the Department of Finance of the Ministry of Economy and Finance. The database contains information on IRAP declarations and tax bases for the 2002-07 period. The data are organized by region and sector of economic activity. Using the panel structure of this database, several regressions were estimated, with the purpose of obtaining an econometric identification of the elasticity of the tax with respect to its tax base.

The results of this estimation exercise are reproduced in Table B.1. In each of the models reported in the table, the dependent variable is represented by IRAP tax receipts, as resulting from the IRAP declarations by region and sector of economic activity for the 2002-07 period. Several specifications of the panel regressions are provided, using as dependent and independent variables respectively, either the aggregate tax receipts and tax base or the average tax receipts and tax base by region and sector of economic activity for the 2002-07 period. For both types of regressions, we estimated both fixed-effects and random-effects models. In addition, we estimated weighted versions of the models in average tax variables, using as weights either the tax receipts or the tax base frequency by region and sector of economic activity in the sample period. The results reported in the table provide confirmation to our assumptions on the tax elasticity.

Table B.1

Elasticity of IRAP

Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Tax Base	1.0643 (0.0082)	1.0195 (0.0043)	1.0437 (0.0082)	1.0400 (0.0073)	1.0643 (0.0128)	1.0195 (0.0053)	1.0437 (0.0132)	1.0400 (0.0111)	1.0759 (0.0150)	1.0754 (0.0149)	1.0759 (0.0241)	1.0754 (0.0240)
Const.	-3.9332 (0.1114)	-3.9189 (0.0592)	-3.2926 (0.0447)	-3.8044 (0.0349)	-3.9332 (0.1736)	-3.9189 (0.0809)	-3.2926 (0.0716)	-3.8044 (0.0492)	-3.5056 (0.0711)	-3.5034 (0.0708)	-3.5056 (0.1142)	-3.5034 (0.1137)
Obs. Units	1,680 280	1,680 280	1,680 280	1,680 280	1,680 280	1,680 280	1,680 280	1,680 280	1,680 280	1,680 280	1,680 280	1,680 280
R ²	0.9723	0.9956	0.9769	0.9953	0.9723	0.9956	0.9769	0.9953	0.9769	0.9769	0.9769	0.9769
σ_u	0.2820	0.0941	0.2440	0.0933	0.2820	0.0941	0.2440	0.0933	0.2360	0.2361	0.2360	0.2361
σ_ε	0.0571	0.0571	0.0599	0.0599	0.0571	0.0571	0.0599	0.0599	0.0530	0.0527	0.0530	0.0527
ρ	0.9606	0.7309	0.9431	0.7078	0.9606	0.7309	0.9431	0.7078	0.9519	0.9526	0.9519	0.9526
Corr.	-0.3091	–	0.2624	–	-0.3091	–	0.2624	–	0.0773	0.0800	0.0773	0.0800

Source: Authors' calculations from Ministry of Economy and Finance, Finance Department, IRAP Declarations, 2002-07. Panel regressions of the log transform of IRAP on the log transform of its tax base. Sample period 2002-07. In each time panel, observation units are defined by region and sector of economic activity. In models (1)-(2) and (5)-(6), variables are aggregated by region and sector of economic activity, while in models (3)-(4), (7)-(8) and (9)-(12), average variable values are used. Models (1), (3), (5), (7) and (9)-(12) are fixed-effects, models (2), (4), (6) and (8) are random-effects. Random-effects models include a set of sectoral indicator variables among the regressors. In models (9) and (11), regressions are weighted with the frequency of tax base observations, in models (10) and (12) regressions are weighted with the frequency of tax receipts observations. Heteroskedasticity and autocorrelation-consistent standard errors are compiled for models (5)-(8) and (11)-(12). Standard errors are reported in parentheses.

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