Own resources for the EU budget.

An analytical exploration of possible tax revenue instruments

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Abstract

The paper is an analytical endeavour exploring the relative merits of possible tax revenue instruments, if they were used as own resources for the EU budget. It first considers the criteria that could be considered when assessing a proposal to reform the regime of EU own resource. It then evaluates the degree of cyclical and structural convergence in the main tax aggregates across the EU Member States in order to draw general lessons for the revenue side of the central budget. These would be relevant not only for potential revenue sharing mechanisms based on existing tax instruments already implemented at the national level, but would help inform also the design of potential new taxes levied at the EU level.

Keywords: EU budget, stabilisation, tax revenue

JEL classification codes: H29, E620, H87

Introduction

The current system of financing the EU budget faces a number of issues, as identified by the Court of Auditors, the European Commission and the European Parliament. It has actually evolved into a system of national contributions, with only a minor part representing 'genuine', or 'autonomous' own resources. In particular, the GNI-based contribution, while initially designed as a residual, to cover the balance of total expenditure exceeding the traditional own resources and own resources based on value added tax (VAT), has gradually gained in importance[2]. It now represents around 70% of the EU budget. The traditional own resources, which result directly from the existence of a customs union (customs duties and sugar levies), have become marginal. Against this background

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[2] Financing of the EU budget relies on the following categories: i) Traditional own resources: consist mainly of customs duties on imports from outside the EU and sugar levies. EU Member States keep 25 % of the amounts as collection costs. ii) Own resources based on value added tax (VAT): a uniform rate of 0.3 % is levied on the harmonised VAT base of each Member States. iii) Own resources based on GNI: each Member State transfers a standard percentage of its GNI to the EU. Although designed simply to cover the balance of total expenditure not covered by the other own resources, this system has become the largest source of revenue of the EU budget.

and in the context of reflections how to reform the EU budget, financing instruments providing autonomous resources, and in particular tax instruments, have attracted particular attention. At the current juncture, the debate on the financing of the EU budget is inevitably intertwined with the discussions on the future of European integration (and on the need to build a fiscal capacity for EMU), particularly on "a fiscal union" for Europe (The Five Presidents' Report, 2015; Cottarelli and Guerguil, 2015).

Against this background, this paper aims to provide some economic and empirical insights on potential new own resources for the EU budget (see, e.g., Iara, 2015). The paper presents the issue at hand in an orderly manner by setting out criteria that could be considered when assessing a proposal to reform the regime of EU own resource and by presenting –a variety of tax revenue options to finance the EU budget. Moreover, the assessment and choice of tax instruments to finance the EU budget may be helped by the examination of the volatility and the yield capacity of the main taxes (looking at country-specific revenue elasticities) and the heterogeneity of the tax bases and convergence thereof across countries.

The paper is structured as follows. The first section spells out the criteria which could be used for the assessment of tax options. The second section reviews the series of possible options, including those related to the use of existing taxes or financing instruments already subject to a high level of harmonisation. It should be stressed that these 'harmonised' instruments are not related to EU revenue but, up until now, to national revenue/contributions. This section however refrains from assessing the options according to the criteria listed below, which lies outside the scope of the paper. The third section investigates two important dimensions to bear in mind when assessing the relative merit of different taxation options, namely i) the volatility of different taxes and its drivers, and ii) the heterogeneity of tax bases across countries. The last section concludes.

1. Objectives and criteria

The adequacy of the different tax instruments can be assessed against a number of criteria, pertaining to the specific objectives that can be achieved, and to the feasibility of the potential options. These are consistent with the general objectives established by the High Level Group on Own Resources (HLGOR) in 2014, namely: equity/fairness; efficiency; sufficiency and stability; transparency and simplicity[3]. However, the criteria below aim to translate these general principles into more operational principles, to the extent possible.

Securing budget financing

This set of criteria corresponds to the main aim of own resources, that is, providing the EU budget with revenue sources apt to cover the EU budget expenditures on a sustainable basis. The first criterion is clearly the ability to provide financing, not only in terms of expected *size of revenue* but also in terms of *stability* over time *and predictability* of the revenue yield. The *size of revenue* is related to the notion of sufficiency: the resources used should be large enough to cover the financing needs of the EU, since the EU budget needs to be balanced (art. 310 TFEU). Otherwise, the EU budget would have to continue to rely on 'ad-hoc' national contributions (such as GNI-based resources), as a balancing device. The *stability* of revenue refers to the relative independence from the change in short-term economic conditions, such as the cyclical fluctuation

[3] The High Level Group on Own Resources (HLGOR) was established in February 2014 to reflect possible reforms to the ways to finance the EU.

or boom/burst in asset prices. This is important since the EU cannot run debt and the budget should be balanced on an annual basis.

The requirement of *autonomous resources* appears also of primary importance to overcome the issues arising from the current reliance on a 'residual' as the main source of finance. The system of 'own resources' has gradually become a system of national contributions with only a minor fraction being 'autonomous' or 'genuine' own resources. Autonomous resources are, strictly speaking, resources collected centrally at EU level, according to automatic rules. In practice, the administration in Member States could certainly help collect this resource on behalf of the EU. Autonomous resources could make the budget more transparent, less contentious – unlike contributions –, more secure in the long run, while avoiding delayed payments.

Other objectives related to the EU dimension: e.g. macroeconomic stabilisation

Regarding the specificities of the EU as a supra-national entity, an issue deserve consideration, namely, to what extent a revenue source is able to capture other cross-border issues, in terms of spill-overs or externalities. A side issue is also how the resource sources reinforce other EU policies or EU objectives. This is fully in line with the subsidiarity principle, by which the EU acts when its actions are more efficient than national interventions. In this context, it is natural to put forward the concepts of *macroeconomic stabilisation*, or risk-sharing, as an additional assessment criterion, all the more so because it is a typical features of a budget, on one hand, and to the specificities of the EU as a supra-national entity, on the other.

At the national level, the central budget normally plays a stabilising role across regions. At the EU level, this objective corresponds to the economic need of reducing harmful cyclical fluctuation across EU economies, while applying the solidarity principle in the short run. Importantly, macroeconomic stabilisation supposes the absence of permanent transfers, but only the accommodation of temporary fluctuations. However, the stabilisation role already embedded in the EU institutional arrangement can only be indirect and modest. First, the size of the EU budget remains modest, around 1% of EU GDP, which would practically limit the stabilisation capacity of autonomous own resources. Second, the composition of the EU budget is not adequate to provide output stabilisation. Indeed, most of the funded expenditure is a-cyclical, that is, not moving with the economic activity. Third, and even more importantly, the EU *cannot* run a budget deficit since article 310 of the TFEU demands that "the revenue and expenditure shown in the budget shall be in balance" on an annual basis. Bypassing this rule would involve a Treaty change. The criteria of stabilisation (of economic activity) could also run counter to the aforementioned criteria of stability (of revenue). Therefore, the stabilisation capacity would not be fully consistent with a balanced budget. This could be achieved by increasing the weight of resources that vary strongly with the economic cycle or the state of the economy, while maintaining the use of a "buffer", preferably cyclically-neutral, such as the GNI-based contribution, to compensate the cyclical shortfalls and bring the budget back to balance. Reducing the weight of the GNI-contribution at the expense of more cyclically-driven revenue could raise the stabilisation property of the EU. In this respect, this would only provide *relative* stabilisation with respect to the EU average, albeit to a limited extent given the small size of the EU budget and its need to remain strictly balanced. Member States displaying less favourable cyclical conditions than the EU average could benefit

from more cyclical own resources[4]. All in all, achieving proper macroeconomic stabilisation would require a dedicated fiscal capacity, outside the EU budget as it is currently set up.

Feasibility

A third set of assessment criteria pertains to the feasibility of the identified options. Such criteria cover practical aspects of implementation but also of political feasibility, since the unanimity of votes is required for adopting any revision of the own resource system. Therefore, both *administrative efficiency* and *political acceptance* are important prerequisites for the actual implementation of a financing system alternative to the current one. We could also add the criteria of *transparency and simplicity,* which is at the crossroads of administrative efficiency and political acceptance, but is easier to assess per se. First, making the EU revenue system more understandable will foster the acceptance by the citizen and the democratic accountability in the long run. Second, a simpler and more transparent system is easier to audit and to run in conformity with budgetary control procedures.

2. Reviewing possible tax instruments to finance the EU budget

The financing options we consider focus on tax instruments. They are of course not exhaustive, and may be dependent on decisions taken in the area by the relevant institutions.

Using existing revenues subject to a high level of harmonisation

This section examines options related to the use of existing taxes or financing instruments already subject to a high level of harmonisation at EU level, which are natural candidates for financing the budget. It should be stressed that these "harmonised" instruments are not directly related to EU revenue but, up until now, to national revenue/contributions.

[4] As discussed in Carnot et al. (2015), this relative stabilisation corresponds to mechanisms where the own resources vary with the difference between the country's output gap and the EU-wide output gap. This relative stabilisation differs from the absolute stabilisation, by which the own resources vary with the level of output gap, and could lead to a deficit in bad times. Carnot et al. (2015) also discuss the caveats related to the use of the output gap. The relative stabilisation of the EU budget could modestly contribute to increasing the economic activity of countries in a downturn. Conversely, it will, through higher payments, dampen the domestic demand of countries with more favourable cyclical conditions than the EU average.

Increasing the current VAT contribution. A simple way to provide the budget with more resources would be to increase the current call-in rate (set at 0.3%[5]) on the VAT resource as it is determined now (i.e., on the notional VAT harmonised base). Although this option is not really considered in the current debate, given the serious shortcomings identified for the system, it is nonetheless useful to assess how it fares against the assessment criteria set out in this paper and as compared to other options.

Reforming the VAT. Since existing harmonised tax instruments are a natural candidate for financing the central budget, VAT is clearly an option to be explored. This is of course a very complex issue, which is also intertwined with the current policy strand to reform VAT to increase its efficiency. This short paragraph only provides a preliminary discussion, without prejudice of current policy discussions. With a harmonised tax, the size of the contributions to the central budget closely reflects the contributive capacity of Member States. A genuine system based on actual VAT receipts has the advantages of providing autonomous resources of potentially significant size, given the importance of the tax. The concrete design of such option could in principle take different forms. Not exhaustively, three possible options could be contemplated: a certain tax rate (x%) from transactions taxed at the *VAT standard rate*. The HLGOR in its First Assessment report of 17 December 2014 proposes to apply "a single EU rate of 1% on all the goods and services currently subject to the standard rate (…)"; x% rate from *all transactions, excepted exemptions or zero rates*. To circumvent the risk of moral hazard, the reference revenue aggregate could be enlarged to include the receipts also from transactions at the reduced rate(s). This means that only the goods and services benefitting from (non-binding) exemptions or zero rates, which are not subject to VAT either legally or in practice, will drop outside the tax base; x% rate from *all transactions subject and eligible to VAT*. This includes the (non-binding) exemptions or zero rates, establishing a level playing field in the EU. This could correspond to a genuine EU tax levied at the central level, since the tax base will be identical across countries.

Harmonised excise duties. Like for the VAT, excise duties could be used to finance the central budget on the grounds of the degree of harmonisation at the EU level, notably in terms of product categories subject to taxation and specific tax design, including minimum rates and possible exemptions. Indeed, the system of harmonised excises was set up with the launch of the Single Market in order to facilitate cross-border trade and prevent distortions, including to the degree of competition in markets for specific products. Harmonised excises are applicable to three main product categories: alcohol, tobacco and energy products (i.e., product used for heating and transport, as well as electricity).

Seigniorage is the central bank/government income generated by issuing money (currency and central bank deposits). It is often associated with an "inflation tax." The Eurosystem's "monetary income" is distributed among national central banks according to the ECB capital key (Article 32 ESCB Statute). It becomes part of central banks' profits, whose use is regulated at Member State level. The largest share of profits tends to be paid out to national Treasuries, after deducting operating costs, replenishing buffers as needed etc. Subject to these deductions, seigniorage/monetary income is thus currently a fiscal revenue of Member States.

Other possible sources

[5] Reduced call-in rates are applicable for Austria (0.225 %), Germany (0.15 %), the Netherlands and Sweden (0.1 %).

This section reviews options referring to the use of new harmonised taxes or instruments that have already been proposed by the Commission but not yet adopted. The harmonisation planned does not involve the attribution of potential revenue to the EU, since these revenues are now meant to be exclusively received by Member States. It also reviews the use of taxes which are or could be subject to some forms of coordination at EU level. It finally examines other options, corresponding to the use of brand new instruments.

Financial Transaction Tax (FTT). The FTT proposal, tabled as a response to the need to have the financial sector give a fair substantial contribution to public finances after the financial crisis, is now, in revised form, under the enhanced cooperation procedure among 11 EU Member States. Among the possible options, economic and technical reasons linked to the nature of the tax base and to the characteristics of the technical infrastructure call for a high degree of harmonisation in the design of the tax (e.g., in terms of broad scope, broadly defined residence principle, no exemptions), also in order to minimise tax evasion, avoidance and abuse[6].

Common consolidated corporate tax base (CCCTB). A way of financing the budget with corporate income tax revenue could be based on the Commission proposal for a Common Consolidated Corporate Tax Base (CCCTB). The CCCTB proposal provides a single set of rules applicable by companies operating within the EU for the calculation of their taxable profits. Cross-border consolidation of losses comes on top of the common rules to calculate the base, with the latter being applicable on their own (CCTB). Consolidation requires also the use of formula apportionment, which in principle partly acts as a sharing mechanism, while at the same time mitigates the problem of the profit shifting through transfer pricing[7].

Financial activities tax (FAT) can be defined as a typology of taxes, sharing common features. In practice, a FAT can be levied on the sum of profit and labour compensation in the financial sector, thus capturing the rent accruing either to shareholder or to workers. However, different types of FAT can be designed, depending on how profit and remunerations are defined and which objectives are pursued with the tax. FAT was among the possible options assessed in the impact assessment put forward by the Commission as accompanying document to the FTT proposal in 2011. Although the option was not retained in the final evaluation, it is nonetheless of interest to see how this type of taxes would fare against the criteria set forth for the EU budget.

An EU CO2. A tax on CO2-emissions – very hypothetical so far -could be seen as a complement to the ETS and cover the sectors not included in the system, i.e. mainly transport, agriculture and residential heating. As such, it would aim to have a more efficient climate policy by creating one common carbon price in the EU. Some Member States have introduced different forms of carbon taxation. The UK uses it as an instrument in addition to the ETS to enhance incentives for investment in low-carbon technologies. The climate change levy is applied on electricity and fossil fuels used for lightening, heat and power in the business and public sector. In e.g. Sweden, Denmark and France CO2-taxes are part of the excise tax regime, with the same type of scope and derogations.

[6] A more technical discussion of the features of the FTT can be found in the Commission impact assessment. See, http://ec.europa.eu/taxation_customs/index_en.htm.

[7] Details on the CCCTB, including the proposal and accompanying Impact assessment, can be found at http://ec.europa.eu/taxation_customs/taxation/company_tax/common_tax_base/index_en.htm.

Based on "back-to-the envelop" calculation , a genuine VAT resource seems to offer the largest revenue potential, in particular if compared to alternative tax bases, such as capital income of households and corporate income, which appear much narrower than consumption.

3. Tax revenues in the EU: volatility and heterogeneity

In this section we focus on some economic features of the main tax instruments discussed in the first part of the paper. We use country-specific data on tax revenues and the corresponding tax bases, proxied by macroeconomic aggregates, to draw general lessons on the yield capacity of different taxes and analyse the additional challenges that emerge in a cross-country setting such as the EU. In particular, our empirical exercise tackles two issues: *i*) how tax revenues react to changes in the tax bases, and which factors drive such responsiveness; *ii*) how different revenue structures are in the EU, and whether and to what extent they have been converging over time. The first part of the analysis allows us to identify tax design aspects that, in addition to structural and economic features, affect the sensitivity of tax revenue to changes in the relevant tax bases. Then, by taking a closer look at the evolution of revenues and tax bases across countries and over time, we gauge the degree of structural convergence on the revenue side of the national budgets in the EU.

3.1. Choosing tax instruments: what do country-specific revenue elasticities tell us?

The starting point of our analysis is the empirical work of Price et al. (2014), who estimate revenue elasticities for the main tax aggregates - PIT, CIT, and VAT – in the EU28 using data for the period 1995-2013. These elasticities are endorsed by the EU Member States and used in the EU budgetary surveillance framework (Mourre et al., 2014). In the methodology agreed upon at the EU level to calculate the cyclically adjusted budget balance, the revenue-to-output gap elasticities are obtained as a product of their two components, namely the relevant revenue-to-base elasticities and the base-to-output gap elasticities (Mourre and Princen, 2015). In our exercise, we focus on the former component, while leaving the analysis of the cyclical aspects of tax bases to the next section. It is important to stress that, throughout the section as well as in the first-step econometric regressions in Price et al. (2014), tax bases are proxied by macroeconomic aggregates[8]. These are earnings, gross operating surplus and household final consumption for personal income, profits and the consumption tax base respectively.

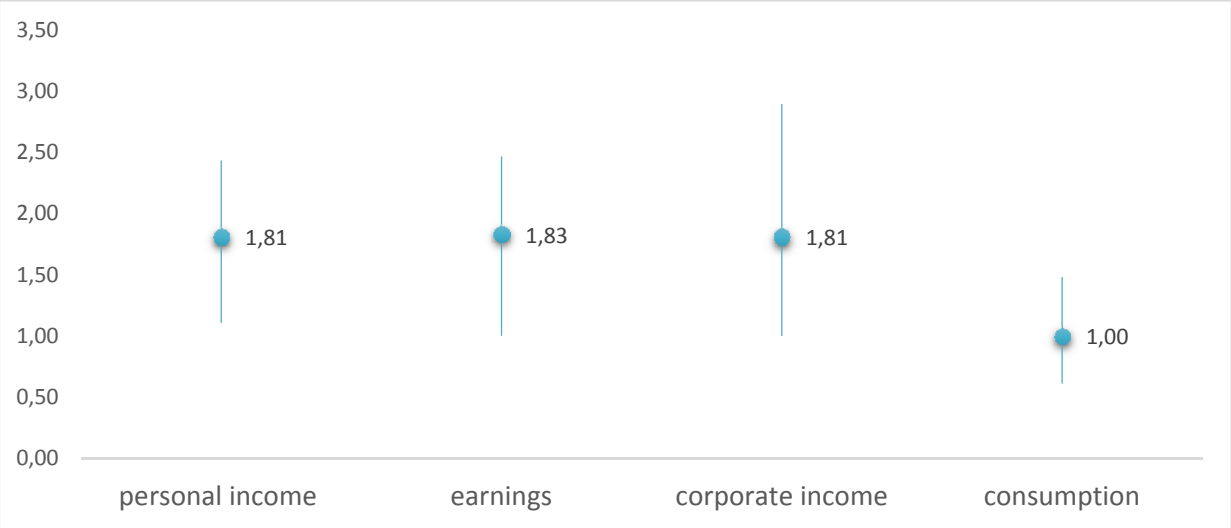
The revenue-to-base elasticity can be expressed as the ratio between the marginal rate and the average rate of taxation. Thus, the point estimate of the elasticity indicates not only by how much an increase in the tax base translates into an increase in revenue, but also how the marginal rate behaves with respect to the average rate as the relevant base increases. Hence, with a unit elasticity, revenues increase proportionally with the base, and there is no difference between average and marginal rates of taxation. If the elasticity is larger than one, the increase in revenue is more than proportional than the change in the base. Otherwise said, the marginal rate is larger than the average rate. Progressive taxes will therefore be characterized by elasticities above unity.

Figure 2 depicts the average EU elasticities, together with the minimum and maximum country-specific point estimates. The figure points to a large degree of heterogeneity when it comes to the

[8] The analysis of Bruce et al. (2006) shows that there might be significant discrepancies between the actual tax bases and their macroeconomic proxies.

sensitivity of tax revenue items with respect to their tax base in the EU. In what follows, we discuss the potential institutional and economic determinants of such heterogeneity. We do so by performing a standard two-step regression, whereby we explain the variation in the estimated elasticities across countries using a number of country-level potential determinants.

Figure 1. Tax revenue elasticities



Note: the dots represent the EU average value of the elasticities. The length of the lines indicate the country-specific maximum and minimum values.

Source: Price et al. (2014)

Personal income tax

We test a number of variables as potential determinants of the elasticities of personal income tax revenues to the (proxy of the) tax base, as obtained in the first step regressions in Price at. al (2014). First, we try and capture relevant features of the personal income tax design, particularly its degree of progression, since the elasticity – which can be expressed as the ratio of the marginal to the average tax rate – will tend to be larger the higher the deviation from proportionality. In particular, we introduce the following controls. The *value of the general allowance* as a percentage of the average wage. Given that the presence of a tax-free threshold automatically introduces an element of progressivity in the personal income tax system, we expect the elasticity to be higher, the larger the tax-free threshold. By the same token, we use a dummy indicating whether the country has a *flat tax system* in place for taxing personal income. The dummy is defined loosely for the countries with a flat rate, without accounting for the presence of a general allowance (captured by the previous variable). In addition, we also control explicitly for the *marginal rate progression* of the personal income tax schedule, taken from Sabirianova Peter et al. (2010). Following Musgrave and Thin (1948), this is a measure of structural progressivity that denotes changes in the calculated (nominal) tax burden along the (relevant parts of the) income distribution, as opposed to the effective progressivity that depicts changes in actual income inequality[9]. We take the value at the middle of the tax schedule, rather the value for the whole

[9] Sabirianova Peter et al. (2010) calculate the marginal rate progression (MRP) as a single, comprehensive measure for each country. First, they compute marginal rates at 100 different levels of pre-tax income that are evenly spread in the range from 4% to 400% of a country's GDP per capita. These variables are then used to construct marginal rate of progression by estimating the slope coefficient from regressing marginal rates on the log of gross income for the income distribution up to 4·y income.

schedule, since the aggregate value of the elasticity is driven by the sensitivity in the lower part of the income distribution. We also include *tax expenditures related to pensions* among the controls, introducing dummies for the presence of allowances and other types of relief for this type of income. Lastly, we introduce a variable measuring the *change in the top personal income tax rate* over the period 1995-2013. The top rate can be considered a rough measure of how redistributive is the tax system. Ceteris paribus, this is expected to have a positive impact on the elasticity.

A second set of regressors controls for demographic factors potentially affecting revenue elasticities. They are the *share of population aged under 19* and the *share of population above 65 years*. By the same token, we use the *income quintile share ratio* as a measure of the inequality of the income distribution. The metric is calculated as the ratio of total income received by the top quintile to that received by the bottom quintile of the income distribution.

Lastly, we control for labour market dynamics introducing measures for the *growth of employment* and its *standard deviation*, as a measure of volatility, over the reference period (1995-2013). The descriptive statistics and the correlation matrix are reported in table 2 (panels a. and b., respectively).

Table 1. Variables – personal income tax

a. Descriptive statistics

Variable	Mean	Std. Dev.	Min	Max
elasticity of personal income tax	1.865	0.350	1.11	2.43
general PIT allowance	28.838	21.770	0	49
flat tax system (dummy)	0.190	0.402	0	1
change in top pit rate	-8.177	11.305	-40	16.50
marginal rate progression (mid)	0.058	0.032	0	0.13
relief for pension income (dummy)	0.238	0.436	0	1
allowance for pension income (dummy)	0.333	0.483	0	1
share of population under 19	22.041	2.233	18.96	27.40
share of population above 65	16.321	2.336	11.27	20.32
income quintile shares	4.761	1.174	3.33	7.10
employment growth	0.576	0.961	-1.64	3.17
st. dev. of employment growth	1.793	0.817	0.72	3.62

b. Pairwise correlations

		1	2	3	4	5	6	7	8	9	10	11
1	elasticity of personal income tax	1										
2	general PIT allowance	0.1866	1									
3	flat tax system (dummy)	-0.1169	-0.0993	1								
4	change in top pit rate	0.4945	0.2991	-0.7617	1							
5	marginal rate progression (mid)	0.1138	0.3023	-0.1769	0.3695	1						
6	relief for pension income (dummy)	0.1035	0.0727	0.2983	-0.2481	0.0934	1					
7	allowance for pension income (dummy)	0.2564	0.3097	-0.0857	0.1124	-0.2909	-0.1581	1				
8	share of population under 19	-0.0446	0.0005	-0.1928	0.1069	-0.296	-0.1041	0.1468	1			
9	share of population above 65	-0.3534	0.1213	-0.2243	0.1153	0.5021	0.0063	-0.1828	-0.6701	1		
10	income quintile shares	-0.2099	-0.3357	0.2249	-0.1274	0.1538	-0.392	-0.3517	-0.3591	0.2704	1	
11	employment growth	0.3415	-0.0149	-0.4873	0.29	-0.307	-0.0692	0.3617	0.4463	-0.3751	-0.3923	1
12	st. dev. of employment growth	-0.1222	-0.0507	0.149	-0.1041	-0.0153	-0.3206	-0.0197	0.07	-0.2532	0.5859	-0.0206

We run the regression using two alternative measures of the elasticity, estimated for all personal income and only for earnings, respectively. The two aggregates differ because personal income includes self-employment income and income from capital in addition to earnings. The results are reported in table 3.

Table 2. Country-level regressions for revenue elasticities – personal income tax

	personal income	earnings
	(1)	(2)
general allowance (% of AW)	0.003	0.003
	[0.96]	[1.06]
flat tax system (dummy)	-0.06	-0.154
	[-0.35]	[-0.78]
marginal rate of progression (mid)	3.688*	4.303*
	[1.97]	[1.93]
relief for pension income (dummy)	0.169	0.220**
	[1.72]	[2.35]
allowance for pension income (dummy)	0.173*	0.218*
	[2.11]	[2.01]
change in top pit rate	0.014**	0.015**
	[2.93]	[2.63]
share of population under 19	-0.118***	-0.130***
	[-4.57]	[-5.71]
share of population above 65	-0.187***	-0.210***
	[-5.39]	[-5.56]
income quintile share ratio	0.157**	0.175**
	[2.31]	[2.41]
employment growth	0.099*	0.100*
	[2.05]	[1.90]
st. dev. of employment growth	-0.233***	-0.233***
	[-3.50]	[-3.26]
constant	6.859***	7.400***
	[7.55]	[8.71]
N	21	21
R sq.	0.906	0.914
F	35.145	33.727

Note: White heteroscedasticity robust t-stats in square brackets.

The coefficient of the general allowance is positive, although not statistically significant. Likewise, the effect of a flat tax system, while expectedly negative, is not identified with precision. The presence of tax expenditures associated to pension income, particularly the ones taking the form of an allowance, significantly affects the elasticity. The impact is particularly strong for the elasticity based on earnings, potentially indicating that revenue from self-employment and investment income might be playing a confounding role in the identification of the elasticity for overall personal income[10]. The size of the coefficients imply that systems with allowances and other relief for pension income have elasticities that are larger by 22 percent than those estimated for countries without such tax expenditures. The degree of marginal progressivity of the tax system – measured in the middle part of the income distribution – affects positively the elasticities. The point estimates imply that one-standard deviation increase in the marginal rate of progression leads roughly to a 0.15 proportional increase in the elasticity. Changes in the top rate of taxation, which could be considered a measure of the degree of redistribution at the top of the income distribution, also impact positively and significantly the elasticity. The impact is of the same order of magnitude, namely a one-standard deviation increase in the change of the top PIT rate translates into a 0.16 proportional increase in the revenue-to-base elasticity.

[10] This would not be the case where all types would be pooled together and then be subject to the same income tax schedule as the one applicable earnings. However, in some countries the capital tax regime differs from the regime for employment income, mainly through the application of a flat tax, or a dual or semi-dual income tax system. A flat tax imposed without any allowances would be expected to generate a capital income elasticity of exactly one, whereas applying a uniform tax rate on capital income above a certain threshold would be expected to generate a capital income elasticity higher than one, depending on the height of that threshold, but lower than countries applying a progressive higher-rate schedule. By the same token, self-employment income is subject to special tax regimes in some EU Member States.

Moving to demographic factors, both the shares of population under 19 and above 65 years decrease the sensitivity of personal income tax revenue to income. Changes to income inequality, as measured by the income quintile share ratio, lead to increases in the estimated elasticity. Employment growth also impacts positively the elasticity, while its volatility has a negative impact.

Corporate income tax

We next look at the determinants of the elasticities for corporate income taxes with respect to gross operating surplus. The relationship between gross profits and taxes is however made non-linear by the possibility to offset losses against current profits and by the fact that tax liabilities will be affected by capital gains (Price et al., 2014). Moreover, the fact that profits and losses receive a non-symmetrical tax treatment (that is, a firm pays taxes if it makes a profit, but it does not receive a refund for tax losses) and the provisions for carrying losses backward or forward into other tax years of most corporate tax systems cause difficulties in linking precisely the tax base to current corporate income[11]. With these caveats in mind, we perform the second-step regression using tax provisions that affect the definition of the tax base as controls.

In particular, we use a dummy variable that takes the value of one when there are *R&D incentives* broadly defined (accelerated depreciation schemes, allowances, etc...)[12]. The *tax treatment of losses* is captured via two different dummies. The first takes unit value in the presence of indefinite loss carry-forward, where we identify the additional effect given by the time length of the carry-forward scheme with respect to the baseline case where this lasts only for a few years. By contrast, since not all the countries considered have such provision in place, the dummy for the loss carry-back captures the mere impact of the scheme, irrespective of its duration. We also include the change in the *corporate tax rate* over the reference period (1995-2013). We use two measures for the rate, namely the statutory rate and the effective average tax rate (EATR). The latter captures also some features of the tax base, notably the generosity of tax depreciation allowances for capital expenditure, in the context of a discrete investment project. By contrast, the former represent the key variable in the decision to shift book profits across jurisdictions. Finally, we capture the impact of the production structure with a variable measuring the share of value added in the mining sector. This would capture both the macroeconomic relevance of extractive industries, and special fiscal treatment often in place to fully exploit their revenue potential[13]. The descriptive statistics and the correlation matrix are reported in table 4 (panels a. and b., respectively).

Table 3. Variables – corporate income tax

a. Descriptive statistics

[11] Ultimately, this will make the relationship between current corporate tax receipts and GDP potentially unstable.

[12] We have experimented also a more general definition of tax incentives for business investment not necessarily linked to R&D outlays. The results were never significant.

Variable	Mean	Std. Dev.	Min	Max
elasticity of corporate income tax	1.810	0.566	1	2.9
R&D tax incentives (dummy)	0.600	0.503	0	1
indefinite loss carry-forward (dummy)	0.600	0.503	0	1
loss carry-back (dummy)	0.250	0.444	0	1
change in top CIT rate	-12.093	8.052	-28	1
change in EATR	-6.150	3.996	-12.30	5
share of VA in mining	0.015	0.015	0.00	0.05

b. Pairwise correlations

		1	2	3	4	5	6
1	elasticity of corporate income tax	1					
2	R&D tax incentives (dummy)	0.5812	1				
3	indefinite loss carry-forward (dummy)	0.1462	-0.0417	1			
4	loss carry-back (dummy)	0.2659	-0.2357	0.2357	1		
5	change in top CIT rate	0.1904	0.0148	0.0995	-0.1813	1	
6	change in EATR	-0.3583	-0.4455	0.0472	0.215	0.0817	1
7	share of VA in mining	0.4666	0.415	-0.1435	0.061	-0.1238	-0.196

We run the second step regression using both the short run and the baseline value of the revenue-to-base elasticity, the latter having been obtained as an average of the short and long run point estimates in the first-step error correction model in Price et al. (2014). The results are reported in table 5.

Table 4 Country-level regressions for revenue – corporate tax

	baseline elasticity	short run elasticity
	(1)	(2)
R&D investment incentives (dummy)	0.549**	0.51
	[2.19]	[1.70]
indefinite loss carry-forward (dummy)	0.084	0.011
	[0.46]	[0.05]
loss carry-back (dummy)	0.574***	0.770***
	[3.71]	[4.07]
change in top CIT rate	0.021**	0.025**
	[2.23]	[2.90]
change in EATR	-0.031	-0.064***
	[-1.71]	[-3.86]
share of VA in mining	8.976	10.384
	[1.40]	[1.55]
constant	1.225***	1.261***
	[7.39]	[6.62]
N	20	20
R sq.	0.664	0.69
F	11.389	20.325

Note: White heteroscedasticity robust t-stats in square brackets.

The impact of R&D tax incentives is positive and significant for the baseline elasticity, but loses statistical significance in explaining the variation in the short run elasticities. The tax treatment of losses also has a positive impact on the elasticity, although that is identified with precision only for the loss carry-back provisions. The change in the top CIT rate is found to affect the sensitivity of revenue to profits significantly, also in the short run. By contrast, changes in the EATR have the opposite effect, which turn significant only in the short run. This could be indeed explained with the inherent differences in the two tax rates. Increases in the statutory rate, ceteris paribus, increase incentives to shift profits away, and might therefore ultimately translate in lower

revenue. Increases in the EATR might be driven from less generous depreciation allowances for fixed investment, and thus the negative impact would be fully consistent with the effect of tax incentives the affect the definition of the tax base. When it comes to the economic variables, we find a positive impact of the share of the mining sector in value added on the sensitivity of revenue to profits. The coefficient is not estimated with precision, however.

Indirect taxes

Indirect taxes account for roughly one-third of government revenues in the EU countries. Around 60 percent of that is from VAT. Indirect taxes are in practice considered as proportional to their main tax base (consumption), which, in turn, is taken as proportional to the output gap. Thus, ultimately, indirect taxes are not subject to cyclical adjustment. In other words, they are assumed to have a unit elasticity. This assumption can be questioned on several grounds, however. First and foremost, the VAT is not necessarily proportional if different rates are applicable to items with different income elasticities. In particular, if the more income elastic items are taxed at higher rates the elasticity would be expected to be above unity. While the actual patterns of rates and exemptions differ substantially across counties, there is some evidence of compositional shifts in consumption taking place over the cycle, which would make this deviation from proportionality significant in explaining the patterns of elasticities (Sancak et al., 2010). By the same token, the other main components of indirect taxation – taxes on specific goods and services – would have an aggregate elasticity with respect to consumption which is a function of the income elasticities of the various bases. Specifically, excises on fuel would have elasticity above one, as would some alcohol duties, while excises on tobacco would have a near zero income elasticity. Overall, these elasticities should probably not be assumed to be unity[14].

As before, we use the elasticities estimated by Price et al. (2014) as our dependent variable in the second-step regression. Results must be taken with extra caution given both the limited number of observations and the low variability in the data. From the discussion above, we will focus on explanatory variables that are more likely to drive the tax away from proportionality. In particular, we use *VAT efficiency* (also called the VAT revenue ratio), which is the ratio between actual VAT revenue and the maximum theoretical revenue (i.e., product of the standard rate and the tax base). In addition to the impacts of policy action via reduced rates and exemptions, VAT efficiency also captures the effect of tax collection and compliance[15]. The effects of the statutory rate of taxation are controlled for by including the *change in the VAT standard rate* over the reference period (1995-2013). By the same token, we also include a dummy for the existence of *super-reduced rates*, which would suggest a string deviation from proportionality in the VAT system.

[14] Price et al. (2014) identify two other factors as relevant in driving the elasticities away from one, notably: i) the VAT treatment of residential housing – classified as investment or intermediate spending in the national accounts – which strongly differs from country to country, and thus affects the overall indirect tax elasticities asymmetrically across countries; ii) taxes on financial transactions, which are included in the national accounts indirect tax aggregate but not in consumption. Indirect tax receipts may vary non-linearly with these items, particularly when they have a stronger cyclicality than consumption.

[15] A similar indicator is the VAT rate ratio, which is calculated as the ratio of the average household VAT rate over the standard rate. The measure provides a synthetic indication of the use of reduced rates and VAT exemptions, while being only partially effected by features other than tax policy in a strict sense. Both ratios can be considered as a measure of the deviation from proportionality of the VAT.

Given its peculiarity, the tax design for excise duties is difficult to capture in synthetic indicators. Thus, we focus only on one specific feature of excises on energy products, notably we introduce a dummy which takes the value of one in case *excise duties are not indexed to inflation*. Indeed, properly indexing excises to inflation would help to maintain unaltered the impact of taxes on consumer behaviour, and the level of revenue yield per unit of GDP (European Commission, 2015).

Finally, as an economic variable, we include the ratio of *exports to GDP* in the regression. There is a twofold rationale for using this variable. First, exports are not subject to VAT in the exporting country. Thus, different propensities to export across countries might be associated with different VAT revenue elasticities. Secondly, the VAT zero-rating of exports indirectly offers room for VAT fraud. While the vulnerability of the VAT systems of EU Member States clearly depends also on other factors, such as the quality of tax administration and of the overall institutional framework, export propensity can be thought as being correlated with such outcomes. The descriptive statistics and the correlation matrix are reported in panel a. and b. of table 6, respectively.

Table 5. Variables – indirect taxes

a. Descriptive statistics

Variable	Mean	Std. Dev.	Min	Max
elasticity of indirect tax revenue to base	0.995	0.238	1	1.5
VAT efficiency	51.644	8.458	37	70
super-reduced VAT rate (dummy)	0.125	0.342	0	1
change in standard VAT rate	2.063	2.330	-3	6
no indexation of excises (dummy)	0.188	0.403	0	1
export-to-GDP	48.860	19.737	20.93	87.33

b. Pairwise correlations

		1	2	3	4	5
1	elasticity of indirect tax revenue to base	1				
2	VAT efficiency	-0.5824	1			
3	super-reduced VAT rate (dummy)	0.5506	-0.3713	1		
4	change in standard VAT rate	-0.0681	-0.2385	0.2408	1	
5	no indexation of excises (dummy)	-0.087	0.0913	-0.1816	0.2351	1
6	export-to-GDP	-0.3608	0.3938	0.1533	-0.4655	-0.0485

In table 7 we report results from two different second step regression, where we use as dependent variable the short run and the baseline value of the revenue-to-base elasticity, alternatively. The impact of VAT efficiency on the revenue elasticity is negative. This implies that as the indicator increases (i.e., actual receipts converge towards the theoretical ones when all consumption would be taxed at the standard rate) the revenue elasticity will decrease, as the tax becomes increasingly proportional. The point estimate is not statistically significant however. Increase in the standard rate also reduce the elasticities, potentially capturing the effect of different income elasticities of taxed items. This impact is expected to be reinforced if the change in the standard rate is accompanied by a shifting of items across rates, which unfortunately we are unable to control for. The dummy indicating the presence of super-reduced rates has a positive sign and is statistically significant. As expected, elements that make the system deviate from proportionality increase the estimated elasticities. The dummy measuring the absence of indexation of excise duties has a positive impact on the elasticities, particularly the short run ones. Finally, the estimated coefficient for the ratio of exports to GDP is negative, indicating that

countries with a larger share of production sold abroad have a lower sensitivity of indirect tax revenue to the tax base.

Table 6. Country-level regressions for revenue elasticities – indirect tax

	baseline elasticity	short run elasticity
	(1)	(2)
VAT efficiency	-0.005	-0.011
	[-1.04]	[-0.79]
super-reduced VAT rate (dummy)	0.551***	1.143**
	[6.50]	[3.08]
change in standard VAT rate	-0.070***	-0.169***
	[-5.14]	[-3.89]
no indexation of excises (dummy)	0.118*	0.379**
	[1.95]	[2.60]
export-to-GDP	-0.009***	-0.016**
	[-5.09]	[-2.41]
constant	1.741***	2.686***
	[7.39]	[3.94]
N	16	15
R sq.	0.833	0.754
F	46.084	4.681

Note: White heteroscedasticity robust t-stats in square brackets.

3.2. How heterogeneous are revenue structures in the EU?

Supra-national fiscal institutions providing macroeconomic stabilization would ideally cater for asymmetric shocks (Carnot et al. 2015). Thus, the degree of business cycle synchronization across countries matters. While there is evidence that cyclical divergence – measured as variation of country-specific output gaps – has increased after the crisis in Europe, in what follows we complement such findings taking a different perspective. In particular, we assess the degree of synchronization of the macroeconomic aggregates that best proxy for the major relevant tax bases (compensation of employees, gross operating surplus and private consumption). In doing so, we also depart from the existing literature on macroeconomic stabilization in Europe, which naturally focuses on the expenditure side of the budget. In this way, we aim to identify additional challenges linked to the design of the revenue side for a supra-national budget.

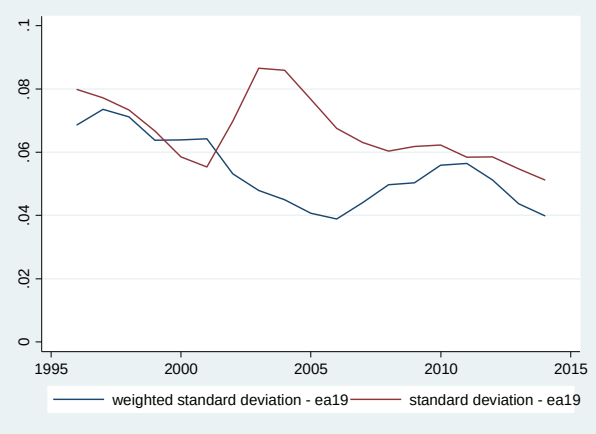
We limit ourselves to a descriptive analysis of developments in the relevant tax revenue and macroeconomic aggregates, leaving further investigation on the determinants of such dynamics to future extensions of this work. To assess the degree of structural convergence, we first separate the trend and cyclical components of each series by using the Hodrick-Prescott (1997) filter. Since we work with annual data, we use a smoothing parameter of 6.25 as recommended in the literature (Ravn and Uhlig, 2002). Then, we calculate the growth rates of the underlying trend variables, and finally we compute the standard deviation of the growth rates across both the EU and the Euro area. We also use a GDP-weighted measure of standard deviation to correct for the possibility that results could be driven by one or more small Member States acting as outliers. Constrained by availability of revenue data, our sample period spans from 1995 to 2014.

Convergence of revenue developments?

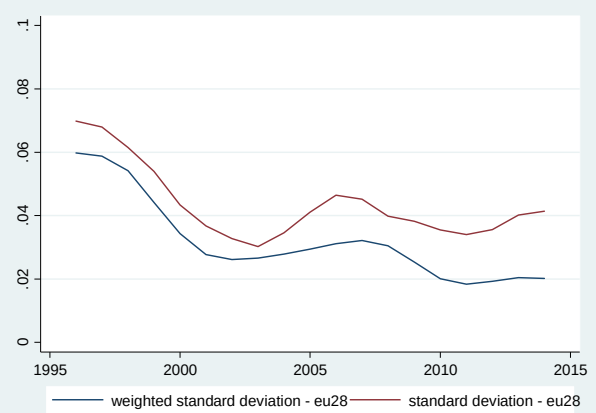
Figure 3 show the standard deviation (GDP-weighted and simple) for the trend growth rates of different types of tax revenue: CIT, PIT, VAT and excise duties. This should give an indication of whether the financing of national budgets is becoming more or less similar in terms of reliance on different tax instruments. We observe a generalized long-term decrease in the (GDP-weighted measures of) dispersion of trend growth rates, particularly pronounced in the case of income taxes. Some divergence across types of taxes is apparent in the pre- and post-crisis years. After a sharp increase in dispersion in the run-up to the crisis, the growth rates of corporate income taxes converge again as of 2010. By contrast, VAT and personal income tax revenues show the opposite dynamics. This might reflect the different cyclical developments after the crisis, combined with an asymmetric tax policy reaction, including through discretionary measures. The unweighted standard deviation shows some spikes pointing, not surprisingly, to some pronounced volatility coming from the small Member States. Dynamics for the EU and the Euro area are roughly comparable.

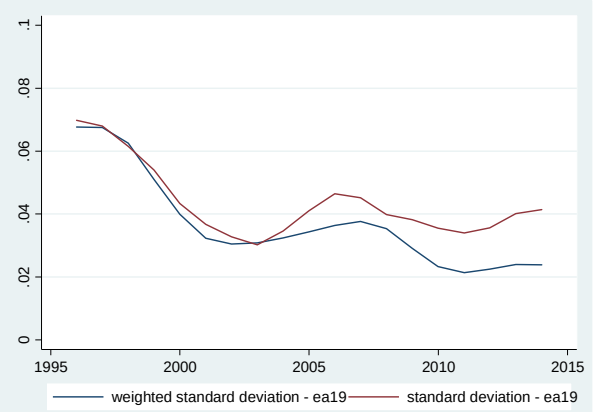
Figure 2. Dispersion of trend growth rates of tax revenue components

a) Corporate income tax

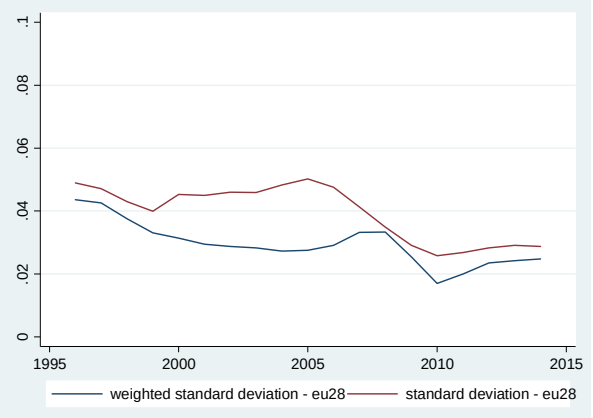


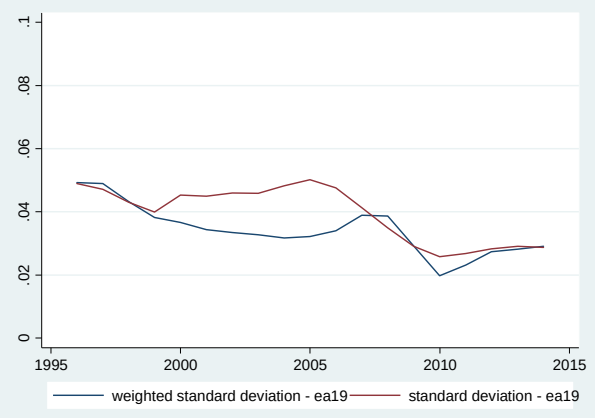
b) Personal income tax



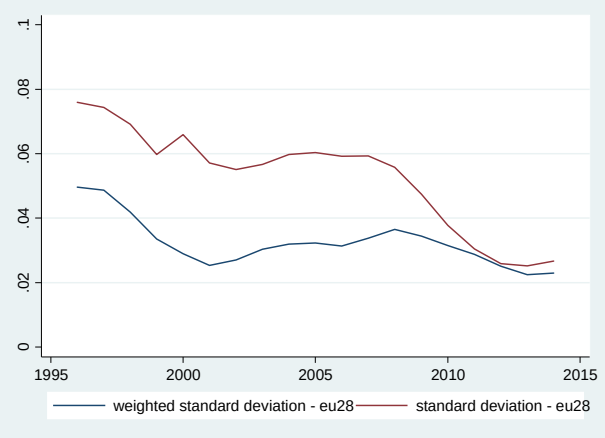


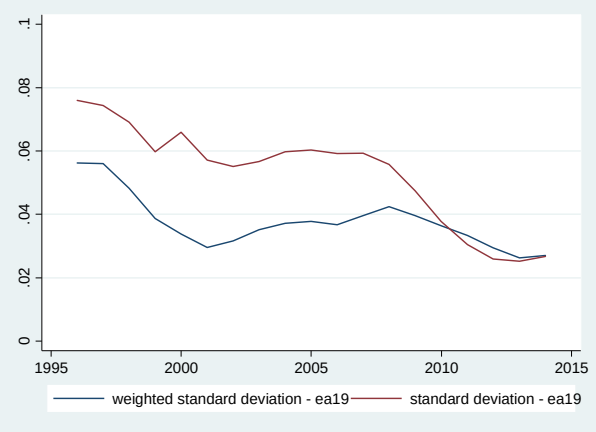
c) VAT





d) Excise duties





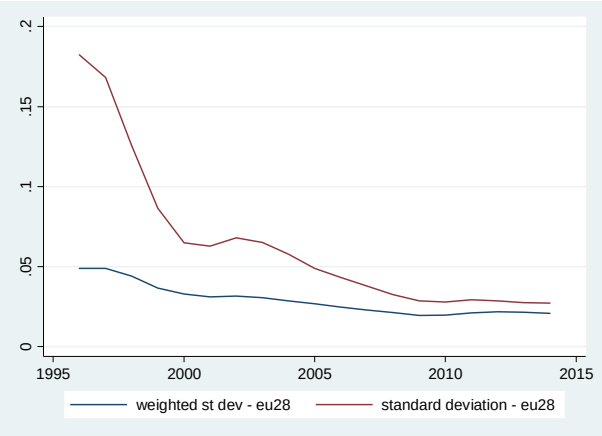
Source: elaborations on Eurostat data.

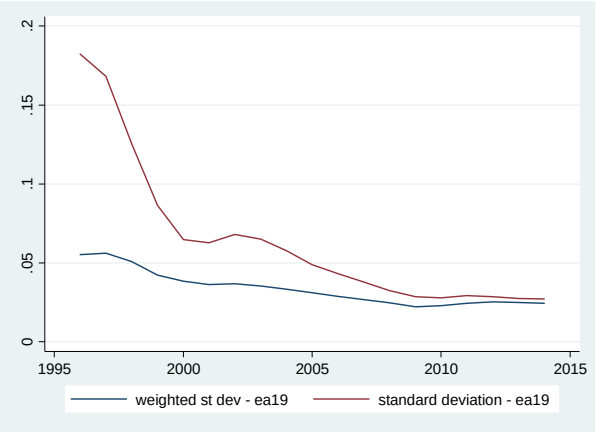
Co-movement of tax bases?

To disentangle the macroeconomic dynamics and the role of tax policy measures, we look at the degree of convergence of the tax bases, using the corresponding macro variables as proxies. As before, we separate trend and cycle components of the relevant variables – gross operating surplus, earnings and consumption – using the Hodrick-Prescott filter. Then, we plot the standard deviation (GDP-weighted and simple) for the trend growth rates of the different macro aggregates in Figure 4. Graphical inspection shows a general decline in the dispersion of trend growth rates as of 1995, somewhat halted in the post-crisis years. In particular, the dispersion of growth rates shows an upward pattern in the case of earnings and, to a lesser extent, of household final consumption as of 2010, while being relatively flat in the case of gross operating surplus. The impact of outliers is particularly visible in the peaks in the unweighted standard deviation at the beginning of the sample period.

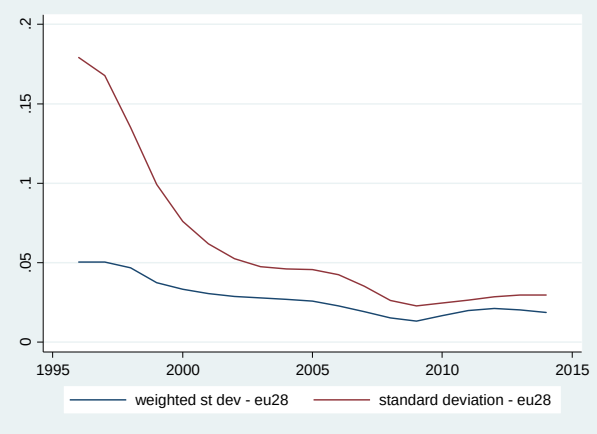
Figure 3. Dispersion of trend growth rates of tax bases

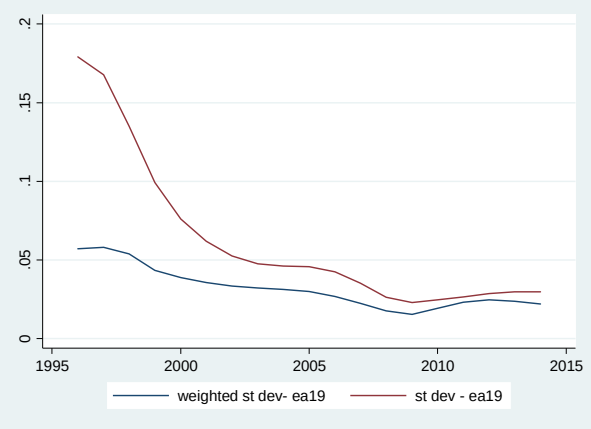
a) Gross operating surplus



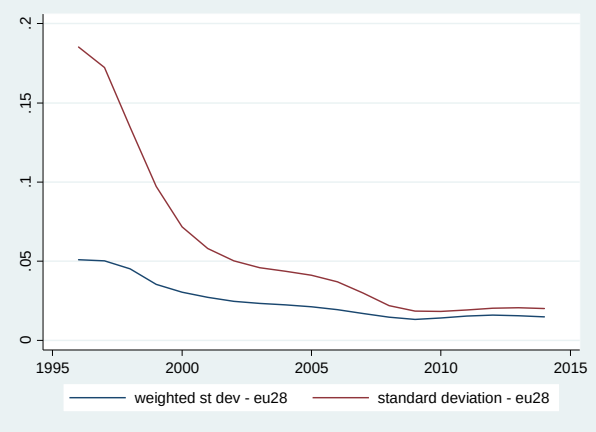


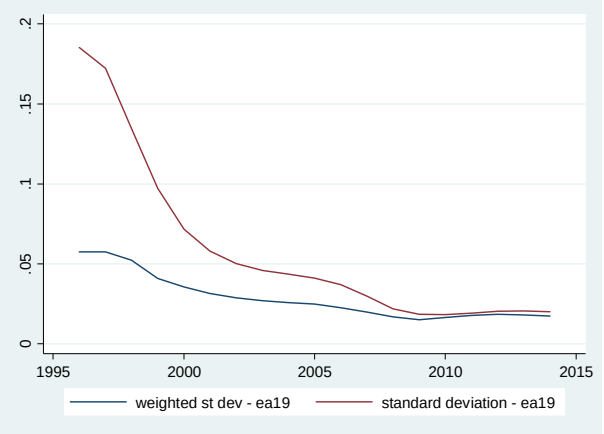
b) Earnings





c) Household final consumption





Source: elaborations on Ameco data.

4. Conclusion

The paper provides an analytical exploration of tax instruments that could be used as own resource for the EU budget. It first considers a set of assessment criteria against which to evaluate a proposal to reform the regime of EU own resources. Then, it illustrates the main taxes that could be used to finance the EU budget. These options are of course not exhaustive and may vary according to recent decisions taken by the relevant institutions. Among them, a genuine VAT resource seems to be the most promising revenue instrument.

The second part of the paper focuses on the economic features of different tax instruments using data for the EU28. It looks more specifically at the cyclical and long term behaviour of the main tax aggregates in the EU countries in an attempt to draw some lessons for the revenue side of the central budget. We document significant heterogeneity in country-specific revenue-to-base elasticities for the main tax aggregates – personal income tax, corporate tax and indirect tax – across the EU Member States. Then, we discuss a number of tax design features, pertaining both to the structure of tax rates and to the definition of the tax base, among the potential drivers of such variability. When evaluating the degree of dissimilarity of the revenue structures – and of the dynamics of the macro variables that best proxy for the relevant tax bases – across the EU countries, we find a long term convergence in the trend growth rates, particularly pronounced as of the mid-90s but partly reversed in the last years in the aftermath of the crisis. This could pose additional challenges for the design of the revenue side of the central budget.

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