FISCAL POLICIES ENHANCING GROWTH IN EUROPE: CAN WE APPLY COMMON REMEDIES TO DIFFERENT COUNTRIES?

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Abstract

This paper provides evidence of a variety of reactions of the growth rates in the European Union countries to changes in taxes and public expenditure. We find significant heterogeneities across countries and time when the budget constraint of governments is taken into account. The finding of heterogeneous fiscal/growth relationships is based on a double quantile estimator in order to allow the slopes of the fiscal variables, in addition to specific fixed effects, to be a source of heterogeneity in the panel estimation. We find that direct taxation exerts a much more damaging effect in the emerging economies of Europe than in the most industrialized countries. Indirect taxes are not inconsistent with growth in the latter, while they are harmful in the former. Increases in human capital expenditure stimulate growth in the low-growth countries, while welfare and sovereign spending are efficient for growth in the economies that grow rapidly.

Keywords : Fiscal Policy, Growth, Quantile Regression, Heterogeneity

JEL Classiffication : E62, H30

1.- Introduction and motivation of the paper

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The ongoing slump in the European countries has brought a renewed interest on the use of fiscal policy to promote economic growth. One issue in this debate relates to the effects of the composition of public spending and of the structure of taxes. A second key issue concerns the heterogeneity of situations in Europe regarding the fiscal policy/growth link. The purpose of this paper is to provide robust features of the fiscal policy/growth link in the European countries, paying an attention to the second issue. There have been a number of papers examining empirically fiscal policy impacts on growth, but regardless of the heterogeneity conditions. Many papers have assumed that countries are sufficiently close, so that we learn enough by analyzing mean effects. When the question of heterogeneity comes to the floor, researchers usually split the data into separated groups of countries (for instance developed countries and developing countries, OECD countries and the others, or a geographical distinction by continents). The cost of separating the countries into different groups is a loss in the degree of freedom in the estimation and restrictions imposed on lag lengths. In this paper we apply a new estimator based on quantile regression and we challenge the view that one could boost economic growth in the EU by applying similar fiscal policies to different countries.

To the best of our knowledge, a relatively small literature is concerned with the impact of tax structure and the composition of public expenditure on economic growth in the European countries. Many empirical papers consider a larger group of countries, either the OECD countries or panels composed of both developed and developing countries[3]. Four notable exceptions are Afonso and Gonsalez-Alegre (2007), Afonso and Furceri (2010), Nikos (2009) and Furceri and Karras (2009). For instance, Afonso and Furceri (2010) find that a rise the following components of taxes and expenditures negatively affect growth: indirect taxes, social contributions, subsidies. An important contribution of their paper is the finding that the disaggregated components impact growth when changes occur in both their size and volatility. Nikos (2009) examines whether a reallocation of the components of public spending and revenues in 14 EU countries have enhanced their economic growth between 1990 and 2006. He concludes that government outlays on education, social protection

[3] See, for instance Angelopoulos *et al*. (2007), Arnold (2008), Arnold and Schwellnus (2008), Bleany *et al*. (2001), Gemmel *et al*. (2011), Lee and Gordon (2005), Peretto (2003, 2007), Vartia (2008).

and defense, as well as public expenditures on infrastructures, are growth-enhancing, while distorsionary[4] taxes depress growth. Furceri and Karras (2009) show that increases in social security contributions and in taxes on goods and services have had a larger negative effect on growth in the European countries between 1965 and 2003, than increases in income taxes.

Our paper provides an empirical support to the hypothesis of different reactions of growth to changes in the fiscal variables. Like previous studies in the literature, rather than total tax and expenditure, we consider their disaggregated components in order to account for the effects of tax structure and public expenditure composition[5]. However, our approach differs from the literature in two ways.

The first difference concerns the econometric methodology. Although there is a considerable literature on the fiscal policy/growth relationship, a relatively small amount of this literature is concerned with heterogeneous reactions in terms of growth to the same fiscal policies[6]. To our knowledge, three exceptions are Bassanini and Scapetta (2001), Arnold (2011) and Gemmel et al. (2011). These authors use the pooled mean group (PMG) and mean group (MG) estimators introduced by Pesaran *et al*. (1999). Although these estimators are useful in accounting for different slopes across the countries of a panel, the cost of using them is a reduction of the degrees of freedom. Indeed, they are based on an average of the estimates from individual countries regressions. We instead use an estimator that keeps the pooled dimension of the panel while allowing at the same time to deal with

[4] Following the definition given by Kneller et al. (1999), distortionary taxes are those which affect the investment decisions of agents (with respect to physical and / or human capital), creating tax wedges and hence distorting the steady-state rate of growth. Non-distortionary taxation does not affect saving / investment decisions because of the assumed nature of the preference function, and hence has no effect on the rate of growth.

[5] For examples of papers linking growth to the composition of expenditure and tax structure, the reader may refer to Lee and Gordon (2005), Angelopoulos *et al*. (2007), Gemmel *et al*. (2011),

[6] In a survey of the growth empirics, Eberhart and Teal (2011) note that the possibility of heterogeneous parameters is ignored by a vast majority of studies.

the diversity of reactions across the countries: a quantile regression estimator. One advantage is to consider the entire panel and to distinguish the countries by their location in the conditional distribution of growth. Instead of estimating models for conditional means functions, we consider a full range of other conditional quantile functions. Our motivation to prefer this estimator is based on the fact that we analyze the fiscal/growth link in the EU countries over the last 10 years, after the adoption of the euro, from 2000 to 2010. With a small time dimension, we cannot apply individual regressions.

Secondly, unlike many previous studies, we do not only consider estimates of fiscal/growth regressions based on the growth rate of the GDP *per-capita*, but also the growth rate of the real GDP itself in a context where the European governments search to avoid a rise in the burden of public debt. Our approach is motivated as follows. Fiscal policy usually has several objectives. The first is equity. Taxation and expenditure are considered in terms of their ability to impact fairly personal incomes. In this case, using the growth rate of GDP *per-capita* (or a multidimensional welfare indicator) as the endogenous variable is convenient. Previous papers examining the impact of fiscal measures on *per-capita* growth implicitly assume that a higher growth of the real GDP translates into a higher standard of living within and across individuals, on average (but this is an assumption that would need to be proved, since average effects mask potential changes in income distribution). A second concern of fiscal policy is efficiency. This can be defined as the way in which expenditure and taxes "deliver" in terms of the growth rate of the real GDP. For instance, finding a negative elasticity of the latter with respect to welfare expenditure, or direct taxation, might be interpreted as the existence of waste in the public sector inducing inefficiencies in the global activity (the channels yielding such inefficiencies are for instance a lower productivity of the labor supply, a higher wage reservation level, a reduced competitiveness of firms, etc). In this paper, we adopt the interpretation in terms of efficiency and equity. We thereby consider both the growth rate of the real GDP and the growth rate of per-capita GDP. Finally, a third concern is the sustainability of public debt. When a government makes decisions on taxes and spending, the effects on growth are different whether the initial structure of the other taxes and spending remains unchanged (meaning that the budget deficit/surplus, or equivalently public

debt, is the adjustment variable), or whether any change in a given category of tax or expenditure is compensated by a change in the opposite direction of other items of taxes and spending. Following previous papers in the literature[7], we explicitly take into account the government budget constraint in testing the impact of fiscal measures and expenditure on growth.

The remainder of the paper is structured as follows. Section 2 describes the theoretical underpinnings, while section 3 presents the econometric methodology and data. Section 4 contains our estimation results and our main comments. Finally, Section 5 concludes.

2.- Theoretical underpinnings

In this section, we briefly explain the theoretical framework underlying our empirical equations. Although, we do not present the theoretical models formally, this is important to motivate the choice of our variables as well as some restrictions imposed on some coefficients of our equations. Our empirical framework relies upon two different strands of the theoretical literature on growth. One is the correlation between growth and the composition of public spending and taxes. The second concerns the effects of fiscal policy on growth with respect to how a public spending or deficit is financed.

2.1.- Linking growth to the structure of taxes and the composition of expenditure

The Lisbon strategy puts an emphasis on the efficiency of fiscal policy on the European countries' growth rate. Indeed, the EU member States agreed on improving the contribution of public spending to growth by directing public expenditure towards growth-enhancing investment in both physical and

[7] See Kneller et al. (1999), Bleany et al. (2001), Gemmel et al. (2011),

human capital[8]. Besides, in a report published in 2011, the European Commission points to several challenges of tax policy, among which the potential to make the tax structure more growth friendly[9].

These issues cannot be examined within the first-generation endogenous growth models linking fiscal policy to growth. Indeed, as pointed by Agell *et al*. (2007) and Myles (2000), when the growth effects are apprehended by considering aggregate measures of tax burden and public expenditure, these models only capture the role of government size. In second-generation models of endogenous growth the share of different categories of public expenditure and taxes is explicitly taken into account. A fairly simple approach consists in separating public spending between productive and non-productive components, as well as distinguishing between distortionary and non-distortionary taxes. An important conclusion of the papers is that different spend-tax combinations yield different effects on growth. For instance, productive expenditure financed by non-distortionary taxes have a higher effect on growth than when they are financed by distortionary taxes. Another practice widely used in the growth literature to identify the effects of fiscal policy is to consider a fine disaggregation of public spending and taxes. On the spending side, it is usual to consider a functional disaggregation of government expenditure: spending on health, education infrastructure, defense, recreation, social protection, *etc*. On the revenue side, the decomposition of taxes is generally between personal income taxes, corporate income taxes, direct and indirect taxes, taxation of capital gains, etc. A motivation for doing this is that determining the direction of the response of growth to changes in the fiscal variables requires somewhat careful judgment on the transmission channels, for instance through their influence on private production, human capital accumulation, on productivity, or through the diffusion of innovations and network externalities[10].

[8] Wierts (2005) discusses some aspects of redirecting public expenditure under the Lisbon experience.

[9] The report published on October 2011 was entitled "Tax reform in EU member States 201: tax policy challenges for economic growth and fiscal sustainability".

[10] See, among others, Zeng and Zhang (2002), Zagler and Durnecker (2003), Blankenau and Simpson (2004), Linneman and schabert (2003), Greiner et al. (2005), Agenor and Yilmaz (2011), Peretto (2003, 2007), Semmler et al. (2007), Gosh and Gregoriou (2008).

There are diverse findings in the theoretical literature regarding the direction of the different fiscal components on growth. Recommendations for tax policy and government spending from the view of endogenous growth models do not lead to consensual conclusions. In general, the conclusion of the endogenous growth models is that the mechanisms through which the different components of taxes and spending influence growth are diverse, thereby implying that the question of composition of government spending and tax structure on growth remains an open question. For instance, some models support the idea that income taxes are detrimental for growth through the decline in the rate of capital accumulation (see, for instance, Lucas (1990)), Easterly and Rebelo (1993)). This leads to the policy recommendation that reducing taxes on capital income could lead to increases in growth. However, in some other models, a positive impact on long-run growth of changes in income tax is shown to exist when these taxes are used to finance public services (see Rivas (2003)). Another example, government consumption spending has been shown to affect growth alternatively negatively or positively depending upon whether public goods and services enter the households' utility function or whether they enter as inputs in the production function (see Barro (1990), Turnovsky and Fisher (1995), Dhont and Heylen (2008)). Myles (2000) provides a literature review of the diversity of theoretical models analyzing tax incidence and its influence on growth. The channels through which taxation can affect growth are many: the elasticity of substitution between capital and labor in production, households' preferences over consumption in different periods of life over the life-cycle, the relationship between capital and the non-taxable factors, the share of physical capital in human capital, the way in which taxes affect risky assets, the proportion of wealth invested in foreign assets, etc.

Given the great variety of theoretical models, the diversity of their predictions regarding the effects of fiscal variable changes on growth, it is unlikely that the same model would illustrate the case of all the EU countries. Further, the balance between the various items of taxes and expenditure vary in each country and across time depending upon the juncture and their priorities. Our aim here is not to test a particular theory. The above brief review of the theoretical literature is useful to shed some light on the

fact that, given the wide range of predictions from the theoretical models, imposing a priori common parameters across countries would be restrictive and may result in non robust conclusions.

When the purpose is to test the fiscal policy/growth relationship from the view of the endogenous growth model, whichever the theoretical apparatus, the empirical relationship is very often a linear equation between the growth rate of GDP per-capita and the different items of taxes and public spending, for given control variables describing the economic environment. We modify the standard equation by taking into account the distributional heterogeneity of fiscal policy effects on growth. The specific form employed in this paper is the following:

$$\gamma_{it}(\theta) = \sum_{j=1}^{J} \alpha_{1j}(\theta)\Delta\gamma_{it-j} + \sum_{k=1}^{K} \alpha_2(\theta)\Delta F_{it-k} + \sum_{l=1}^{L} \alpha_3(\theta)\Delta X_{it-l} + \upsilon_{it}(\theta) \quad (1)$$

where *i* indicates a country, t is year, γ is the growth rate of real GDP, $\boldsymbol{F}$ is a vector of fiscal variables, $\boldsymbol{X}$ is a vector of control variables, $\beta_1(\theta)$, $\beta_2(\theta)$, $\alpha_2(\theta)$, $\alpha_3(\theta)$ are vectors of coefficients to be estimated, $\alpha_{1j}(\theta)$ is a lagged coefficient and υ_{it} is an error term.

Equation (1) provides a useful way to deal with the issues discussed above and to confront the predictions of the theoretical models with the experience of the European countries by considering the percentiles of the conditional distribution of the growth rates. The θ^{th} percentile is assumed to vary between 0 and 100%. The idea is to yield the value of the estimate of the parameter vectors which best fits the impact of the fiscal variables at various points along the conditional distribution of growth. This approach permits a flexibility to capture heterogeneity. Indeed, since we are considering a pooled panel, the percentiles do not only refer to countries but also allow time variation and therefore possible non-monotonic effects of the components of taxes and expenditure on growth. Finally, finding different coefficients according to the percentiles is a way of showing that fiscal changes in the European countries may result in multiple equilibriums both in terms of transitional growth and long-run growth.

2.2.- Deficit financing and growth

Given the importance of the government budget constraint in the theoretical models, the influence of a given component of public spending on growth depends on how an increase in this component is financed. A government considering new spending programs must decide on how to raise the necessary revenue. A financing of productive public spending by higher direct taxes will not necessarily results in a positive impact on long-run growth, because of the negative effect of the taxes on the returns of capital. Also, as far as we consider the structure of taxes and the composition of public spending, the final decision is the result of different trade-offs. For instance, cuts in labor income or capital tax might be compensated by increases in indirect taxes; or a government can search to balance an increase in productive expenditure by a decrease in non-productive expenditure. Another example is that any change in a given spending or tax can be decided by maintaining a continuously balance budget, by keeping a constant share of expenditure and taxes in GDP, or alternatively by allowing a higher or lower fiscal balance. Taxes and public policies are thus restricted by the budget constraint.

The implication is that, different financing methods have different effects on the economic growth. In his seminal papers, Harberger (1964a, 1964b) showed that the mix of direct and indirect taxes in a growth-accounting framework has a negligible effect on growth. Mendoza et al. (1997) show that this conjecture can be supported within the framework of an endogenous growth model. In standard endogenous growth models, expansionary fiscal spending stimulates economic growth provided that they are financed by lump-sum taxes or by non-distorsionary taxes (see, Devereux and Love (1995), Palivos and Yip (1995)). This finding is, however, challenged by Pelloni and Waldman (2000). The authors find that a small amount of capital taxation can increase the growth rate. Barro (1990), Blankeneau and Simpson (2004) show that spending funded by distortionary taxes such as taxes on capital or labor income has a non-monotonic effects: increases in productive spending is growth-enhancing in the short-run, but growth-depressing in the long-run. There are conflicting views in the theoretical literature about the growth implications of a financing of public spending by public debt.

Some authors conclude that the effect is unambiguously positive (for instance Greiner and Semmler (2000)). Others reject this finding (Minea and Villieu (2010)).

As pointed by Easterly et al. (2007), irrespective of the theoretical framework, it is likely that the combination of fiscal variables needed to obtain a positive impact on growth vary across countries and across time depending on a number of structural factors: the initial level of debt, the composition of revenues and taxes, fiscal institutions, different public finance constraints, etc. Again, the issue of heterogeneity is at stake.

What this implies in our case is the following. The government budget constraint can be written by considering the various components of the vector of fiscal variable $\boldsymbol{F}$ as follows:

$$\sum_{n=1}^{N} rev_{it}^{n} - \sum_{m=1}^{M} exp_{it}^{m} + b_{it} = 0 \quad , \quad i=1,..,I \text{ and } t=1,...,T$$

where *exp* means expenditure and *rev* stands for revenue. We consider M components of public spending and N components of fiscal taxes. b is the budget surplus. As shown in a paper by Bleany et al. (1995), not taking into account this constraint when examining the fiscal policy/growth link yields strong biases in growth equations. Further, since the different components of the fiscal vector are linked through the budget constraint, considering all them in Equation (1) yield inefficient estimates due to colinearity between the variables. Some of them must be omitted. The omitted variables are interpreted as the financing instruments. To show this, consider for instance that we separate the taxes into distorsionary (*DIST*) and lump-sum (*LUMP*) taxes and that spending are categorized as productive (*PROD*) and non productive (*NPROD*). Equation (2) can be rewritten as follows:

$$DIST_{it} + LUMP_{it} - PROD_{it} - NPROD_{it} + b_{it} - 0 \qquad (3a)$$

Assume that the omitted variable is the distorsionary tax. Then (3a) implies that

$$DIST_{it} = -(LUMP_{it} - PROD]_{it} - NPROD_{it} + b_{it}) \qquad (3b)$$

In the general case, we decompose the vector $\boldsymbol{F}$ into two sub-vectors vectors $\boldsymbol{F_1}$ and $\boldsymbol{F_2}$ containing respectively the omitted and non-omitted variables. The constraint (3b) implies that $\boldsymbol{F_1} = -\boldsymbol{F_2}$. Equation (1) can thus be rewritten as follows:

$$\gamma_{1it}(\theta) = \Sigma_1(j=1)^{J} [\alpha_1 1(\theta)\Delta] \gamma_1(it-j) + \Sigma_1(k=1)^{K} [\{\alpha_1 22(\theta) - \alpha_1 21(\theta)\}_1 [\Delta F]_1(2it-k) \quad (4)$$

Therefore the coefficients of the fiscal variables are interpreted as follows. They indicate how changes in given fiscal variables, offset by changes in omitted fiscal variables, affect the economic growth. Equation (4) is retained as our benchmark equation for testing the fiscal policy/growth link.

3.- The econometric methodology and data

3.1.- Quantile regressions

Equation (4) can be rewritten in matrix form as follows:

$$Y_{it}(\theta) = X'_{it}\beta(\theta) + v_{it}(\theta), \qquad i = 1,\dots,N \text{ and } t = 1,\dots,T \quad (5)$$

where **X** is the vector of explanatory variables, $\beta(\theta)$ is the vector of coefficients and Y is the endogenous variable. We apply a double-quantile regression to Equation (5).

Before turning to the estimation, some discussion about the methodology of quantile regression is warranted. The idea is to model the percentiles of the conditional distribution of the growth rate as functions of the explanatory variables. In a situation of heterogeneous responses of the endogenous variable to changes in the explanatory variables the standard linear estimators (OLS, GLS, GMM, etc.) are not suited. Indeed, those methodologies focus on the estimation of a conditional mean function and conditional dispersion of the endogenous variable around its mean. So doing, one assumes that the conditional mean summarizes the behavior of all the observations in the endogenous variables. This approach is good as far as we consider that the fluctuations of γ_{it} around its conditional mean are erratic or "accidental". However, once the reaction of the endogenous variables to its covariates are assumed to vary across the sample, the standard methodologies do not fully account of the diversity of reaction across the distribution of γ_{it}. In this case, we need alternative estimators.

In panel data methodologies, a now widely used approach consists in using standard estimators but by allowing slope variations across individuals and/or time. In a recent paper, Gemmel et al. (2011) use Pesaran et al. (1999)'s pooled mean group (PMG) and mean group (MG) estimators to study the impact of fiscal policy on growth using a panel of 17 OECD countries from 1970 to 2004. Although these estimators are useful to account for different slopes across the countries of a panel, the cost of using them is a reduction of the degrees of freedom. Indeed, they are based on an average of the estimates from individual country regressions either for the short or for the long-run coefficients. Quantile estimators avoid this caveat since growth estimators conditional on fiscal policy variables, for given control variables, are obtained by considering the entire sample and by distinguishing the countries and the years according to their location in the conditional distributional of growth. Quantile estimator allows a greater flexibility by allowing all the parameters in a regression to vary across the distribution.

Let $F(y)$ be the probability distribution function of Y. The θ^{th} percentile of Y is defined as the smallest y satisfying $F(y) \geq \theta$. In a regression context, it can be shown that the finding of θ amounts to estimating β such that

$$\hat{\boldsymbol{\beta}}(\theta) = argmin\left\{\sum_{i=1}^{T} H(\theta, v_t)\right\}, \qquad H(\theta, v_t) = \theta v_t^{+} + (1-\theta) v_t^{-} \tag{6}$$

where v_t^{+} is the vector of residuals with positive value and 0 otherwise, v_t^{-} is the vector of negative residuals and 0 otherwise. We thus have as many estimators of $\boldsymbol{\beta}$ as values of $\theta \in (0,1)$. Therefore, a quantile regression leads to estimate $\boldsymbol{\beta}$ by changing the "representative" individual. The latter can be the "mean" (as in OLS), the median ($\theta = 0.5$) or any other percentile.

Basset and Koenker (1978) derive the asymptotic normality results for the quantile regression and show that

$$\sqrt{T}\left(\hat{\beta}_\theta - \beta_\theta\right) \approx N\left(0, \theta(1-\theta)s(\theta)^2 J^{-1}\right) \tag{7}$$

$$J = \lim_{T \to \infty} \left(X' X / T \right) \tag{8}$$

$$s(\theta) = 1 / f(F^{-1}(\theta)) \tag{9}$$

While the estimation of β is quite simple and requires the use of simplex algorithms (see Koenker and d'Orey (1987)), the estimate of the standard error of the estimated parameters is more complicated since it requires the estimation of the unknown probability distribution function of the endogenous variable and its derivative. The latter are required in order to estimate the quantile density function $s(\theta)$, also called sparsity function. Here, the coefficient covariance matrix is computed using bootstrap resampling and the sparsity function is estimated by using a kernel density estimator as proposed by Powell (1984) and Buschinsky (1994).

All the variables in the right-hand side of Equation(4) are purged from reverse causality (endogeneity) by using the double-stage quantile regression proposed by Kim and Muller (2004) They show that the double-quantile estimator is consistent for finite samples[11]. In order to obtain efficient estimates, we however depart from these authors by bootstrapping the standard errors of our estimated coefficients at the second step. Indeed, we are working with the EU countries and our data are contaminated by country cross-correlation. In order to avoid problem of inefficient estimation, we prefer a direct method of estimating the covariance matrix of the estimates by employing a bootstrapping technique(residual bootstrap).

Possible effects running from growth to control and fiscal variables are taken into account in the first step by instrumenting as fully as possible for those variables. We use the logarithm of per-capita GDP, the lags of the growth rates of per-capita GDP, the difference between the long and short-term interest rate, the ratio of labor force to population as well as lags of the explanatory variables

[11] Other methodologies have been proposed in the literature to deal with endogeneity bias in quantile regressions. For instance, Chernozukov and Hansen (2006, 2008) have suggested an instrumental variable quantile regression estimator. However, the latter is computationally demanding when applied to our case since it is based on a grid search procedure on the coefficients of all the variables which are suspected to be endogenous. Their method is well suited to models where there are few endogenous variables among the explanatory variables of a regression.

themselves. In addition, endogenous relationships are avoided by not considering the contemporaneous effects of the fiscal variables.

Finally, in each regression, unobserved heterogeneity is taken into account through country fixed effects.

3.2.- Data

Our dataset cover 22 countries of the European Union from 2000 to 2010[12]. Our motivation for considering the recent ten years is the following. The current members of the EU are composed of three groups of countries regarding the date of adhesion. 15 were members before the 2000s, 10 countries entered the Union in the early 2000's (in 2004) and 2 in 2007. We consider as many countries as possible and not limit our attention to EU 15. With the exception of Romania and Bulgaria whose adhesion is very recent, we therefore consider the other countries. Luxembourg has a very high GDP therefore may appear as an "outlier". To avoid a strong influence on our results, we drop it from the panel. We also do not include Cyprus and Malta for problem of data availability. This leaves us with 22 countries. Regarding the choice of the time period, we restrict years from 2000 to 2010. We begin after the introduction of the euro, since after 1999, a new institutional framework for fiscal policy was set up (Stability Growth Pact, multilateral surveillance) intended to reinforce the coordination of national fiscal policies. For the countries which joined the EU in 2004, they also had to change the conduct of their fiscal policy at least 4 to 5 years before their adhesion (the Maastricht conditions were entry requirements). Therefore, our aim is to see whether, the adoption of a common fiscal framework makes taxation and expenditure measures become growth-enhancing or growth-reducing in a similar way across countries, or whether their impact on growth have been distinctly different across countries.

[12] The countries are the following: Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, the Netherlands, Norway, Poland, Portugal, Slovenia, Spain, Slovak Republic, Sweden and the United Kingdom.

In our pooled data, an individual observation describes a country and a year, which we call "an episode" of growth rate of real GDP. Our fiscal variables are taken from the functional classification of public administration expenditure (COFOG) as set by the OECD and by considering the disaggregated taxes. This yields the fiscal categories described in Table 1. The set of endogenous and conditioning variables includes those described in Section 2.2. The GDP, the long-run and short-run interest rates, as well as the inflation and unemployment rates are from the OECD statistics. Private investment is measured by the gross capital formation of corporations and comes from the European Commission AMECO dataset. Data on labor markets were obtained from the OECD: employment, working-age population, population, hours worked per employee, labor force (the latter are used as instruments in our regressions).

All the variables in the regressions are in logarithm, except the budget surplus, the inflation rate and the interest rate term structure defined as the long-run minus the short-run interest rates. The fiscal variables are measured as share of GDP.

Table 1. Classification of fiscal variables.

Theoretical classification	Classification in the data source
Taxes	
Direct taxation	Direct taxes on business Direct taxes on households
Payroll taxes	Social security contributions received by governments
Indirect taxation	Taxes on production and imports
Other government revenues	General Government total receipts minus direct and indirect taxation
Expenditure	
Sovereign expenditure	Defence expenditure Security expenditure Economic affairs General public service expenditure
Human capital	Education expenditure Health expenditure
	Social security expenditure Recreation and culture environment

Other expenditure	General government total disbursements minus productive and unproductive expenditure
Budget surplus	Government total revenues minus Government total disbursements

4.- The results

4.1.-The unconditional distribution of growth episodes

A somewhat mechanical approach in the literature consists in using the growth rate of per-capita GDP as the endogenous variable when studying the link between fiscal policy and growth. However a note of caution is necessary here since this choice may come at the expense of losing some information on the heterogeneity of countries. Indeed, part of the heterogeneity inherent to the series of growth may be masked by heterogeneous factors stemming from demography or variables influenced by the demographic factor. Therefore, we need to consider both measures of growth rates. The first is the simple growth rate of the real GDP. The policy recommendations regarding the design of tax structure and composition of expenditure in the EU are usually made by considering this indicator. The second indicator, the growth rate of the real GDP per-capita, is helpful for evaluating how economic growth feeds into welfare (a rough measure of income distribution). There exists no reason why the conclusions regarding the growth effects of fiscal policy should be similar to those obtained when one considers the first indicator. We expect them to be different.

In order to contrast the different growth episodes with each others, we first examined how the countries and years are shared across the main percentiles of the conditional distribution of the growth rate of the real GDP. We ran many regressions by considering different percentiles from the 10^{th} to 90^{th} percentiles. In terms of the growth impact of taxation and expenditure changes, we observed that the estimated coefficients of the explanatory variables were quite similar for four "subgroups" of percentiles as described in Table 2a.

Table 2a. Classification of countries according to the results of quantile regressions

Low-growth episodes: <2.6% [0^{th}-40^{th}]	All countries Most ancient members	Crisis episodes (2008-2009) Years : 2002, 2003, 2010
Medium low growth episodes : 2.6%-3.3% [40^{th}-50^{th}]	Most ancient members	2000, 2001 and 2004 to 2007
Medium high growth episodes : 3.3%-4.3% [50^{th}-70^{th}]	Most ancient members New members	2000, 2001 and 2004 to 2007 2000,2001, 2010
High-growth episodes : >4.3% [70^{th}-100^{th}]	New member states Periphery	Period 2002 to 2007 (catch-up growth) Early 2000's

At the left-hand side of the distribution, below the 40^{th} percentile, the real GDP growth rate is less than or equal to 2.6%. This corresponds to times of crisis. Indeed, the intervals up to the 40^{th} percentiles contain the data for all the countries corresponding to the years 2008 and 2009. In addition, these intervals also include the growth episodes of the most ancient members of the EU corresponding to the years 2002, 2003 and 2010. The percentiles up to the 40^{th} are therefore refereed as low growth episodes in times of crisis. At the higher end of the distribution, above the 70^{th} percentile, the real GDP growth is driven by a catch-up dynamics. Indeed, the group of years and countries is made of the new member states between 2002 and 2007 (Central and Eastern Europe) and some former member countries belonging geographically to the periphery of Europe, for instance Ireland, Portugal, Spain in the earlier 2000's. Their growth rate is greater than 4.3% per-annum. There is a broad consensus in the literature that these countries' very fast growth was an illustration of a catch-up dynamics to the standard of living of the richest members of the EU from 2000 onwards. We therefore consider the percentiles above the 70^{th} as illustrating transitional growth rate. Then we have medium growth episodes, between 2.6% and 3.3% (from the 40^{th} to the 50^{th} percentile) and high

growth not corresponding to transitional growth, between 3.3% and 4.3%, (from the 50^{th} to the 70^{th} percentiles).

An interesting feature of the data is that the more industrialized members of the EU move in the distribution during over different years (all the intervals of the different percentiles are "visited"), which is not the case of the Central and Eastern emerging countries. For the latter we indeed have few observations between the 40^{th} and 70^{th} percentiles, which could be explained by the fact that they are still converging to the other countries and therefore they experience a higher growth rate (catch-up dynamics).

Comparing the cases of two leading economies of the EU, France and Germany, we observe an unhooking of the former with regard to the latter from 2006 onwards. Indeed, from Table 2b, it is seen that France's growth rates systematically lies in lower percentile intervals.

Table 2b. Classification of growth episodes across quantile intervals for France and Germany

France		Germany	
2000	70^{th}-80^{th}	2000	50^{th}-60^{th}
2001	30^{th}-40^{th}	2001	30^{th}-40^{th}
2002	20^{th}-30^{th}	2002	10^{th}-20^{th}
2003	40^{th}-50^{th}	2003	20^{th}-30^{th}
2004	40^{th}-50^{th}	2004	30^{th}-40^{th}
2005	30^{th}-40^{th}	2005	20^{th}-30^{th}
2006	50^{th}-60^{th}	2006	70^{th}-80^{th}
2007	40^{th}-50^{th}	2007	60^{th}-70^{th}
2008	10^{th}-20^{th}	2008	20^{th}-30^{th}
2009	0^{th}-10^{th}	2009	0^{th}-10^{th}
2010	20^{th}-30^{th}	2010	60^{th}-70^{th}

A classification can also be done by considering the regressions with the growth rate of per-capita GDP. This yields a grouping of percentiles in three intervals whose upper bounds are respectively the 40^{th} percentile, the 90^{th} percentile and the percentiles between the 70^{th} and 90^{th}.. The first group is composed of countries and years for which the conditional growth rate is below

3.2%, the second group for countries and years for which the growth rate lies between 3.2% and 5% and finally the third group refers to countries and years characterized by a growth rate above 5% (see Table 2c).

Table 2c. Classification of countries according to the results of the quantile regressions

Low-growth episodes : <1.14%	**Austria** (2000-2010), **Belgium** (2000-2010), **Czech** (2006-2010), **Denmark** (2000-2010), **Finland** (2000-2010), **Germany** (2000-2010), **Greece** (2006-2010), **Ireland** (2006-2010), **Italy** (2000-2010), **France** (2005-2010), **Netherlands** (2006-2010), **Portugal** (2000-2010), **Spain** (2006-2010), **UK** (2006-2010), **Sweden** (2000-2010).
Medium-growth episodes : 1.14%-3%	**Estonia** (2006-2010), **Hungary** (2006-2010), **Netherlands** (2000-2005), **Norway** (2000-2010), **Slovakia** (2006-2010), **UK** (2000-2005), **Poland** (2000-2005)
High-growth episodes : > 3%	**Czech** (2000-2005), **Estonia** (2000-2005), **Greece** (2000-2005), **Hungary** (2000-2005), **Ireland** (2000-2005), **Spain** (2000-2005), **Poland** (2006-2010), **Slovakia** (2000-2005), **Slovenia** (2000-2010).

This table suggests that the distributional dynamics of growth, conditional on the fiscal variables and control variables, is driven by catch-up growth at the higher end of the distribution. Indeed, the third group of countries (high-growth episodes) is composed of economies which have grown significantly and a broad consensus of the literature attributes their growth to a catch-up dynamics of their GDP per-capita to the level of the richest members of the EU during the years 2000-2005 (Ireland, Spain, Greece and the former Central and Eastern Europe countries). Their situation contrasts with the case of a majority of countries in the first group, characterized by low-growth episodes, for which the catch-up dynamics has already kicked-in and which exhibit slower growth rates (the most ancient members of the EU). The medium-growth group is composed of a mixture of former and recent members of the EU.

This new classification based on the growth rate of per-capita GDP have common features with the distribution of growth episodes based on the growth rate computed when the GDP is not deflated by population. Specifically, we retrieve the difference in terms of growth performance between the

emerging countries and the industrialized countries. The main difference is that the industrialized countries now form a more homogenous group. For instance, France and Germany now have the same growth performance). Besides, the countries that belong to the geographical periphery of Europe (Greece, Spain, etc) are now in the same groups as the continental countries.

4.2.- Tax and expenditure effects on real GDP growth

Tables 3 till 5 report the estimation results of Equation (4). The reported coefficients are cumulative sums over the two years following the initial changes in taxation and expenditure. We report the cumulative sum over the coefficients over the two years. This corresponds to the length of time usually required for changes in investment to fully affect growth. Further, we assume that the implementation of fiscal policy requires a delay before impacting the economy and that short-run effect are completely dissipates after two years. In Table 4, second regression, it is assumed that tax and expenditure changes are compensated by an equal and opposite change in the budget surplus. In Table 3, first regression, we posit that any change in taxes (respectively expenditure) is compensated by an exact change in welfare expenditure (respectively by an exact and opposite change in the case of a change an expenditure item). Similarly interpretations apply to the regressions in the remainder tables.

We report the results of the regressions based on the 40^{th}, 50^{th}, 60^{th} and 70^{th} percentiles. The reader must keep in mind that for different choices of percentiles, we do not split the data into different sub-samples. We use the whole pooled observations. The difference with the classical "mean-based" estimations is simply that, instead of the conditional mean, the representative observation to whom the others are compared is the reported quantile.

The following observations emerge from the analysis of the effects of fiscal variables on growth.

Social security contributions have the strongest influence among the different fiscal variables (strongest coefficients) but they effect on growth is asymmetric. This variable has two potential effects on growth. The first impact is negative through the cost of labor since payroll taxes amount to a high

proportion of social security revenues. The positive influence on growth is due to second round demand effects since income transfers are paid from such revenues. The expected total effect is therefore ambiguous. From the tables, we see that cutting social security taxes has the potential for increasing growth in times of crisis or when the economies grow slowly. Conversely, raising these taxes is detrimental for growth. Indeed, we find statistically significant negative coefficients for the 40^{th} and 50^{th} percentiles. This happens when a fall in social security revenues yield to an increase in the fiscal deficit of the same amount when the tax structure remains unchanged (Table 4), when a government decides to compensate the fall (resp. an increase) by an increase (resp. a decrease) in direct taxation (Table 3) or indirect taxation (Table 4). In countries that grow fast, we find that the total impact on growth is positive (always for the 60^{th} percentile and sometimes for the 70^{th} percentile), though they are not found to be significantly related to growth, except when the omitted variable is the budget surplus (Table 4). Therefore, the estimates suggest that in the European emerging countries and in some industrialized European countries like Denmark, Finland or Sweden (whose growth episodes are located in the percentiles above the 60^{th}), the negative growth effects of social security revenues (through a supply channel) are more than cancelled out by their positive demand effects.

We now consider the growth impact of a mix between direct and indirect taxation, looking at the respective coefficients of these variables in Tables 3 and 4 when the other variable is omitted from the regression. Indirect taxes can be considered as taxes on consumption, while direct taxes are taxes on production (labor and capital revenues). It is seen that a shift from direct to indirect taxes (Table 4), that is a fall of the former followed by an increase in the latter is growth-augmenting. Table 6 yields a similar conclusion if one considers instead a shift from indirect to direct taxation (lower indirect taxes financed by higher direct taxes). However, the impact of direct taxation in Table 5 is much smaller than the impact of indirect taxation in Table 4. This suggests that a shift from direct to indirect taxes is less detrimental and more efficient for growth. One reason may be that direct taxation is more distortionary. Simple reliance on either one or the other form of taxation (when none of them is considered as an omitted variable) implies that indirect taxes mainly affect growth in times of crises or during low-growth episodes (in Tables 3,4,5, we find a statistically significant coefficient for the 40^{th}

percentile, while the coefficient is often non-significant for the other percentiles). Direct taxation significantly reduces growth in all the countries. The negative effect is stronger in the highest growth countries. Therefore, an increase in direct taxation is more detrimental for the economies which are either experiencing a catching-up dynamics or which are already on their long-run growth path but are still experiencing a high growth rate.

On the expenditure side, our results point to different effects of sovereign and welfare expenditure across the percentiles and the way in which they affect growth depends upon the financing variables in the government budget constraint. When an increase in welfare or sovereign expenditure is compensated by an equivalent increase in taxes (direct or indirect), the coefficient of growth with respect to these explanatory variables is statistically positive for the higher-growth episodes, but statistically negative for the lower-growth episodes. The reported coefficients capture the benefits on growth of recreation, culture, and environment spending, income transfers from social security, sovereign spending minus the costs of taxation on growth. The results suggest the following interpretation. Although the literature usually classifies these spending as unproductive, they have a demand effect on growth that may or may not cancel out the negative effects of taxation depending upon whether an economy is growing slowly or at a fast rate. Table 5 also suggests that welfare expenditure have no significant growth impact, except a negative impact in times of crisis, if a trade-off is made with other spending items, for instance sovereign expenditure. Finally, if a government increases the welfare expenditure without searching to reduce the resulting higher budget deficit by either a decrease in another spending or an increase in taxation, the increase results in a negative impact irrespective of the growth rate of the economy (in Table 4, the coefficient is negative for all the percentiles and statistically significant in most cases). In the same configuration (no changes in the structure of taxes and spending), sovereign expenditures appear to have significant positive effects on growth only in those countries growing fast (the estimated coefficient are statistically significant for the 60^{th} and 70^{th} percentiles).

The empirical evidence regarding the growth effect of human capital spending is mixed. Health and education expenditure, when significant, contribute positively to economic growth in times of crisis

(40th percentiles) or during low-growth episodes in the richest European countries, but is likely to result in lower growth rates during high-growth episodes (70th percentile). The positive sign is intuitive, since such expenditure is expected to enhance labor productivity. The negative sign reflects the fact that, in the European emerging economies, educational and health expenditure seem to have been inefficient in generating a positive growth rate, which could be explained by a weaker linkage between public education and wealth outlays and education and wealth indicators. As reported in the literature, there may be several causes of ineffective human capital spending, among which the inefficient role of institutions and governance in mediating the nexus between social spending, indicators and growth. Incorporating institutions indicators as additional control variables in the model would be interesting in assessing the negative link. We let this for a further study.

Finally, public deficits turn out to be growth-enhancing during high-growth episodes (60th and 70th percentiles) and often not statistically significant when an economy grows slowly (40th and 50th percentiles).

To sum up, considering the growth impact of fiscal policy in terms of growth efficiency, the results for tax and spending are the following. Social security revenues, when taxes remains unchanged, are neutral with respect to real GDP growth in the fast growing European emerging economies, but they boost growth if they are reduced in times of low-growth in the industrialized European countries. Reducing direct taxation would speed recovery in the new EU member more forcefully in the emerging economies than in the industrialized countries of the EU, when this category of taxation is used without making a mix with other taxes and when any change is simply reflected in changes in the budget surplus. However, when we consider the balance between indirect and direct taxation, a shift from indirect to direct taxes would provide a gain for all the countries. Our results display substantial heterogeneity with respect to how growth reacts to public expenditure across years and countries. Welfare and sovereign expenditure financed by higher taxes have strong demand effects in the economies that grow fast (thus they may speed the economic recovery in the emerging European economies if they are raised), but they are inconsistent with a pro-growth dynamics in the industrialized which are growing more slowly. Finally, an increase in education and health spending

could be an appropriate measure in response to a slow growth, but it might not be an effective way for the fast-growing countries to improve growth. Worst, higher human capital spending are harmful to growth.

4.3.- Impact of fiscal policy on per-capita growth rate under alternative financing hypotheses

We now test the robustness of the above results to different changes in the specification. First, we consider the growth rate of per-capita GDP as has been done in many empirical papers. This implies that we are no longer reasoning from a growth efficiency point of view, but we search to see whether different fiscal policies can raise or jeopardize the growth rate of the standard of living across years and countries. As we said before, working with per-capita growth rate implies that we assume that a shift in GDP modifies the average income per individuals. We further add one lag to the explanatory variable since the annual macroeconomic programs transmitted by the countries to the EU Commission are evaluated over a period of three years. We also consider an alternative classification of spending. As shown in Table 6, we now consider three groups of expenditure: social spending, economic and sovereign expenditure, and, other public expenditure. Direct taxation now incorporates a third component, namely taxes that are neither personal income taxes nor corporate income taxes. These other government revenues include for instance taxes on property transactions. We consider several combinations of the omitted variables to conform to the literature. Finally, we add inflation and the initial growth rate of per-capita GDP to the list of control variables.

Table 6 reports the estimation result using again a double quantile regression with bootstrapped standard errors. We found that the results for the 40^{th}, 70^{th} and 90^{th} percentiles were very close to those obtained when considering the quantiles (25^{th}, 50^{th} and 75^{th} quantiles). So, Table 6 showsts the results for the three quantiles. The reported coefficients are cumulative sums over the three years following the initial changes in taxation and expenditure. Regression (1) assumes that tax and expenditure changes are fully reflected by changes in the budget surplus. In regression (2), it is assumed that

changes in taxation and public spending are not entirely reflected in budget deficit/surplus, because the government modifies the structure of taxation by changing indirect taxation. Similar interpretations apply to regressions (3) till (5).

Table 6. An alternative classification of fiscal variables

Theoretical classification	Classification in the data source
Direct taxation	Direct taxes on business
	Direct taxes on households
	Other direct taxes (total direct taxes minus direct taxation on business and households)
Indirect taxation	Taxes on production and imports
Other government revenues	General Government total receipts minus direct and indirect taxation
Economic and sovereign expenditure	Defense expenditure
	Security expenditure
	Education expenditure
	Health expenditure
	General public service expenditure
	Economic affairs expenditure
Social expenditure	Expenditure on recreation and culture
	Social security and welfare expenditure
Other expenditure	General government total disbursements minus productive and unproductive expenditure
Budget surplus	Government total revenues minus Government total disbursements

We begin with a brief comment of the results obtained for the conditioning variables. Their coefficients have the expected signs. Both the business investment ratio and the employment growth enter the regressions with a positive sign and they are mostly statistically significant, irrespective of the quantiles. This seems better than in our previous regression where the ratio of business investment to GDP was positive and statistically significant for the low-growth countries only and the growth rate of the employment rate was rarely significant across the different regressions. Inflation negatively affects per-capita GDP growth, which is not a surprised given that price stability has been set up as a prerequisite for sustainable growth in the EU.

Direct taxation significantly reduces growth if a country is experiencing either a low-growth or a high-growth rate (in regressions 3 till 5) while the effect is statistically insignificant for middle-growth countries. Therefore, an increase in direct taxation financed by an equivalent decrease in indirect taxes, social expenditure, or which results in a higher budget surplus, is growth-reducing when growth is below 1.14% or above 3%. When indirect taxation is excluded from the list of omitted variables (Regressions 1 and 2), higher direct taxes are growth-reducing only for the high-growth countries (above 3%).

The regressions report a negative growth effect for indirect taxes in the case of low-growth economies but a positive effect in high-growth countries (Regressions 1 and 2). A lower deficit implied by higher indirect taxes, or the financing of additional social spending by a higher indirect taxation has several theoretical effects. In principle, deficits and indirect taxes imply a shift in growth in opposite directions. The effect of the former is either positive or negative depending upon whether one observes strong or weak Keynesian multipliers. The latter can be cancelled out by different phenomena (crowding out effects, Barro-Ricardo effects, etc). Indirect taxes are expected to be growth-reducing. The total impact is thus either positive or negative depending upon the effects which is predominant. According to Regression 1, it seems that the taxation effect is larger in low-growth countries, while the negative effects of higher budget surpluses dominates in high-growth economies. Therefore, an indirect taxation used to finance social expenditure has the benefit of shifting growth upward if an economy evolves on its transition growth path to its long-run per-capita GDP level. Once the latter has been achieved, indirect taxation is likely to result in a lower growth. This finding can be explained by our previous observation that social spending are growth-enhancing in the European emerging countries, but growth-reducing in the industrialized countries.

Interestingly, the results report a positive effect on growth of economic and sovereign expenditure in high-growth countries, while they are neutral for the group of low-growth countries. Indeed in Regressions 1, 2 and 4, we obtain statistically significant coefficients for the median and the 75^{th} quantile only. Economic and sovereign expenditure are therefore beneficial for growth above 3.2%, when the initial composition of taxes and spending remains unchanged (Regression 1), when their

increase is substituted for social expenditure (Regression 2), or even if they are partially financed by higher indirect taxation (Regression 4). Finally, we can see that social expenditure, when included in the list of explanatory variables, has a negative effect on growth irrespective of the quantile (Regression 4). This contrasts with our findings in the preceding section, since we saw that such spending had strong demand effects in the fast-growth countries.

To summarize, social expenditure is negatively correlated with growth irrespective of the location of an economy in the distribution of the growth rate of per-capita GDP, while economic and sovereign expenditure only plays a significant role in the case of medium to high-growth countries. Direct taxation has a growth-reducing impact everywhere, but the impact is significant at the lower and high-end of the conditional growth distribution. Indirect taxes are harmful in the low-growth countries, but seem to raise growth in the high-growth countries.

4.4.- Discussing some currently debated policy issues in the EU

We now elaborate on some policy implications of the above results regarding some issues which are currently discussed in Europe. Table 8 summarizes our main findings in Sections 4.2 and 4.3.

A first policy issue relates to social VAT and growth. The idea is to replace part of social security contributions (essentially payroll tax) with an increase in VAT as a way of fostering growth. Such a measure is expected to work through both a demand channel and a supply channel by inciting firms to reduce their prices more or less in proportion to the decrease in unit labor costs. Our results lead mixed conclusions. The estimations suggest that this could lead to a sizeable positive effect on growth, but only in the countries that experience a low growth rate. Conversely, the impact would be neutral for growth in the emerging high-growth countries (see Table 4, the coefficients in the regressions where the indirect taxes are the omitted variable). Therefore, a transfer of fiscal revenues from payroll taxes to indirect taxes can either drive growth downwards or boost it. In the most industrialized countries (a majority of which have their growth episodes located below the median), one may expect the shift in

the tax schedule to result in a higher growth. One reason may be that, in the EU, where growth is low, the price channel (domestic goods are sold at a reduced price) plays more intensively than the tax channel on domestic demand (the elasticity of domestic demand with respect to relative prices may be higher than the elasticity with respect to indirect taxes). Conversely, a reason why a measure like a social VAT would be neutral in the emerging EU countries facing a fast growth rate may be a consequence of a consumption fall following the rise in indirect taxation in spite of higher real wage increase.

A decrease in payroll taxation not accompanied by an increase in indirect taxation is harmful for growth in the fast growth EU emerging economies while it is growth-friendly in the industrialized countries with lower growth rates (compare the respectively negative and positive coefficients in Table 4 where the omitted variable is the budget surplus). Here, we need to take into account the effects of both the tax decrease and the implication in terms of a higher deficit or a lower surplus. The magnitude and sign of their impact on growth depends upon whether households act as Keynesian consumers or as Ricardian. As is known from the literature, during low growth episodes consumers are generally Keynesian. Higher deficits imply increased transfers which are consumed. In times of high growth rates, consumers tend to save more if they think that, the current decrease in payroll taxation will be offset in the future by higher taxation in bad times.

Direct versus indirect taxation is another debated issue in the EU policy circles. What is the relevance in terms of tax structure in terms of economic growth. In terms of efficiency (growth rate of the GDP not deflated by population), a decline in indirect and direct taxes have, in general, a positive impact on growth irrespective of the growth dynamics, whether they are substituted for from each other or whether they are used to finance increases in expenditure. However, in terms of magnitude, indirect taxation would be preferred since the estimated coefficients are higher as compared with those of direct taxation (in absolute value). Therefore, these results tend to support the view that, to adapt to the tax competition, it could be better in the EU countries to raise revenues from VAT then by increasing direct taxation.

The empirical evidence regarding the composition of expenditure and their role in promoting growth suggest that there should be country by country recommendations in the EU. The expenditure items which are growth-supportive are not unique within Europe. The economic literature and policymakers usually classify public spending as productive versus unproductive, depending upon whether they are expected to impact an economy production function. Welfare expenditure, very often referred as unproductive, have different effects depending upon whether we use per-capita or non per-capita GDP to evaluate their impact on growth. When the growth rate of per-capita growth is chosen as the endogenous variables, they are always negatively correlated with growth. However, with the non-deflated GDP growth, we find that they are either neutral for growth or sometimes have a stimulating growth effect in the emerging fast-growing EU countries. Human capital expenditure are only growth-supportive in the EU industrialized countries, while the other productive expenditure (economic affairs, defense) have contrasted effects on growth. They can enhance growth in the fast-growing emerging economies countries, while they tend to be harmful in the low-growth countries, specifically when financed by increased taxes.

An important policy consequence is that we would be unable to draw recommendations regarding the composition of public expenditure in the EU countries in connection with growth, without considering two groups of countries, namely the most ancient members and the recent members that are still in a catch-up growth process. For instance, the suggestion of reducing welfare expenditure would be a good thing for growth efficiency in the industrialized countries, but would have doubtful effects on growth in the emerging countries. A reallocation of welfare expenditure to sovereign expenditure (which include infrastructure), say from productive to unproductive spending, would probably be a good thing in the low-growth European countries (as shown in Table 5), but would certainly not be a mean of enhancing growth in the countries that are already fast-growing. Indeed, the non-significant coefficient indicate that such a policy would be neutral on growth.

5.- Conclusion

While using taxes and public spending to foster growth, the EU governments also use their fiscal policy to reduce the budget deficit in order to keep their finance sustainable. Taking into account the

mix of expenditure cuts (resp. increases) and revenues increases (resp. cuts), we cast some doubts on the idea according to which a higher growth rate in the EU could be achieved with the same fiscal mix in all member countries. Quantile estimates strongly illustrate heterogeneous reactions across the EU economies.

In light of our findings, we favor the idea of distinguishing among the ancient member countries and the recent emerging countries which adhered in the early 2000's. On the differences discussed in this paper, social security spending, direct taxation, welfare and sovereign expenditure and human capital expenditure have strikingly different effects on the growth rate of the real GDP. Increases in human capital spending are growth-enhancing in the industrialized EU countries, while welfare and sovereign expenditure play a more important role in fostering growth in the emerging economies. Direct taxation exerts a much more detrimental impact in the countries that are growing rapidly than in those that experiment a slow growth. When the growth rate is considered in per-capita terms, indirect taxes appear to exert an asymmetric effect on the EU economies: they are harmful in the low-growth countries, but not inconsistent with a stronger growth dynamics in the economies that grow rapidly. Direct taxation is growth-enhancing if an economy has either a slow or fast growth rate. Direct taxes are neutral at moderate growth rates.

One implication of the above results is that, in analyzing the fiscal policies which could act friendly to growth in the EU, using average fiscal multipliers could be of very little use. One needs to consider the different growth impacts in times of crises and normal times and to acknowledge the different ways in which the same policies can affect the growth rates in different countries. This rules out the use of a single fiscal/growth model for the EU economies.

Table 3. Growth equation. Two-stage quantile regression with bootstrapped standard errors (t-ratios in parentheses)

Omitted variable	Welfare expenditure				Direct taxation			
	0.4	0.50	0.6	0.7	0.4	0.5	0.6	0.7
Constant	-2.61***	-2.87***	-0.60***	-0.45**	-4.74***	-3.17***	-2.96***	-1.30***
	(-4.51)	(-5.04)	(-5.58)	(-2.49)	(-4.70)	(-4.57)	(-5.61)	(-3.58)
Business investment	0.04**	0.04**	-0.007	0.07***	0.09***	0.005	-0.025	0.008
	(2.34)	(2.13)	(-0.26)	(2.99)	(4.94)	(0.185)	(-0.84)	(0.39)
Employment growth	-0.15	0.14	0.04	0.003	-0.009	-0.09	0.03	0.004
	(-1.51)	(1.51)	(0.55)	(0.03)	(-0.108)	(-0.97)	(0.39)	(0.053)
Hum. capital expenditure	-0.02	-0.04	-0.003	-0.148***	-0.005	-0.07	-0.28***	-0.32***
	(-0.44)	(-1.06)	(-0.09)	(-4.60)	(-0.54)	(-0.73)	(-4.06)	(-3.41)
Welfare expenditure	-	-	-	-	-0.02	0.074	0.11*	0.102
					(-0.42)	(1.27)	(2.20)	(1.58)
Sovereign expenditure	-0.08	-0.004	0.36*	0.24	-0.04	-0.001	0.16**	0.122***
	(-0.37)	(-0.02)	(1.88)	(1.08)	(-0.66)	(-0.02)	(2.55)	(2.10)
Direct taxation	-0.05***	-0.08***	-0.27***	-0.11	-	-	-	-
	(-3.20)	(-4.66)	(-6.16)	(-1.50)				
Soc. Sec. contributions	0.22	-1.66***	0.08	-0.04	-0.69*	-1.51***	0.05	0.06
	(1.08)	(-3.56)	(0.53)	(-0.176)	(-1.87)	(-4.16)	(0.28)	(0.21)
Indirect taxation	-1.22***	0.34	0.16	-0.11	-1.59***	0.297	-1.31***	-0.45***
	(-4.34)	(0.70)	(1.09)	(-0.51)	(-4.84)	(1.17)	(-5.15)	(-2.33)
Other taxes	-0.03	0.05	-0.19	-0.46***	-0.16	0.04	-0.12	-0.18
	(0.35)	(0.29)	(-1.25)	(-2.64)	(-0.96)	(0.18)	(-0.70)	(-0.96)
Budget surplus	0.03	-0.01	-0.20***	-0.407***	-0.03	-0.19**	-0.19***	-0.32***
	(0.35)	(-0.22)	(-3.73)	(-4.98)	(-0.36)	(-1.99)	(-2.92)	(-3.63)
Pseudo R^2	0.62	0.61	0.66	0.56	0.63	0.58	0.65	0.58

Note : *,**,*** mean significant at 10%, 5%, 1%.

Table 4. Growth equation. Two-stage quantile regression with bootstrapped standard errors (t-ratios in parentheses)

Omitted variable	Indirect taxes				Budget surplus			
	0.4	0.50	0.6	0.7	0.4	0.5	0.6	0.7
Constant	-2.59***	-3.90***	-0.54***	-0.75***	-2.87***	-3.85***	-0.57***	-1.00***
	(-3.38)	(-5.00)	(-5.48)	(-4.94)	(-4.35)	(-5.43)	(-4.82)	(-6.29)
Business investment	0.09***	0.05**	-0.025	0.008	0.08***	0.04	-0.004	-0.02
	(4.94)	(2.29)	(-0.842)	(0.39)	(4.15)	(1.59)	(-0.15)	(-1.19)
Employment growth	-0.009	0.06	0.03	0.004	-0.02	-0.009	-0.003	-0.06
	(-0.108)	(0.70)	(0.39)	(0.05)	(-0.28)	(-0.11)	(-0.04)	(-0.64)
Hum. capital expenditure	0.22*	0.38***	-0.001	-0.38***	0.27***	0.34***	-0.05	-0.24***
	(1.91)	(2.97)	(-0.014)	(-4.56)	(2.64)	(3.25)	(-0.58)	(-2.78)
Welfare expenditure	-0.21***	-0.24***	-0.03	0.13**	-0.24***	-0.21***	-0.07	-0.15*
	(-2.84)	(-3.39)	(-0.51)	(2.05)	(-3.49)	(-3.62)	(-0.83)	(-1.86)
Sovereign expenditure	-0.07	-0.15*	0.05	0.15***	-0.07	-0.11	0.138**	0.31***
	(-1.29)	(-1.81)	(0.84)	(2.77)	(-1.24)	(-1.60)	(2.41)	(6.09)
Direct taxation	-0.09***	-0.10***	-0.26***	-0.14**	-0.09***	-0.09***	-0.24***	-0.19***
	(-4.84)	(-5.28)	(-5.15)	(-2.33)	(-4.96)	(-5.03)	(-4.63)	(-3.53)
Soc. Sec. contributions	-1.31***	-2.06***	0.05	-0.31	-1.45***	-2.01***	0.51**	0.63**
	(-3.29)	(-4.88)	(0.28)	(-1.36)	(-4.24)	(-5.25)	(2.03)	(2.28)
Indirect taxation	-	-	-	-	0.14	0.17	0.33	1.05***
					(0.60)	(0.74)	(1.52)	(4.10)
Other taxes	-0.165	0.01	-0.12	-0.06	-0.02	0.05	0.02	0.28
	(-0.96)	(0.05)	(-0.71)	(-0.31)	(-0.12)	(0.28)	(0.09)	(1.34)
Budget surplus	-0.03	-0.02	-0.195***	-0.32***	-	-	-	-
	(-0.36)	(-0.21)	(-2.93)	(-3.63)				
Pseudo R^2	0.63	0.61	0.65	0.58	0.62	0.62	0.65	0.58

Note : *,**,*** mean significant at 10%, 5%, 1%.

Table 5. Growth equation. Two-stage quantile regression with bootstrapped standard errors (t-ratios in parentheses)

Omitted variable	Sovereign expenditure			
	0.4	0.50	0.6	0.7
Constant	-3.37***	-3.05***	-0.76	-0.53***
	(-4.74)	(-5.53)	(-1.60)	(-3.08)
Business investment	0.05**	0.05**	-0.01	0.06***
	(2.54)	(2.24)	(-0.43)	(3.01)
Employment growth	-0.07	0.06	0.09	0.002
	(-0.76)	(0.65)	(1.26)	(0.02)
Hum. capital expenditure	0.10	-0.09	0.07	-0.15*
	(1.27)	(-0.52)	(0.97)	(-1.80)
Welfare expenditure	-0.134*	0.03	-0.06	0.03
	(-1.98)	(0.24)	(-0.77)	(0.37)
Sovereign expenditure	-	-	-	-
Direct taxation	-0.077***	-0.10***	-0.29*	-0.15**
	(-3.90)	(-5.31)	(-1.74)	(-2.34)
Soc. Sec. contributions	0.35	-1.97*	0.28	0.16
	(1.54)	(-1.82)	(0.99)	(0.67)
Indirect taxation	-1.59***	0.61	0.40*	-0.04
	(-4.51)	(0.49)	(1.70)	(-0.17)
Other taxes	0.12	0.01	-0.03	-0.55***
	(0.65)	(0.05)	(-0.16)	(-2.81)
Budget surplus	-0.03	-0.017	-0.18**	-0.32***
	(-0.40)	(-0.21)	(-2.50)	(-3.65)
Pseudo R^2	0.63	0.61	0.66	0.57

Note : *,**,*** mean significant at 10%, 5%, 1%.

Table 6. Growth equation (per-capita). Two-stage quantile regression with bootstrapped standard errors (t-ratios in parentheses)

Regression n°	(1)			(2)			(3)		
Omitted variable	Budget surplus			Budget surplus and social expenditure			Budget surplus, indirect taxes and social expenditure		
	0.25	0.50	0.75	0.75	0.50	0.75	0.25	0.50	0.75
Constant	0.17	0.02	0.27**	-0.009	-0.09	-0.11	0.11	-0.08	0.10
	(1.51)	(0.18)	(2.39)	(-0.09)	(-0.94)	(-1.29)	(1.29)	(-1.00)	(1.32)
Growth(-1)	0.12	0.35***	0.20*	0.28**	-0.05	0.05	0.23**	0.24**	0.07
	(1.07)	(3.34)	(1.94)	(2.84)	(-0.66)	(0.62)	(2.24)	(2.60)	(0.90)
Inflation	-1.48***	-1.87***	-1.39***	-1.14***	-1.13***	-1.09***	-1.69***	-0.80***	-0.87***
	(-4.63)	(-6.84)	(-4.35)	(-3.93)	(-4.88)	(-4.12)	(-5.72)	(-3.11)	(-3.83)
Business investment	0.74***	0.45**	0.71***	0.44**	0.37**	0.33**	0.92***	0.29	0.29*
	(3.56)	(2.14)	(3.43)	(2.17)	(2.11)	(2.02)	(4.58)	(1.48)	(1.70)
Employment growth	0.58**	0.54**	0.51**	0.72***	0.70***	0.62***	0.43*	0.69**	0.68***
	(2.51)	(2.32)	(2.07)	(2.82)	(3.26)	(2.89)	(1.73)	(2.94)	(3.26)
Direct taxation	-0.39	-0.15	-0.66	-0.19	-0.84**	-0.79**	-1.21***	-0.42	-0.99**
	(-0.85)	(-0.32)	(-1.55)	(-0.43)	(-2.27)	(-2.18)	(-2.71)	(-0.99)	(-2.58)
Indirect taxation	-1.05	-0.52	-1.46**	-0.77	1.28*	1.37**	-	-	-
	(-1.54)	(-0.76)	(-2.34)	(-1.21)	(2.24)	(2.51)			
Other taxation	0.10	0.30	-0.05	0.21	-0.19	0.11	0.11	0.33	-0.30
	(0.24)	(0.94)	(-0.14)	(0.55)	(-0.63)	(0.34)	(0.28)	(0.92)	(-0.93)
Economic and sovereign expenditure	0.07	0.52**	-0.26	0.43*	0.32*	0.51**	-0.26	0.45**	0.28
	(0.28)	(2.11)	(-1.07)	(1.91)	(1.88)	(2.68)	(-1.11)	(2.09)	(1.49)
Social expenditure	-0.65	-0.77*	-0.67**	-	-	-	-	-	-
	(-0.65)	(-1.89)	(-2.20)						
Budget surplus	-	-	-	-	-	-	-	-	-
Pseudo R^2	0.53	0.38	0.53	0.39	0.45	0.45	0.66	0.57	0.45

Note : *,**,*** mean significant at 10%, 5%, 1%.

Table 6 (continued). Growth equation (per-capita). Two-stage quantile regression with bootstrapped standard errors (t-ratios in parentheses)

	(4)			(5)		
Omitted variable	Budget surplus and indirect taxes			Indirect taxes, other taxes and social expenditure		
	0.25	0.50	0.75	0.25	0.50	0.75
Constant	0.10	-0.08	0.09	0.02	-0.03	0.11
	(1.12)	(-0.97)	(1.13)	(0.31)	(-0.42)	(1.47)
Growth(-1)	0.04	0.22**	0.06	-0.09	0.07	-0.07
	(0.39)	(2.37)	(0.65)	(-0.82)	(0.72)	(-0.69)
Inflation	-1.60***	-1.34***	-1.25***	-1.79***	-0.74**	-1.44***
	(-5.18)	(-5.04)	(-5.26)	(-5.30)	(-2.32)	(-5.81)
Business investment	0.96***	0.37*	0.36**	1.09***	0.31	0.51**
	(4.93)	(1.83)	(2.00)	(5.19)	(1.49)	(2.53)
Employment growth	0.76***	0.79***	0.62**	0.62**	1.01***	0.39*
	(3.18)	(3.25)	(2.87)	(2.56)	(4.79)	(1.80)
Direct taxation	-0.97**	-0.39	-0.88**	-0.84*	-0.54	-1.12**
	(-2.19)	(-0.87)	(-2.29)	(-1.77)	(-1.19)	(-2.50)
Indirect taxation	-	-	-	-	-	-
Other taxation	0.04	0.46	-0.34	-	-	-
	(0.12)	(1.16)	(-1.02)			
Economic and sovereign expenditure	0.18	0.68**	0.63***	-0.14	0.37	0.24
	(0.64)	(2.62)	(2.85)	(-0.55)	(1.59)	(1.18)
Social expenditure	-0.94**	-0.62	-0.60*	-	-	-
	(-2.45)	(1.63)	(-1.89)			
Budget surplus	-	-	-	-0.04	-0.04	0.36*
				(-0.18)	(-0.21)	(1.69)
Pseudo R^2	0.54	0.40	0.44	0.54	0.41	0.46

Note : *,**,*** mean significant at 10%, 5%, 1%.

Table 8. Summary of our main results

	Per-capita GDP growth	Real GDP growth (GDP non deflated by population
Social expenditure (welfare)	Negative impact irrespective of the growth episodes	Increases are harmful for low-growth countries Increases are neutral or stimulate growth in the fast-growing countries
Economic and sovereign spending	Neutral during low-growth episodes Raise growth in the medium- to high-growth countries	Significant positive effects in high-growth countries when financed by increased taxation Turn to have negative effects on low-growth countries (the effects of tax dominate)
Direct taxation	Negative impact irrespective of the growth episodes, but nonlinear effects (left and right of the distribution)	Negative irrespective of the growth episodes, but stronger in magnitude in the high-growth countries.
Indirect taxation	Stimulate growth when they are reduced Can sometimes be detrimental for growth in the high-growth countries when used to finance higher expenditure	Negative effects on growth when raised with an increasing effect with the speed of growth A shift from direct to indirect taxes is less detrimental then the reverse shift.
Social security revenues	-	Positive impact in the low-growth if they are reduced, but negative impact in the high-growth countries

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