Tax Policy and Social Output: The UE Case

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Abstract. *The aim of this paper is to emphasize how the correlations between fiscal policy and economic growth are manifesting in the UE case. After theoretical framework, the paper is organized as follows: Section 2 tries to provide a model at micro-economic level for the interconnections between fiscal policy and economic growth and Section 3 looks for same empirical evidences for the EU-25 case. Finally, some conclusions are drawn and some limits of the proposed analysis are derived in Section 4.*

Key words: fiscal policy; economic growth; effects; European Union .

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JEL Codes: E62, F43.
REL Codes: 8E, 8K.

1. Introduction

The macro-economic relationship between fiscal policy and economic growth has long fascinated economists. Unfortunately, analyses of that relationship have frustrated empiricists for almost as long. One root of that frustration is the array of possible policy indicators. As Tanzi and Zee (1997) discuss, there are three candidate indicators of fiscal policy – government expenditures, taxes and deficits.

The literature does not systematically favor one indicator of fiscal policy over the others. Neoclassical growth models imply that government policy can affect only the output level but not the growth rate (Judd, 1985). However, endogenous growth models incorporate channels through which fiscal policy can affect long-run growth (Barro, 1990, Barro-Sala-i-Martin, 1992, 1995). The latter models classify generally the fiscal policy instruments into: a) distortionary taxation, which weakens the incentives to invest in physical/human capital, hence reducing growth; b) non-distortionary taxation, which does not affect the above incentives, therefore growth, due to the nature of the utility function assumed for the private agents; c) productive expenditures that influence the marginal product of private capital, henceforth boost growth; d) unproductive expenditures that do not affect the private marginal product of capital, consequently growth.

Unfortunately, many empirical studies examining fiscal effects on growth have been based only loosely on theoretical models, often testing *ad hoc* hypotheses relating to government size such as government consumption spending or public investments or some aggregate measure of tax burden. Not surprisingly, early results were ambiguous or contradictory and frequently non-robust (see Agell et al., 1997, for a review).

Furthermore, Levine and Renelt (1992) investigated the robustness of explanatory variables in cross-country regressions using extreme bounds analysis and found that none of the fiscal indicators is robustly correlated with economic growth when evaluated individually. Nevertheless, the methodology used by Levine and Renelt was challenged to be "too strong" by Sala-i-Martin (1997), which investigated the distribution of coefficient estimates, concluding that for a substantial number of variables, including the fiscal ones, the relation to economic growth is robust. So, the empirical literature on the growth effects of fiscal policy produced mixed and non-conclusive results. Kneller et al. (1999) argue that one reason for such apparently contradictory results is their failure to incorporate the government budget constraint formally into testing procedures. Empirical models which do control for the government budget have generally found more robust associations between fiscal policy and economic growth (Devarajan et al., 1996, Kocherlakota, Yi, 1997, Miller Russek, 1997, de la Fuente, 1997, Kneller et al., 1999). Still we will not employ the budget deficit as a descriptor variable for the fiscal policy but instead the fiscal pressure and its components.

The paper is organized as follows: Section 2 tries to provide a model at micro-economic level for the interconnections between fiscal policy and economic growth. Section 3 looks for same empirical evidences for the EU-25 case. Finally, some conclusions are drawn and some limits of the proposed analysis are derived in Section 4.

2. The conceptual framework

The effects of the fiscal policy could be localized both at the macro and at the micro levels. At the *macro-level*, these are localized in the social redistribution of the resources, social output dynamic, "full" or partial labor utilization, emigrational stance and external equilibrium. At the *micro-level*, such effects are reflected in the incomes and expenditures flux and in the patrimonial architecture.

A fruitful model for the spillovers of the fiscal policy at the micro-level could be represented by the framework of the *multi-periodic optimization of the patrimonial structures* model. More exactly, suppose that the economic system is form by N groups of identical agents, each group with its individual utility function. Each of them are chosen a certain structure of their wealth by incorporation both M monetary and Q non monetary assets trying to balance their return to risk ratio and to preserve an "optimal" structure of the wealth for a certain number of successive period in order to minimize the *adjustments costs* for suboptimal structures by taking into account the *budgetary restriction*. So that, the current and expected values for the non-monetary assets costs, returns and risks as well as the incomes from labor and capital are involved in the optimization process. If the information is "imperfect" (is incomplete, unequal distributed and there are costs of obtaining, updating and using it) a *bounded rationality* anticipation mechanism will be involved (the anticipation will be form based on a *mix* mechanism which will incorporate "all" the available information from the current and past periods). The differences between different agents are reflected by their individual utility functions where the return to risk ratio is particularly weighted to reflects the "risk aversion".

The formal description of the optimization problem at a *global* level looks by the aggregation of S individual problems like:

$$x_{ijt} \geq 0, \quad \sum_{j=1}^{S}\sum_{i=1}^{N} x_{ijt} = 1, \forall (j,t) \qquad (1)$$

$$\begin{aligned}&\sum_{j=1}^{S}\sum_{i=1}^{N}\sum_{k=1}^{t}\left(c_{ijk} + c^*_{ijk+1}\right)x_{ijk} + \\ &+\sum_{j=1}^{S}\sum_{p=1}^{M}\sum_{k=1}^{t}\left(L_{pk} + L^*_{pk+1}\right) = \\ &= \sum_{j=1}^{S}\sum_{z=1}^{Q}\sum_{k=1}^{t}\left(Y_{zk} + Y^*_{zk+1}\right)\end{aligned} \qquad (2)$$

$$\frac{\sum_{j=1}^{S}\sum_{i=1}^{N}\sum_{k=1}^{t}\left(\eta_{ijk} + \eta^*_{ijk+1}\right)x_{ijk}}{\sum_{j=1}^{S}\sum_{i=1}^{N}\sum_{k=1}^{t}\left(R_{ijk} + R^*_{ijk+1}\right)x_{ijk}} \rightarrow MAX \qquad (3)$$

$$\sum_{j=1}^{S} E\left(*_{k+1}\right) = \sum_{j=1}^{S}\left(\sum_{k=1}^{t}\alpha_{kj} *_k + \beta_{tj} *_t\right) \qquad (4)$$

where x is the weight of a non monetary asset i in the structure of the wealth in the current period t, N is the total of the non monetary assets from the *selection universe*, c are the costs associated with the buy and hold non monetary assets, L are the monetary and quasy monetary assets with a high degree of liquidity, Y are the incomes from label and capital which are obtaining in the current period and/or are tesaurised from previous periods, η are the returns of non monetary components of the wealth composed by the monetary flows generated by their utilization and by their prices variations, R are their associated risks and * denotes the anticipated values of the involved variables formed in the current period for l futures periods.

Relation (1) is a *logical restriction:* the weights of a particular the non-monetary asset could be only positive or null and their sum could not exceed "1".

Relation (2) is a *budgetary restriction:* the total amount of the expenditures with buying, holding and using the non monetary assets as well as financial resources thesaurised for the futures periods could not exceeds the total of available incomes from work and capital obtained in current period or accumulated from past ones.

Relation (3) is the *objective function:* each group of agents is trying to maximize not only the individual level of return or risk but their ratio.

Relation (4) is the *anticipation mechanism:* in a situation of bounded *rationality* the anticipation are formed by taking into account the past and current information as this could be obtain.

This description of the optimization problem implies that:

- Each group of agent is looking to *systematically* preserve an "optimal" patrimonial structure. If in the current period this structure becomes as a result of a modification in the involved variables "sub-optimal" they are trying to "rewrite" the problem by excluding some assets from their wealth and including others.
- In order to minimize the *transactional costs* a certain adopted structure should be kept at least for some future period so that it is necessary to include the anticipated values of the variables.
- The "optimal" level of *monetary balances* (the stocks of different medium of exchange and medium of payment) is obtained *simultaneous* with the level of the non monetary assets by "solving" the optimization problem so that there is no "residual" thesaurisation for *prudential* or *speculative* reasons.
- The objective function implies a "balance" in return to risk ratio elements so that the agents could be described as "risk neutral" (with different degree of risk tolerance). In others words, they accept to assume a higher degree of risk that the "perfect risk aversion" agents and a lower level of return that the "perfect risk takers" in order to obtain a better correlation between these variables. Since such an assumption could be critical for the optimization problem description it should be noticed that this is not only a simple "average agent" description but even more a "autonomous" hypothesis about the social mechanisms of risks acceptance: at the "aggregate" level there are nether "casino" economical systems nether "old granny" ones.
- The *bounded rationality* model implies that all the information which could be obtained at an "efficient level of implied

costs" is used both from previous as well as from current periods. The goal is to adopt the "second best" decisions with "incomplete information".

A particular issue concerns the definition of the "risk" concept. The key distinction involved in defining and obtaining a risk measurement is the one between "risk" and "uncertainty". *"Risk" is the probability to obtain an unfavorable result of an economic decision. "Unfavorable" means that the result is "positive" but lower that the expected one or the result is "negative"*. So that the risk concept incorporates both the situations of "unrealized" results and the situation of "looses".

"Uncertainty" means that the observable result deviates (in a "positive" or "negative" sense) from the expected one. "Uncertainty" reflects both the situations of "unfavorable" results as well as the situations of an "excess of the results". Suppose for instance that the returns of a project are "normally" distributed around a certain "objective" or "subjective" target value as in Figure 1.In such a case, three main areas could be delimited: *Area 1,* where the returns are positive but lower that the target value which could be settled based on the average of the previous values, the average of the sectors returns, the "concurrencies average", the interest or inflation rate, the rate of growth for the financial markets etc. or could be a pure subjective value; *Area 2,* where the returns are negative and respectively *Area 3,* where the returns are positive and higher that the target value. *Area 1* and *Area 2* are forming together the *risk zone* while all three areas are reflecting the uncertainty *zone*. Of course, the relative importance of the *Area 1* and *Area 2* for the risk definition is not the same: the agent will perceive a greater level of risk associated will looses that with values of return which are lower that the target but still positive.

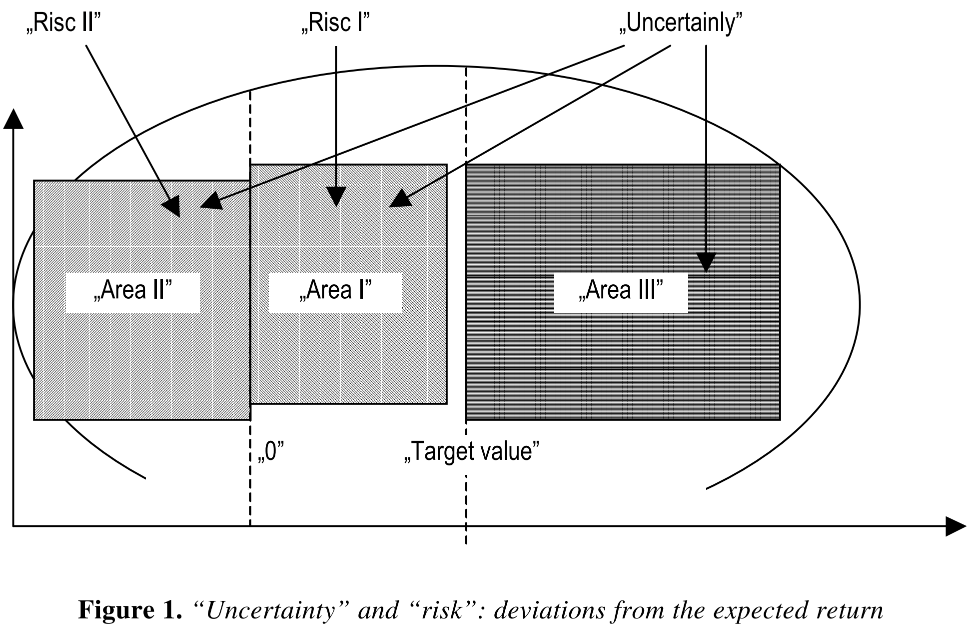

Figure 1. *"Uncertainty" and "risk": deviations from the expected return*

A methodology to implement at the operational level such risk definition could consist in the next steps:

1. The construction of on risk values set r_{jt} according to the next rules:

$$r_{jt} = \begin{cases} m1\times\left(target_j - \eta_{jt}\right) \text{ if } target_j > \eta_{jt} \text{ and } \eta_{jt} > 0 \\ m2\times\left(target_j - \eta_{jt}\right), \text{ if } \eta_{jt} < 0 \\ m3\times\left(\eta_{jt} - target_j\right), \text{ if } target_j < \eta_{jt} \\ \text{with } m2 > m1 > m3 \end{cases} \quad (5)$$

2. The construction of a global measurement of risk as the Euclidian norm of the risk values set components:

$$R_{jt} = \sqrt{r^2{}_{j1} + r^2{}_{j2} + ...r^2{}_{jt}} = \sqrt{\sum_{k=1}^{t} m_m\left|target_j - \eta_{jk}\right|}, m = 1,2,3 \quad (6)$$

The m parameters could be seen as measures of *risk aversion* specific to each group j [1].

With these features, the optimization problem becomes:

$$x_{ijt} \geq 0, \quad \sum_{j=1}^{S}\sum_{i=1}^{N} x_{ijt} = 1, \forall(j,t) \quad (7)$$

$$\sum_{j=1}^{S}\sum_{i=1}^{N}\sum_{k=1}^{t}\left(c_{ijk} + c^*{}_{ijk+1}\right)x_{ijk} + \sum_{j=1}^{S}\sum_{p=1}^{M}\sum_{k=1}^{t}\left(L_{pk} + L^*{}_{pk+1}\right) = \sum_{j=1}^{S}\sum_{z=1}^{Q}\sum_{k=1}^{t}\left(Y_{zk} + Y^*{}_{zk+1}\right) \quad (8)$$

$$\frac{\sum_{j=1}^{S}\sum_{i=1}^{N}\sum_{k=1}^{t}\left(\eta_{ijk} + \eta^*{}_{ijk+1}\right)x_{ijk}}{\sum_{j=1}^{S}\sum_{i=1}^{N}\sum_{k=1}^{t}\left(m_m\left|target_{ji} - \eta_{jik}\right| + m_m\left|target_{ji} - \eta^*{}_{jik+1}\right|\right)x_{ijk}} \to MAX \quad (8.1)$$

$$\sum_{j=1}^{S} E\left(*_{k+1}\right) = \sum_{j=1}^{S}\left(\sum_{k=1}^{t} \alpha_{kj} *_k + \beta_{tj} *_t\right) \quad (9)$$

This general framework could be applied to study the impact of the fiscal policy changes on all the relevant variables. It could be noticed that:

- The fiscal prelevations are susceptible to influence the costs of buying non monetary assets especially if they take the form of *indirect taxation*;
- The fiscal prelevations could influence the level and the dynamic of the available incomes, the thesaurisation and the returns/risks ratio especially if they reflects *direct taxation;*
- Same effects are exercised by the *public expenditures* at the different levels of the public authorities' structures.

▪ Apart from positive growth effects of a fiscal expansion, in the last two decades, there was an increasing interest in the effects of a *fiscal consolidation*, which could have in certain circumstances a positive effect on growth. For instance, analyzing the cases of Denmark and Ireland, Giavazzi and Pagano (1990) were the first to prove the expansionary effects of reduction in the size of budget deficit or a fiscal contraction, *via* the interest rate premium and *government credibility*. This last element is also susceptible to influence the expectation mechanism as well as the *risk aversion* (if the capacity of the fiscal policy to stabilize the social output dynamic is perceived to increase then it is possible to observe a shift in the empirical levels of the m parameters).

The effects of the fiscal policy characteristics could formally describe as:

$$x_{ijt} \geq 0, \quad \sum_{j=1}^{S}\sum_{i=1}^{N} x_{ijt} = 1, \forall (j,t) \qquad (10)$$

$$\sum_{j=1}^{S}\sum_{i=1}^{N}\sum_{k=1}^{t}\left(c_{ijk}(I_k) + c^*_{ijk+1}\left(I^*_{k+1}\right)\right)x_{ijk} + \sum_{j=1}^{S}\sum_{p=1}^{M}\sum_{k=1}^{t}\left(L_{pk} + L^*_{pk+1}\right) = \\ = \sum_{j=1}^{S}\sum_{z=1}^{Q}\sum_{k=1}^{t}\left(Y_{zk}(D_k, P_k, A_k, PE_k) + Y^*_{zk+1}\left(D^*_{k+1}, P^*_{k+1}, A^*_{k+1}, PE^*_{k+1}\right)\right) \qquad (10.1)$$

$$\frac{\sum_{j=1}^{S}\sum_{i=1}^{N}\sum_{k=1}^{t}\left(\eta_{ijk}(D_k, I_k) + \eta^*_{ijk+1}\left(D^*_{k+1}, I^*_{k+1}\right)\right)x_{ijk}}{\sum_{j=1}^{S}\sum_{i=1}^{N}\sum_{k=1}^{t}\left(m_m\left|target_{ji} - \eta_{jik}(D_k, I_k)\right| + m_m\left|target_{ji} - \eta^*_{jik+1}\left(D^*_{k+1}, I^*_{k+1}\right)\right|\right)x_{ijk}} \rightarrow MAX \quad (10.2)$$

$$\sum_{j=1}^{S} E\left(*_{k+1}\right) = \sum_{j=1}^{S}\left(\sum_{k=1}^{t}\alpha_{kj}(BD_k)*_k + \beta_{tj} *_t\right) \qquad (11)$$

where supplementary from the previous notations: D is a parameter of the "direct" fiscal prelevation (such as the "fiscal pressure" computed based on this kind of taxation), I describes the "indirect" taxation, A is linked with the social redistribution of incomes, PE are the public expenditures while BD is the budgetary deficit. According with the above relations:

C_0 : *The fiscal policy could affect the flows of incomes and expenditures, the global level of social output as well as the "monetary balances"* via *the changes in the "budgetary restriction" of the wealth structure optimization induced by its different components.*

C_1 : *The fiscal policy could affect the anticipation mechanisms as well as the risk* aversion *both* via *the changes in the objective function and in the relative importance of the past and current information which is changing as the public authorities' credibility varies over time (the agents' trust in their capacity to stabilize the dynamic of the social output and to* *reduce as a consequence the afferent volatility of the economic performances).*

Of course, the viability of the $C_0 - C_1$ findings depends on a set of several conditions which are far to be trivial ones. Among these, one could notice:

- The global viability of the optimization problem framework with its central question: does the agents *systematically* optimizing? Or in a more radical formulation: do they even taking into account the "optimal" structure of their wealth?
- The "exact" nature of the anticipation mechanisms: if the *bounded rationality* model does not stand at least the C_1 viability is implicitly invalided,
- The taxonomy of the *selection universe* for the non-monetary assets and the liquidity degree for different "monetary" and "quasi monetary" assets could be directly reflected in the returns and risks. Or, such aspects are directly linked with the structural and institutional characteristics of the economic systems which modulates the amplitude and the configuration of the connections between the fiscal policy and return to risk ratio. Even more, the different determinants of returns and risks (prices of monetary and non-monetary assets, interest and exchanges rates) are susceptible to be influenced in non-uniforms ways by the fiscal policy that could not be predicted on *ex-ante* basis.

Since all these aspects and many others non specified here could leads to various empirical situations the set could be only interpreted in a "weak" sense according to which *the fiscal policy matters for expenditures, incomes, "monetary balances", returns, risks and anticipation mechanism but the "exact" degree of such a influence depends on particular values of the involved parameters.*

3. The fiscal policy and the social output: an empirical test for the EU countries case

The C_0 (formulated in a "abridge" form as C'_0: *The fiscal policy could affect the global level of social output* via *the changes in the "budgetary restriction" of the wealth structure optimization induced by its different components*) could be directly tested. We are proposing such a test for the EU-25 countries case.

The basic specification of the pooled date model is:

$$Y_{it} = \alpha + X_{it} \times \beta_{it} + \delta_i + \gamma_t + \varepsilon_{it} \qquad (12)$$

where Y_{it} is the dependent variable, X_{it} is a k vector of the exogenous variables formed by three components of the fiscal pressure determined by the "direct", "indirect" and "social" fiscal revenues, $X_{it} = [D_{it}\ I_{it}\ A_{it}]$ and ε_{it} are the errors terms for cross-sectional units observed for dated periods $i = 1,2,..M$. The α represents the overall constant in the model, while δ_i and γ_t represent cross-section or period specific effects (random or fixed). Identification obviously requires that β the coefficients have restrictions placed upon them.

We may view these data as a set of cross-section specific regressions so that we have M cross-sectional equations each with T observations stacked on top of one another:

$$Y_i = \alpha \times 1_t + X_i \times \beta_{it} + 1_T \times \delta_i + I_t \times \gamma + \varepsilon_i \quad (13)$$

where 1_T is a T - element unit vector, I_t is the T – element identity matrix, and γ is a vector containing all of the period effects, $\gamma = (\gamma_1, \gamma_2, ...\gamma_T)$.

Analogously, we may write the specification as a set of T period specific equations, each with M observations stacked on top of one another:

$$Y_i = \alpha \times 1_M + X_i \times \beta_{it} + 1_M \times \delta + I_M \times \gamma_t + \varepsilon_t \quad (14)$$

where 1_M is a M - element unit vector, I_M is the M – element identity matrix, and δ is a vector containing all of the period effects, $\delta = (\delta_1, \delta_2, ...\delta_T)$.

More generally, splitting X_{it} into the three groups (common regressors X_{0it}, cross-section specific regressors X_{1it}, and period specific regressors X_{2it}), one could obtain:

$$\begin{aligned} Y_{it} &= \alpha + X_{0it} \times \beta^0{}_{it} + X_{1it} \times \beta^1 + \\ &+ X_{2it} \times \beta^2 + \delta_i + \gamma_t + \varepsilon_{it} \end{aligned} \quad (15)$$

If there are k_1 common regressors, k_2 cross-section specific regressors, and k_3 period specific regressors, there are a total of $k_0 = k_1 + k_2 \times M + k_3 \times T$ regressors in β.

The spillovers of the fiscal pressure components which are tested could be described as follows:

- An increase in the component of the fiscal pressure associated with the social transfers will increase the relative importance of the public authorities in the social reallocation of the resources. Further, it should appear an increase in the demand for the non monetary assets. If there are non utilized capacities and this higher level of the demand is perceived as a *non-transitory* one, the supply could be adjusted to the new level of the demand by *quantities*; otherwise, there will be an adjustment by *prices* or alternatively by *quantities and prices*;
- An increase in the direct taxation component could work as a *selector* for the economic projects with higher yield rate since it affects the volume and the structure of the agents' wealth and the different return rates. If such effects does not appears, the direct taxation will leads to a reduction in the real output growth;
- An increase in the indirect taxation is reflected in the prices and in the demand for the non-monetary assets. There could appear a shift in the volume and structure of the demand according to the taxation mechanisms as well as redistribution in the social resources. Briefly:

The expected influence of the fiscal pressure components on real G.D.P. dynamic

Table 1

Component	Expected sign
A	+/−
D	−/+
I	+/−

Data are from Eurostat.The time span is from 1995 to 2005 (annually data). The countries from the global set and their codification are listed in the Annex. The results from a specification of the model with *fixed effects* (*cross* and *period*) for this global set are reported in Annex A2. The values of the *Durbin-Watson statistics* as well as the unit roots tests from the Annex A3 which tends to indicates that the residual variables does not displays "individual" unit roots (with some possible common unit roots processes) support an "acceptable" quality of the empirical model. These results are quite puzzling: a mix of "correct" signs and statistical significance for the parameters' coefficients among "wrong" signs and low level of statistical significance. In fact, there could be identified at least two sub-groups of countries with a distinct impact of fiscal policy on economic growth (Annexes A4, A5, A6 and A7). For the first group ("United Kingdom group"):

- All the coefficients are statistically significant;
- With the exception of Denmark and Spain cases, the sign of the coefficients for the fiscal pressure linked with social transfers suggests that this component of fiscal policy is *negative* correlated with the dynamic of output;
- With the exception of Denmark, Lithuania and Hungary, the sign of direct taxation fiscal pressure indicates that this component is *positive* correlated with real GDP growth;
- With the exception of United Kingdom, Poland and Hungary, the sign of indirect taxation fiscal pressure shows that this component is *positive* correlated with real GDP growth.

For the second group ("Germany group"):

- Only ones coefficients are statistically significant;
- For the cases of Germany, Italy, Ireland, Finland, Latvia, Czech Republic, Slovakia and Slovenia the social transfers influences in a *positive* manner the GDP dynamic with a low statistical significance. For the others members of this group, the influence is *negative* with a higher statistical significance;
- Without the cases of Greece, Malta and Slovakia there is no evidence of a consistent connection between direct taxation and real output. For the cases of Netherlands, Ireland, Greece, Austria, Finland, Latvia, Malta and Czech Republic the correlation between these two variables is a *negative* one; for the others, is *positive* with the same low degree of relevance;
- The correlation between the indirect taxation and the real GDP is *positive* for all the cases in this group but is statistical significant only in the case of France and Luxembourg.

Overall, the only consistent finding is that for the EU countries the *indirect taxation is positively correlated with the rate of change in real GDP (with a reduced number of exceptions- United Kingdom, Poland and Hungary); for the social transfers and direct taxation there are mix evidences.*

4. Comments and (self) critics

The results from the previous section do not clearly support a rejection of the neither a confirmation of it in a stronger forms that: the fiscal policy matters for the economic growth but the exact nature, the extent of the spillovers, their amplitude and persistence are different from country to country for the analyzed period. There could be advanced some explanations for such differences:

- The costs, prices, the volume and structure of the "monetary balances", the level and structure of the income and thesaurization, the returns and risks associated with the non-monetary assets are different for the countries in the global set as well as for the two component groups;
- The *risk aversion* is different not only for different agents but also between countries according to their economical background as well as with the non economic factors such as the components of the *cultural paradigm* ("uncertainty avoidance" in Hofstede's terminology);
- The α and β parameters of the anticipation mechanisms are not only agents but also country specifics; for instance, if these anticipations concerns the inflation processes the "new" members are influenced by their recent high / significant inflation history while the "old" ones had benefit from a longer prices stability experience.

But still there are some important issues to be address for this analytical framework both from conceptual and empirical levels:

A) Theoretical limitations

1) What is the "hidden hypothesis" in the optimization problem?

The micro-economic foundations of the optimization problem are not clearly stated in its formal description. For instance, there is argument why the "monetary balances" are not established in a residual manner (and, in fact, there is no role of the thesaurization in the model). Worst, there is no argument of the optimization' systematic character: does really the agents trying to choose an "optimal" structure of their wealth? And does they doing that in a multi periodic framework? (or, in other words, is there an "dynamic" and "inter generational" process of patrimonial adjustment?). Since there are no arguments for justifying such a process, it is just a "postulate" and not a "theory". But the consistence of the entire argumentation does critically depend on its viability.

2) How could individual optimization problems be aggregated?

Even it could be agree on the optimization micro economic foundations, still there is a "aggregation issue" since there are not provided explanations about how the shift to the macro level is done from the individual agents specific problems.

3) How "bounded" is the proposed anticipation mechanism?

The C_1 (and, in a certain degree C_0) could be directly derived only if anticipation mechanism stands as a "real" descriptor of the way in which the agents forms their anticipations. On could notice that: a) it is an "empirical" anticipation model since in fact argues that all the available information is used but the relative weights of the current and past information could not be *ex ante* established; b) it is a particular definition of the *bounded rationality* and does not formally reflects the costs of obtaining and using the information.

4) What about the financial infrastructure?

The transmission mechanisms of the fiscal policy spillovers are linked with returns and risk but there is nothing specific to their formation and to the role of financial infrastructure institutional and functional degree of maturity. Also there is nothing about the composition of the monetary and quasi monetary assets (in terms of complexity, liquidity/marketability and financial performances).

5) Where is the Union?

The empirical analysis is applied over the EU case. But there is nothing particular about the inter-countries linkages and about the harmonization of the national fiscal policies inside the Union mechanisms.

B) Empirical estimation problems

Not only the theoretical but also the empirical part of the paper is affected by imperfect clarifications. Some of them are connected with:

- The stability of the regression models and the quality of the results (for instance, in terms of properties of the residuals variables);
- The identification problems for the involved parameters;
- The possible existence of non-linear interactions between the variables and the effects of such interactions;
- The insufficient number of observation and the absence of an explanation for the composition of the samples for the global set as well as for the two groups;
- The instability of the coefficients signs not only between groups but also inside the same group etc.

Despite all these *caveats*, we argue that the proposed model could explain (with certain supplementary clarifications) the spillovers of the fiscal policy over the economic growth based on micro economic foundations and could supply even in mix terms some empirical support for the EU-25 countries. The main output consists in the thesis of the non uniformity of these spillovers and in the idea that there should be provided a consistent explanatory framework for the transmission over micro-channels of the effects induced by the changes in the different components of fiscal pressure.

Note

(1) It should be noticed that the parameter $m3$ is not necessary equal with "0" since an agent could have some interest in any kind of deviation from the target value of return (could be interested both in risk and in uncertainty).

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Annex A1: The global set of countries

Code	Country
1	Belgium
2	France
3	Germany
4	Italy
5	Luxembourg
6	Netherlands
7	Denmark
8	Ireland
9	United Kingdom
10	Greece
11	Portugal
12	Spain
13	Austria
14	Finland
15	Sweden
16	Cyprus
17	Estonia
18	Latvia
19	Lithuania
20	Malta
21	Poland
22	Czech Republic
23	Slovakia
24	Slovenia
25	Hungary

The "A" set

Code	Country
7	Denmark
9	United Kingdom
12	Spain
17	Estonia
19	Lithuania
21	Poland
25	Hungary

The "B" set

Code	Country
1	Belgium
2	France
3	Germany
4	Italy
5	Luxembourg
6	Netherlands
8	Ireland
10	Greece
11	Portugal
13	Austria
14	Finland
15	Sweden
16	Cyprus
18	Latvia
20	Malta
22	Czech Republic
23	Slovakia
24	Slovenia

Annex A2: The parameters of the empirical model for the global set

Dependent Variable: Real GDP growth rate
Method: ***Pooled Least Squares***
Sample: 1995 2005
Included observations: 11
Cross-sections included: 25
Total pool (balanced) observations: 275
Cross-section weights (PCSE) standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	19.31412	4.472689	4.318234	0.0000
1--A1	-0.290920	0.064190	-4.532169	0.0000
2--A2	-0.466808	0.365972	-1.275529	0.2039
3--A3	0.000123	0.040374	0.003042	0.9976
4--A4	0.166417	0.115857	1.436399	0.1528
5--A5	-0.915514	1.013351	-0.903453	0.3676
6--A6	0.058320	0.173664	0.335822	0.7374
7--A7	1.425258	0.354357	4.022098	0.0001
8--A8	-0.514474	0.278828	-1.845130	0.0668
9--A9	-0.205052	0.041106	-4.988316	0.0000

Variable	Coefficient	Std. Error	t-Statistic	Prob.
10—A10	-0.065916	0.039305	-1.677037	0.0954
11--A11	-0.285067	0.062730	-4.544340	0.0000
12--A12	0.270865	0.112618	2.405173	0.0173
13--A13	-0.678805	0.436592	-1.554781	0.1219
14--A14	0.661114	0.213669	3.094096	0.0023
15--A15	-0.258789	0.054907	-4.713181	0.0000
16--A16	-0.017117	0.030529	-0.560682	0.5758
17--A17	-0.196269	0.052327	-3.750807	0.0002
18--A18	0.423342	0.169500	2.497595	0.0135
19--A19	-0.818755	0.174492	-4.692226	0.0000
20--A20	-0.175772	0.192334	-0.913890	0.3621
21--A21	-0.258676	0.086261	-2.998761	0.0031
22--A22	0.065960	0.126295	0.522274	0.6022
23--A23	0.034556	0.059791	0.577941	0.5641
24--A24	0.094864	0.067723	1.400766	0.1632
25--A25	-0.085445	0.030809	-2.773430	0.0062
1--D1	0.503996	0.296182	1.701645	0.0907
2--D2	0.589196	0.662318	0.889598	0.3750
3--D3	0.330454	0.215394	1.534184	0.1269
4--D4	0.143993	0.193705	0.743365	0.4583
5--D5	-0.019761	2.846261	-0.006943	0.9945
6--D6	-0.653490	1.140429	-0.573021	0.5674
7--D7	-0.654384	0.235154	-2.782793	0.0060
8--D8	-0.323195	1.664732	-0.194143	0.8463
9--D9	0.414919	0.159164	2.606867	0.0100
10--D10	-0.278274	0.105436	-2.639275	0.0091
11--D11	0.302831	0.400017	0.757046	0.4501
12--D12	0.699088	0.504471	1.385785	0.1677
13--D13	-0.611386	0.480260	-1.273030	0.2048
14--D14	-0.048744	0.203000	-0.240118	0.8105
15--D15	0.082132	0.140863	0.583063	0.5606
16--D16	-0.082073	0.102596	-0.799969	0.4249
17--D17	0.176005	0.122904	1.432059	0.1540
18--D18	-0.081991	0.125168	-0.655050	0.5133
19--D19	-0.194836	0.113169	-1.721628	0.0870
20--D20	-0.968718	0.098741	-9.810743	0.0000
21--D21	0.251075	0.059769	4.200751	0.0000
22--D22	-0.101662	0.624623	-0.162758	0.8709
23--D23	0.588567	0.137342	4.285404	0.0000
24--D24	0.139719	0.447206	0.312426	0.7551
25--D25	-1.019116	0.214060	-4.760891	0.0000
1--I1	0.455950	0.387112	1.177824	0.2406
2--I2	-0.029364	2.269476	-0.012939	0.9897
3--I3	-0.559765	0.564034	-0.992431	0.3224
4--I4	-0.107059	0.100482	-1.065455	0.2882
5--I5	5.177718	4.340038	1.193012	0.2346
6--I6	-2.625614	1.233842	-2.127999	0.0348

Variable	Coefficient	Std. Error	t-Statistic	Prob.
7--I7	0.807670	0.207642	3.889715	0.0001
8--I8	-2.003729	1.332217	-1.504056	0.1345
9--I9	-0.799730	0.562132	-1.422672	0.1567
10--I10	0.344258	0.569269	0.604736	0.5462
11--I11	-0.397354	0.311425	-1.275923	0.2038
12--I12	0.044542	0.198872	0.223973	0.8231
13--I13	-0.484527	0.649223	-0.746318	0.4565
14--I14	0.393867	0.595917	0.660943	0.5096
15--I15	-0.792121	0.333417	-2.375768	0.0187
16--I16	-0.169931	0.110857	-1.532884	0.1272
17--I17	0.049202	0.029633	1.660393	0.0987
18--I18	0.637295	0.145535	4.378983	0.0000
19--I19	0.509813	0.095701	5.327149	0.0000
20--I20	-0.079764	0.115274	-0.691947	0.4899
21--I21	-0.249148	0.059517	-4.186185	0.0000
22--I22	-0.425584	0.213678	-1.991706	0.0481
23--I23	-0.195288	0.177410	-1.100770	0.2726
24--I24	0.234354	0.138614	1.690695	0.0928
25--I25	-0.362899	0.160175	-2.265636	0.0248
Fixed Effects (Cross)				
1--C	-1.365390			
2--C	6.413506			
3--C	10.19378			
4--C	1.327334			
5--C	-34.79650			
6--C	46.03477			
7--C	14.43451			
8--C	42.18809			
9--C	15.46776			
10--C	-9.877915			
11--C	-3.467476			
12--C	-16.02573			
13--C	29.38778			
14--C	-11.15386			
15--C	21.80504			
16--C	-3.508284			
17--C	-15.43250			
18--C	-28.58480			
19--C	-13.61433			
20--C	1.115535			
21--C	-11.72393			
22--C	-7.251486			
23--C	-18.53342			
24--C	-15.06082			
25--C	2.028330			
Fixed Effects (Period)				
1995--C	-2.164083			

Variable	Coefficient	Std. Error	t-Statistic	Prob.
1996--C	-1.899932			
1997—C	-1.391865			
1998--C	-0.761164			
1999--C	-0.092611			
2000--C	0.375373			
2001--C	0.806749			
2002--C	1.108069			
2003--C	1.071562			
2004--C	1.074510			
2005--C	1.873391			

Effects Specification

Cross-section fixed (dummy variables)
Period fixed (dummy variables)

R-squared	0.996460	**Mean dependent var**	16.90909
Adjusted R-squared	0.994122	**S.D. dependent var**	11.19914
S.E. of regression	0.858625	**Akaike info criterion**	2.822204
Sum squared resid	121.6440	**Schwarz criterion**	4.268913
Log likelihood	-278.0531	**F-statistic**	426.1349
Durbin-Watson stat	1.720565	**Prob(F-statistic)**	0.000000

Annex A3: The unit root tests for the residual of the global set model

Exogenous variables: Individual effects
User specified lags at: 1
Andrews bandwidth selection using Quadratic Spectral kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs.
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-3.81069	0.0001	25	225
Breitung t-stat	-3.31936	0.0005	25	200
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-4.60736	0.0000	25	225
ADF - Fisher Chi-square	108.767	0.0000	25	225
PP - Fisher Chi-square	219.385	0.0000	25	225
Null: No unit root (assumes common unit root process)				
Hadri Z-stat	12.8342	0.0000	25	225

*** Probabilities for Fisher tests are computed using an asympotic Chi -square distribution. All other tests assume asymptotic normality.*

Annex A4: The parameters of the empirical model for Group "A"

Dependent Variable: Real GDP growth rate
Method: ***Pooled Least Squares***
Sample: 1995 2005
Included observations: 11
Cross-sections included: 7
Total pool (balanced) observations: 77
Cross-section weights (PCSE) standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	13.17047	0.507454	25.95400	0.0000
7--A7	2.000393	0.074186	26.96461	0.0000
9--A9	-0.166998	0.015608	-10.69952	0.0000
12--A12	0.158150	0.038716	4.084831	0.0002
17--A17	-0.091520	0.008770	-10.43553	0.0000
19--A19	-0.555632	0.036489	-15.22748	0.0000
21--A21	-0.119664	0.017324	-6.907283	0.0000
25--A25	-0.136031	0.007428	-18.31423	0.0000
7--D7	-0.787382	0.045657	-17.24566	0.0000
9--D9	0.659166	0.055990	11.77291	0.0000
12--D12	0.809266	0.184926	4.376157	0.0001
17--D17	0.198258	0.022241	8.914008	0.0000
19--D19	-0.157412	0.027034	-5.822795	0.0000
21--D21	0.235859	0.011861	19.88605	0.0000
25--D25	-0.767880	0.045848	-16.74823	0.0000
7--I7	1.169577	0.044849	26.07789	0.0000
9--I9	-0.985633	0.183640	-5.367196	0.0000
12--I12	0.260353	0.073434	3.545394	0.0010
17--I17	0.018217	0.006260	2.910023	0.0059
19--I19	0.503992	0.022008	22.90046	0.0000
21--I21	-0.282227	0.012910	-21.86127	0.0000
25--I25	-0.134342	0.030553	-4.397057	0.0001
Fixed Effects (Cross)				
7--C	17.45633			
9--C	19.77662			
12--C	-13.19332			
17--C	-10.06618			
19--C	-10.16327			
21--C	-6.216779			
25--C	2.406603			
Fixed Effects (Period)				
1995--C	-1.982924			
1996--C	-1.607894			
1997--C	-1.250611			
1998--C	-0.995663			
1999--C	-0.360601			

Variable	Coefficient	Std. Error	t-Statistic	Prob.
2000—C	0.140312			
2001--C	0.556738			
2002--C	0.952393			
2003--C	1.137988			
2004--C	1.607722			
2005--C	1.802539			

Effects Specification

Cross-section fixed (dummy variables)
Period fixed (dummy variables)

R-squared	0.999627	**Mean dependent var**	12.59351
Adjusted R-squared	0.999272	**S.D. dependent var**	10.97215
S.E. of regression	0.295995	**Akaike info criterion**	0.709818
Sum squared resid	3.416899	**Schwarz criterion**	1.866501
Log likelihood	10.67200	**F-statistic**	2821.404
Durbin-Watson stat	2.248014	**Prob(F-statistic)**	0.000000

Annex A5: The unit root tests for the residual of the Group "A"

Exogenous variables: Individual effects
User specified lags at: 1
Andrews bandwidth selection using Quadratic Spectral kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs.
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-0.90752	0.1821	7	63
Breitung t-stat	-2.96977	0.0015	7	56
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-2.68562	0.0036	7	63
ADF - Fisher Chi-square	32.1666	0.0038	7	63
PP - Fisher Chi-square	86.6762	0.0000	7	63
Null: No unit root (assumes common unit root process)				
Hadri Z-stat	4.76121	0.0000	7	63

*** Probabilities for Fisher tests are computed using an asympotic Chi -square distribution. All other tests assume asymptotic normality.*

Annex A6: The parameters of the empirical model for Group "B"

Dependent Variable: Real GDP growth rate
Method: ***Pooled Least Squares***
Sample: 1995 2005
Included observations: 11
Cross-sections included: 18
Total pool (balanced) observations: 198
Cross-section weights (PCSE) standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	21.62617	6.103251	3.543386	0.0006
1--A1	-0.373997	0.103052	-3.629217	0.0004
2--A2	-0.426859	0.352863	-1.209703	0.2289
3--A3	0.031821	0.055297	0.575462	0.5661
4--A4	0.051192	0.172885	0.296103	0.7677
5--A5	-1.017857	0.998038	-1.019858	0.3099
6--A6	0.062436	0.171845	0.363330	0.7170
8--A8	-0.548777	0.262362	-2.091680	0.0386
10--A10	-0.096715	0.052647	-1.837068	0.0688
11--A11	-0.267361	0.072934	-3.665785	0.0004
13--A13	-0.551072	0.461432	-1.194266	0.2348
14--A14	0.684834	0.262338	2.610498	0.0102
15--A15	-0.290277	0.061666	-4.707209	0.0000
16--A16	-0.050643	0.049925	-1.014380	0.3125
18--A18	0.322579	0.238235	1.354038	0.1784
20--A20	-0.188185	0.250819	-0.750282	0.4546
22--A22	0.106435	0.128995	0.825115	0.4110
23--A23	0.080637	0.089964	0.896319	0.3719
24--A24	0.137165	0.096717	1.418210	0.1588
1--D1	0.433931	0.376186	1.153501	0.2511
2--D2	0.493700	0.641325	0.769813	0.4430
3--D3	0.336000	0.306597	1.095900	0.2754
4--D4	0.181055	0.249355	0.726094	0.4692
5--D5	0.146411	2.797076	0.052344	0.9583
6--D6	-0.895095	1.148158	-0.779592	0.4372
8--D8	-0.295070	1.562444	-0.188852	0.8505
10--D10	-0.326304	0.132479	-2.463068	0.0152
11--D11	0.164461	0.459870	0.357626	0.7213
13--D13	-0.663629	0.500524	-1.325867	0.1875
14--D14	-0.137560	0.255250	-0.538921	0.5910
15--D15	0.058458	0.153795	0.380101	0.7046
16--D16	-0.140723	0.128459	-1.095466	0.2756
18--D18	-0.137932	0.156262	-0.882697	0.3792
20--D20	-0.921009	0.135798	-6.782198	0.0000
22--D22	-0.038230	0.631924	-0.060497	0.9519
23--D23	0.610419	0.179827	3.394485	0.0009
24--D24	0.414529	0.624499	0.663778	0.5081

Variable	Coefficient	Std. Error	t-Statistic	Prob.
1--I1	0.416372	0.533962	0.779779	0.4371
2--I2	-0.063680	2.183862	-0.029159	0.9768
3--I3	-0.914419	0.799778	-1.143342	0.2553
4--I4	-0.187415	0.139225	-1.346134	0.1809
5--I5	5.256458	4.261968	1.233340	0.2199
6--I6	-2.834559	1.238019	-2.289592	0.0239
8--I8	-1.962270	1.255030	-1.563524	0.1207
10--I10	0.358814	0.728790	0.492342	0.6234
11--I11	-0.491447	0.333149	-1.475158	0.1429
13--I13	-0.565448	0.670616	-0.843177	0.4009
14--I14	0.296650	0.714530	0.415169	0.6788
15--I15	-0.751328	0.355705	-2.112221	0.0368
16--I16	-0.170192	0.147742	-1.151948	0.2517
18--I18	0.716347	0.200730	3.568705	0.0005
20--I20	-0.085420	0.148457	-0.575382	0.5661
22--I22	-0.429240	0.214956	-1.996875	0.0482
23--I23	-0.201691	0.235642	-0.855922	0.3938
24--I24	0.290957	0.196327	1.482001	0.1411
Fixed Effects (Cross)				
1--C	-0.493502			
2--C	5.230562			
3--C	11.78574			
4--C	1.310655			
5--C	-39.32590			
6--C	49.31416			
8--C	39.31910			
10--C	-11.52751			
11--C	-3.224405			
13--C	27.30252			
14--C	-10.60073			
15--C	19.93648			
16--C	-4.576914			
18--C	-30.25035			
20--C	-1.494860			
22--C	-10.52065			
23--C	-21.45264			
24--C	-20.73176			
Fixed Effects (Period)				
1995--C	-2.200067			
1996--C	-1.951394			
1997--C	-1.385003			
1998--C	-0.642810			
1999--C	0.058845			
2000--C	0.525187			
2001--C	0.951564			
2002--C	1.178059			
2003--C	0.960652			

Variable	Coefficient	Std. Error	t-Statistic	Prob.
2004—C	0.781964			
2005--C	1.723004			

Effects Specification

Cross-section fixed (dummy variables)
Period fixed (dummy variables)

R-squared	0.995042	**Mean dependent var**	18.58737
Adjusted R-squared	0.991580	**S.D. dependent var**	10.85765
S.E. of regression	0.996326	**Akaike info criterion**	3.124122
Sum squared resid	115.1492	**Schwarz criterion**	4.485929
Log likelihood	-227.2880	**F-statistic**	287.4031
Durbin-Watson stat	1.694942	**Prob(F-statistic)**	0.000000

Annex A7: The unit root tests for the residual of the Group "B"

Exogenous variables: Individual effects
User specified lags at: 1
Andrews bandwidth selection using Quadratic Spectral kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs.
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-1.14925	0.1252	18	162
Breitung t-stat	-3.14382	0.0008	18	144
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-2.68087	0.0037	18	162
ADF - Fisher Chi-square	62.7027	0.0038	18	162
PP - Fisher Chi-square	138.018	0.0000	18	162
Null: No unit root (assumes common unit root process)				
Hadri Z-stat	11.0732	0.0000	18	162

*** Probabilities for Fisher tests are computed using an asympotic Chi -square distribution. All other tests assume asymptotic normality.*