# The stability Pact and the coordination of fiscal policies in the EMU

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## *Abstract*

This paper studies the relationship between the Stability and Growth Pact (SGP) and the coordination of fiscal policies in the EMU. Results show that the coordination is an efficient tool to increase EMU stabilization, even though the overall impact greatly varies according to the nature of the shock that occurs. Fiscal coordination appears to be compatible with the SGP and coordination gains can actually be enhanced with the SGP. Nethertheless, results are closely related to the effects of monetary and fiscal policies on output.

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# 1 Introduction

Since EMU members have abandoned national monetary and exchange rate policies as adjustment mechanisms, they have been looking for other ways to protect themselves from shocks. It is usually admitted that this role should be assigned to fiscal policies. A solution usually advanced is the coordination of fiscal policies. Policy coordination is based on the idea that individual policies, affect one another, should take objectives and actions. Partial neglect of these interdependencies would lead to sub-optimal outcome of policies (Issing, 2002). Policy-makers could then improve this outcome by agreeing on the joint setting of their instruments and thereby getting closer to their own preferred policy choices. This idea used by Mundell-Fleming models analyze welfare gains of moving from a non-cooperative equilibrium towards cooperative equilibrium (Kletzer, 1997; Engwerda and al., 2002).

However, the Stabilily and Growth Pact (SGP) introduces a set of fiscal stringency requirements on national fiscal policies. The SGP is an agreement among EMU members to adhere to medium-term budgetary positions close to balance or in surplus. For Beetsma and Uhlig (1999), "the essence of the Stability and Growth Pact is to watch the fiscal deficit of each member country closed, and punish those, whose deficits are excessive". It results a conflict between fiscal flexibility and fiscal stringency.

We therefore propose to study the SGP effects on fiscal policies coordination within the EMU and show how it affects macroeconomic adjustment. The paper is organized as follows: Section 2 develops the analytical framework, Section 3 presents the solution method, Section 4 presents a numerical simulation of the model, and the final section concludes.

# 2 The Model

The model is an extension of the model developped by Schalck (2006). It is a static model of closed monetary union with two countries $i$ and $j$ in which we introduce a demand shock[1]. Demand is given by classical terms of literature (Buti and al., 2002): public deficit ($d$), common interest rate ($r$), and trade balance include intra-EU competitiveness (defined of inflation differential) and differences in economic situations. Demand shock $x$ has a $\sigma_x^2$ variance. Demand can be written

[1]We consider only demand shocks because the efficiency of fiscal policy to counter supply shocks is still being widely debated (Brunila and al., 2002).

as follows:

$$y_i = \gamma d_i - \rho r + \eta(y_j - y_i) + \eta\varepsilon(\pi_j - \pi_i) + x_i \quad (1a)$$
$$y_j = \gamma d_j - \rho r - \eta(y_j - y_i) - \eta\varepsilon(\pi_j - \pi_i) + x_j \quad (1b)$$

where $y$ represents GDP, $\gamma$ demand sensibility to public deficit, $\rho$ demand sensibility to interest rate, $\eta$ countries' relative openness, $\varepsilon$ trade balance elasticity to the inflation differential, $\pi$ inflation rate. Variables are in logarithms and expressed as deviations from their long-run non-inflationary equilibrium. All the parameters are positive.

Because of nominal rigidities, output and prices can diverge from their equilibrium values in the short run. This situation is rendered using a Phillips curve as supply function (Leith and Wren-Lewis, 2002):

$$\pi_i = \theta y_i + \eta(\pi_j - \pi_i) \quad (2a)$$
$$\pi_j = \theta y_j - \eta(\pi_j - \pi_i) \quad (2b)$$

We assume that the European Central Bank (ECB), uses the interest rate as the tool for conducting its monetary policy. The aim of monetary policy is to minimize a linear-quadratic loss function ($LM$) which depends on average values. Price stability is the main objective of the single monetary policy. The implications are that inflation is more heavily weighted in the loss function than other variables. That results in low values of $\beta_1$ and $\beta_2$ ($\beta_1 < 1$; $\beta_2 < 1$) which respectively capture the relative preferences for output stabilization and interest rate smoothing. It must be noted that an extra term has been added to the interest rate in the loss function compare to traditional models. The simulations run on monetary policy rules indeed show that optimal rules lead to excessive interest rate volatility, although this situation is not due to the Central Bank's behaviour. The solution then consists to include the interest rate in the loss function (Rudebush and Svensson, 1998). The monetary loss function can therefore be written as follows:

$$LM = \frac{1}{2}\left[\overline{\pi}^2 + \beta_1\overline{y}^2 + \beta_2 r^2\right] \quad (3)$$

The behaviour of each government in the monetary union is described by a linear-quadratic loss function ($LG$) which depends on its output deviation of the baseline, its rate of inflation with a weight $\phi_1$, and its public deficit with a weight $\phi_2$. We consider that the main objective of governments is output stabilisation, which results in low values of $\phi_1$ and $\phi_2$ ($\phi_1 < 1$; $\phi_2 < 1$). The SGP is modelized by a quadratic contract with a financial penalty $f$. The fiscal loss functions can

therefore be written as follows:

$$LG_i = \frac{1}{2}\left[y_i^2 + \phi_1\pi_i^2 + \phi_2 d_i^2 + f d_i^2\right] \quad (4a)$$

$$LG_j = \frac{1}{2}\left[y_j^2 + \phi_1\pi_j^2 + \phi_2 d_j^2 + f d_j^2\right] \quad (4b)$$

In the cooperative case, fiscal policies are defined jointly order to maximise collective welfare. In others words, cooperation fiscal policies are conducting in minimizing a joined loss function ($JLG$) rather than in minimising individual national loss functions:

$$JLG = \frac{1}{2}LG_i + \frac{1}{2}LG_j \quad (5)$$

Supply and demand functions determine output:

$$y_i = \gamma d_i - \rho r + \Omega\gamma(d_j - d_i) + (1-\Omega)x_i + \Omega x_j \quad (6a)$$

$$y_j = \gamma d_j - \rho r - \Omega\gamma(d_j - d_i) + (1-\Omega)x_j + \Omega x_i \quad (6b)$$

In an equivalent manner, the supply and demand functions determine inflation :

$$\pi_i = \theta\gamma d_i - \theta\rho r + \theta\gamma(\Omega+\mu)(d_j - d_i) + \theta(1-(\Omega+\mu))x_i + (\Omega+\mu)x_j \quad (7a)$$

$$\pi_j = \theta\gamma d_j - \theta\rho r - \theta\gamma(\Omega+\mu)(d_j - d_i) + \theta(1-(\Omega+\mu))x_j + (\Omega+\mu)x_i \quad (7b)$$

$$with \quad \Omega = \frac{\eta\left(1+\frac{\varepsilon\theta}{1+2\eta}\right)}{1+2\eta\left(1+\frac{\varepsilon\theta}{1+2\eta}\right)} \quad \mu = \frac{\frac{\eta}{1+2\eta}}{1+2\eta\left(1+\frac{\varepsilon\theta}{1+2\eta}\right)}$$

Parameters $\Omega$ and $\mu$ can be interpreted as the trade balance on output and prices. Both economies are connected by a number of channels through which price and output fluctuations spread across the two EMU member countries.

# 3 Model Solving

## 3.1 Solution method

We consider that governments internalize the Central Bank's behaviour when making their own decisions. Indeed, if they take for granted the single monetary policy's commitment to maintain price stability, the alignment of expectations will be enhanced and behaviour conditioned in a way which will lead to implicit coordinated policy outcomes, while concurrently limiting policy conflicts and overall economic uncertainty (Issing, 2002). In order to modelize this situation we use a Stakelberg game in which governments are the leaders and the ECB the follower. Firstly, each government makes its own decision, it also accepts the other governments' behaviours as given and takes accounts ECB's reaction function. Then the ECB makes decision considering the governments' decisions as given. The resolution of such a game is made by backward induction.

### 3.2 Interest rate determination

The interest rate is determined by the ECB's behaviour. We define the interest rate by minimizing monetary loss function :

$$\begin{aligned} r &= \psi\gamma(d_i + d_j) + \psi(x_i + x_j) \\ &with \quad \psi = \frac{\frac{\rho}{2}\left(\theta^2+\beta_1\right)}{\frac{\rho}{2}\left(\theta^2+\beta_1\right)+\beta_2} \end{aligned} \tag{8}$$

The interest rate rises with the average amount of public deficit. Consequently monetary policy depends on fiscal policy, which means financial eviction does occur. The interest rate also depends on demand shocks. The interest rate sensibility is mainly determined by monetary function weights $(\beta_1, \beta_2)$ and demand sensibility to interest rate $(\rho)$.

### 3.3 Key variables

Expressing the interest rate allows us to determine output and inflation only with public deficits and the shock:

$$y_i = ad_i + bd_j + cx_i + ex_j \tag{9a}$$
$$y_j = ad_j + bd_i + cx_j + ex_i \tag{9b}$$
$$\pi_i = \theta(a - \gamma\mu)d_i + \theta(b + \gamma\mu)d_j + \theta(c - \mu)x_i + \theta(e + \mu)x_j \tag{10a}$$
$$\pi_i = \theta(a - \gamma\mu)d_i + \theta(b + \gamma\mu)d_j + \theta(c - \mu)x_i + \theta(e + \mu)x_j \tag{10b}$$

$$with \quad a = \gamma - \rho\gamma\Omega \quad b = \gamma\Omega - \rho\gamma\psi \quad c = 1 - \Omega - \gamma\psi \quad e = \Omega - \rho\psi$$

Parameter $a$ capture the net impact of fiscal deficit on output. This impact depends on the sensibility of demand to public deficit $(\gamma)$, interest rate $(\rho\gamma\psi)$ and trade balance $(\Omega)$. Parameter $b$ is the fiscal externality depending on the effect on the interest rate and the trade balance. Parameters $c$ and $e$ capture shock's impact on output and inflation, reduced by economic interdependences and monetary policy.

Macroeconomic equilibria are issued by minimising fiscal loss functions. This methodology allows to compare different situations : the non-cooperative and cooperative cases, and the SGP's impact on equilibria.

## 4 Numerical Simulation

### 4.1 Calibration

We consider that stabilization consists in reducing shocks' impacts on key macroeconomic variables (output and inflation) and therefore on welfare losses. We

study fiscal stabilization within the model when a negative, symmetric or asymmetric, shock occurs (1% of GDP). The sensibility of demand to public deficit is suggested by Bouthevillain and al. (2001). Penalty value $f$ corresponds to the variable part of the Pact's financial sanction, i.e. a tenth of the fiscal overrun. The other parameters are issued from Engwerda and al. (2002). The set of parameters is given in Table I.

**Table I. Parameter Values**

| $\gamma$ | $\rho$ | $\eta$ | $\varepsilon$ | $\theta$ | $\beta_1$ | $\beta_2$ | $\phi_1$ | $\phi_2$ | $f$ |
|---|---|---|---|---|---|---|---|---|---|
| 0.75 | 0.2 | 0.4 | 0.5 | 0.25 | 0.2 | 0.25 | 0.5 | 0.25 | 0.1 |

The set of parameters above allows us to determine foreign trade influence ($\Omega$ and $\mu$), sensibility to the interest rate ($\psi$) public deficit impact on output ($a$), fiscal externality ($b$) and shock's impacts ($c$ and $e$). These parameters are gathered in Table II.

**Table II. Impact Parameter Values**

| $\Omega$ | $\mu$ | $\psi$ | $a$ | $b$ | $c$ | $e$ |
|---|---|---|---|---|---|---|
| 0.2305 | 0.1198 | 0.1798 | 0.5232 | 0.1190 | 0.6975 | 0.1586 |

## 4.2 Results

In order to study the SGP effect on fiscal coordination, we consider two scenarii: a basic scenario where fiscal policies are free (scenario 1), and a scenario where the SGP is introduced (scenario 2). We compare results issued from a non-cooperatice case (Non Coop) and from a cooperative case (Coop). Public deficits, outputs, inflations and welfare losses are simulated for each scenario and for each case. Simulation results can be found in Tables III.

**Table IIIa. Symmetric shock results**

| Scenari | | | $d$ | $y$ | $\pi$ | $LC$ | $LGC$ |
|---|---|---|---|---|---|---|---|
| 1 | Non Coop | $i$ | 0.7728 | -0.3600 | -0.0900 | 0.2829 | |
| | | $j$ | 0.7728 | -0.3600 | -0.0900 | 0.2929 | 0.2829 |
| | Coop | $i$ | 0.8397 | -0.3170 | -0.0793 | 0.2699 | |
| | | $j$ | 0.8397 | -0.3170 | -0.0793 | 0.2699 | 0.2699 |
| 2 | Non Coop | $i$ | 0.6615 | -0.4314 | -0.1078 | 0.3451 | |
| | | $j$ | 0.6615 | -0.4314 | -0.1078 | 0.3451 | 0.3451 |
| | Coop | $i$ | 0.7313 | -0.3866 | -0.0966 | 0.3313 | |
| | | $j$ | 0.7313 | -0.3866 | -0.0996 | 0.3313 | 0.3313 |

**Table IIIb. Asymmetric shock (in country i) results**

| Scenari | | | $d$ | $y$ | $\pi$ | $LC$ | $LGC$ |
|---|---|---|---|---|---|---|---|
| | Non Coop | $i$ | 0.6842 | -0.3279 | -0.0652 | 0.2282 | |
| 1 | | $j$ | 0.0985 | -0.0257 | -0.0232 | 0.0084 | 0.1183 |
| | Coop | $i$ | 0.6941 | -0.3156 | -0.0611 | 0.2164 | |
| | | $j$ | 0.1548 | -0.0050 | -0.0166 | 0.0062 | 0.1113 |
| | Non Coop | $i$ | 0.5741 | -0.3855 | -0.0771 | 0.2746 | |
| 2 | | $j$ | 0.0974 | -0.0393 | -0.0291 | 0.0103 | 0.1425 |
| | Coop | $i$ | 0.5892 | -0.3711 | -0.0727 | 0.2618 | |
| | | $j$ | 0.1521 | -0.0089 | -0.0224 | 0.0084 | 0.1351 |

As a result, we can see that the SGP increases larger short-run output fluctuations. The fiscal stringency criteria reduce the degree of fiscal policy activism and thereby the degree of effective stabilization of output and prices in the EMU. From that perspective, the constraints cause suboptimal macroeconomic policies. This result conforms the study of Bayoumi and Eichengreen (1995). Their simulations indicate that a reduction in national fiscal stabilizers could lead to a noticeable increase in the variance of output.

The study also show that coordination of fiscal policies is an effective tool to increase EMU stabilization. Given the degree of economic interdependence in the EU (through $\Omega$ et $\mu$), externalities from national fiscal policies exist (synthetized by $b$). Coordination of national fiscal policies enables the internalization of these externalities and consequently leads to improve macroeconomic performance compared to non-cooperative policy. Indeed, output and inflation reactions to a demand shock are weaker in the cooperative than in a non-cooperative case. The shock's nature generate different coordination mechanisms. When a symmetric shock occurs, both countries increase their fiscal actvism to stabilize both economies. When an asymmetric shock occurs (in country $i$ for example), country $j$ applies a more activism fiscal policy to counteract the negative impact of shock on its economy, and to contribute to stabilization of the economy of country $i$. It results that coordination is more profitable for country $j$ than for country $i$.

An interesting result is that fiscal coordination is compatible with the SGP. Even if a fiscal contraint exists, fiscal coordination improves macroeconomic performance. This is true for all cases. Moreover, we can see that coordination gains, i.e. difference between non-cooperative welfare losses and cooperative welfare losses, are larger when the SGP is introduced than when fiscal policies are unconstrained. In these conditions, coordination of fiscal policies appears as the preferable response towards European stabilization.

## 4.3 Sensibility studies

In order to test the strength of our issues, we make sensibility studies for some key parameters of fiscal coordination: sensibility to deficit ($\gamma$), sensibility to interest rate ($\rho$), the penalty value ($f$).

The simulation shows that welfare losses are decrease functions of $\gamma$ values, i.e. losses are low when sensibility to deficit is high (Fig 1). This issue corresponds to the economic intuition: fiscal stabilization is strong when fiscal multiplyers are high. Coordination gains increase with the sensiblity value but there is a threshold beyond which gains decrease: it correspond to 0.43 if fiscal policies are free and to 0.52 if fiscal policies are constrained. An interesting result is that coordination gains with the SGP can be larger than those obtained when fiscal policies are free. This situation occurs when the sensibility value is over 0.48. The EMU situation corresponds to this braket and then confirms the assumption that coordination is compatible with the SGP.

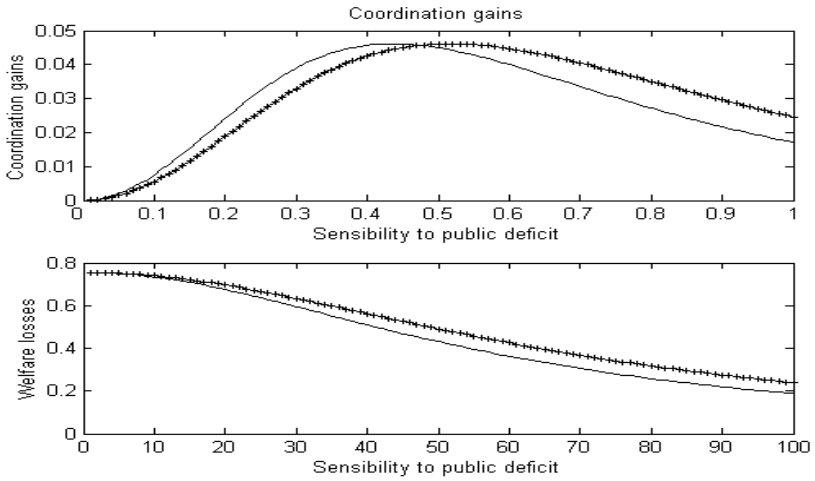


Figure 1: **Fig 1. Sensibility to public deficit and fiscal coordination:** The solid line refers to free fiscal policy case and the line with plus sign refers to SGP case.

The second parameter which can modify coordination issues is the impact of monetary policy. Indeed, sensibility to interest rate depends on fiscal policies in member countries and on demand shock. Insofar as governments internalize the Central Bank's behaviour, impact parameter values ($a, b, c$ and $e$) depend on the

interest rate and therefore depend on sensibility to the interest rate. It results that the higher the sensibility, the weaker impact parameters values and the weaker impacts' shock on welfare. Welfare losses are decrease functions of sensibility to the interest rate (Fig 2). Same as for sensibility to public deficit, coordination gains with the SGP are larger than those obtained when the fiscal policies are free. Nethertheless these gains decrease with the sensibility to interest rate value and become nil beyond $\rho = 0.89$.

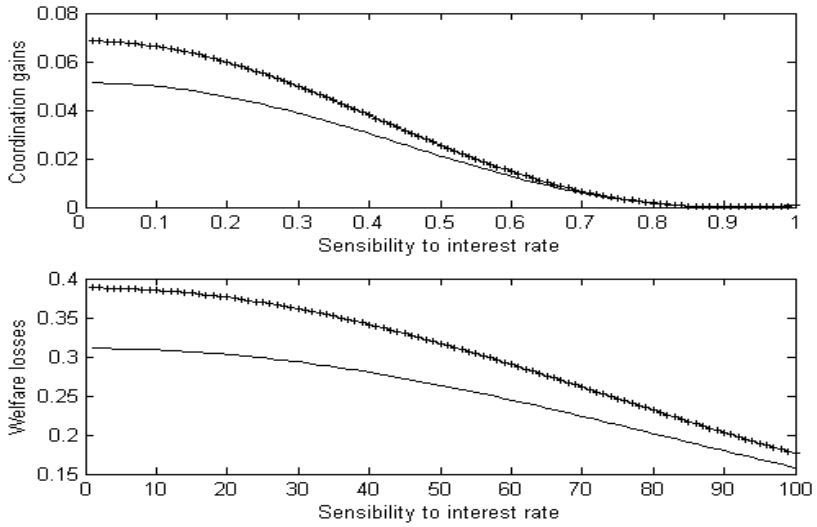


Figure 2: **Fig 2. Sensibility to interest rate and fiscal coordination:** The solid line refers to free fiscal policy case and the line with plus sign refers to SGP case.

The last parameter that we have tested is the penalty value. This parameter does not affect welfare losses and coordination gains when fiscal policies are free, but affect them when the SGP is introduced. Insofar as fiscal stringency implies larger short-run output fluctuations, welfare losses are increase functions of penalty value (Fig 3). Coordination gains increase with the penalty value but there is a threshold beyond which gains decrease: it corresponds to $f = 0.50$. The fiscal activism has a larger welfare cost and is less efficient.

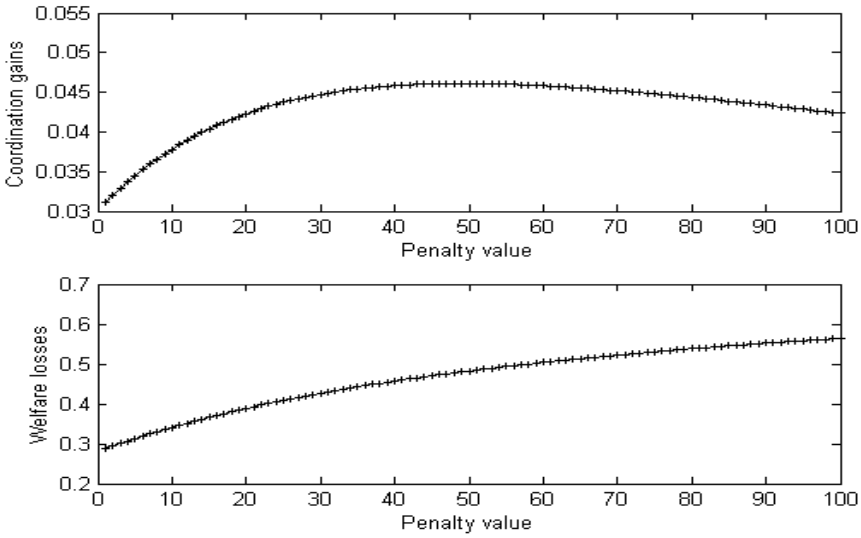


Figure 3: **Fig 3. Penalty value and fiscal coordination:** the line with plus sign refers to SGP case.

# 5 Conclusion

The objective of this paper is to study the impact of the SGP coordination of fiscal policies in EMU. We used a static model of closed monetary union and we compared non-cooperative and cooperative cases in terms of stabilization performance.

Results show that coordination is an efficient tool to increase EMU, but the effects vary according to the shock's nature. Fiscal coordination is compatible with the SGP and coordination gains can be larger with the SGP under conditions. These conditions are the effects of monetary anf fiscal policies on output. EMU is the situation in which the SGP is preferable. In these conditions the SGP is an optimal fiscal rule: it can aim at both fiscal discipline and stabilization.

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