id the Maastricht treaty matter for macroeconomic performance?

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Did the Maastricht treaty matter for macroeconomic performance?

A difference-in-difference investigation

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Abstract

We explore the impact of the Maastricht treaty on fiscal and macroeconomic outcomes in the EU with the difference-in-difference methodology. Our dataset covers 23 OECD countries over the 1975-2006 period. EU 15 countries are classified as the treatment and eight non-EU OECD countries as the control group. The results indicate that the provisions in the Maastricht treaty have been either irrelevant or even harmful for fiscal and macroeconomic developments in the EU. Evidence for a detrimental impact of the Maastricht criteria is particularly strong for the period after the start of the third stage of EMU.

Keywords: Balanced budget rules, Economic and Monetary Union (EMU), Maastricht treaty

JEL codes: E62, F15, H62

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I Introduction

One of the most remarkable historical developments in recent years has been the deepening political and economic integration of Europe. A milestone in this prolonged political journey was the signing of the Treaty on European Union (henceforth Maastricht treaty) in 1992 by the twelve member states of the European Community (EC). This treaty committed EC member states to full monetary integration within a specified time frame. The process of integration, dubbed the European Economic and Monetary Union (EMU), proceeded in three stages and culminated with the introduction of the Euro in 1999.

The run up to monetary integration was characterized by varying degrees of enthusiasm for a common currency. Most notably, while France favored monetary integration as a means to influence the monetary policy of the *Deutsche Bundesbank*, Germany feared that its anti-inflationary preferences would be disregarded in a common currency area that would include a large number of high-inflation countries (Baun, 1995-96). To assuage such apprehensions, the Maastricht treaty established several convergence criteria which European Union (EU) member states had to achieve before the start of the third phase of the EMU, i.e. the introduction of the common currency.[1] In order to ensure continued responsible fiscal and economic policies after the introduction of the common currency, the Maastricht treaty was complemented by the Stability and Growth Pact in 1997. In this pact, the 3% deficit criterion attained center-stage while other criteria (e.g. the exchange rate convergence requirement) became obsolete with the transfer of monetary authority to the European Central Bank (ECB).

It was initially expected that EU governments would use the convergence criteria to justify a reduction in welfare spending (Burkitt and Baimbridge, 1994), and that unemployment rates would increase because of the limits on deficit-financed and/or monetary policy based stabilization policies (Lombard, 2000). On the other hand, the supporters of the treaty argued that it would discipline EU governments, and thus lead to improvements in fiscal balances and a decline in inflation rates. In hindsight, it is open to debate to what extent these expectations were justified. For example, while most countries have apparently consolidated their budgets prior to the introduction of the Euro (Buti et al., 1998), it is also argued by some authors that the goal of long-term fiscal stability was not achieved. These authors point in particular to the repeated breach of the 3% deficit limit by France and Germany after the introduction of the Euro to support their argument (Collignon, 2004).

[1] The main criteria, as formulated in Article 109(j) of the treaty, state that (i) the inflation rate may not exceed the average inflation rate in the three lowest inflation countries in the EU by more that 1.5 percentage points, (ii) the deficit to GDP ratio may not exceed 3%, (iii) the debt to GDP ratio must either be below 60% or else, it must be declining, (iv) the exchange rate mechanism under the European Monetary System must have been joined for two consecutive years and no devaluations must have taken place in this period, and (v) the nominal long-term inflation rate must be no more than two percentage points above the average interest rate in the

One way to explore the impact of the Maastricht treaty on fiscal and macroeconomic outcomes in the EU is to use descriptive statistics. The average development of several fiscal and macroeconomic variables in the "old" EU member states (EU 15)[2] and in eight OECD countries that are not EU members[3] is depicted in figure 1.[4] More specifically, the development of GDP per capita growth[5], unemployment, inflation, general government expenditures, general government revenues, total balances, primary balances, and the interest rate on government bonds from 1975 to 2006 is reported.[6] These plots show for EU countries that the period after the signing of the Maastricht treaty has been on average one of declining deficits, inflation rates, interest rates, and expenditure to GDP ratios. On the other hand, the average growth and unemployment rates in the pre- and the post-Maastricht period are essentially the same.

EU governments have apparently reduced fiscal imbalances, expenditure levels and inflation rates without substantial negative effects on economic growth and unemployment after the signing of the Maastricht treaty. In view of this evidence, one might be tempted to conclude that the Maastricht criteria have been both highly effective and beneficial. However, it can also be seen from figure 1 that the development of these series for OECD countries that are not members of the EU mirrors that in EU countries– even though non-EU countries have not been subject to the Maastricht criteria. This observation casts doubt on whether the Maastricht treaty has been the cause for these positive fiscal and macroeconomic developments. For example, there might have been some world-wide trend in favor of more fiscal frugality that coincided with the adoption of the treaty in the early nineties (Galì and Perotti, 2003). Such a trend would provide an alternative explanation for the apparent ability of EU states to consolidate their budgets and reduce inflation rates.

Given this ambiguity, the aim of this paper is to investigate the *causal* impact of the Maastricht treaty on those fiscal and macroeconomic variables that are plotted in figure 1. We use the quasi-experimental difference-in-difference methodology to establish causality. That is, we perceive the Maastricht treaty as a policy treatment, and contrast the experiences of EU member states before and after the adoption of the treaty with those in comparable OECD countries. Since the validity of the difference-in-difference methodology rests on several important assumptions, we motivate our approach in subsequent sections in more detail. The remainder of this paper is organized as follows.

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three EU countries with the lowest inflation rate (European Union, 1992).

[2] Austria, Belgium, Denmark, Spain, Finland, France, Great Britain, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Sweden.

[3] Australia, Canada, Switzerland, Iceland, Japan, Norway, New Zealand, United States.

[4] Plots for the average development of these variables in European and Non-European countries are also provided in figure 1.

[5] Apart from GDP *per capita* growth we have also investigated GDP *level* growth. Since the correlation coefficient between both variables is over 0.9 and the results in the regressions are basically the same, we only report the results with regard to GDP per capita growth in this paper. However, results with regard to GDP growth are available upon request.

We briefly summarize the related literature in section II. In section III, we discuss the methodology and the data. Benchmark results are collected in section IV. In section V we conduct robustness checks. Section VI concludes.

II Existing evidence

Different strands of the literature are related to this paper. Firstly, because the Maastricht criteria stipulate limits for public deficits and borrowing, they resemble borrowing restrictions. Thus, the literature on balanced budget rules and similar fiscal institutions is relevant.

Poterba (1995b) surveys the literature on balanced budget rules in US States and concludes that they tend to reduce fiscal deficits.[7] For Switzerland, Feld and Kirchgässner (2007) explore the effectiveness of the so called debt brake, which is effectively a borrowing restriction, on the development of debt levels in Swiss cantons. They find that debt brakes have generally been successful in arresting the growth of debt. Kroegstrup and Wälti (2008) find that balanced budget rules are effective in constraining deficits even when they control for the degree of fiscal conservatism at the cantonal level. A similar conclusion with regard to budgetary institutions in Canadian provinces is reached by Tellier and Imbeau (2004). Singh and Plekhanov (2005) find in a study with cross-country data that borrowing restrictions have a significant effect on fiscal outcomes at the subnational level.

In view of these findings, one might conjecture that those Maastricht criteria that pertain to fiscal variables, due to their similarity to borrowing restrictions, should have caused lower levels of public deficits and debt in EU member states. On the other hand, Inman (1998) argues that the existence of certain institutions, for example an independent review body, is the main reason for why deficit limits seem to be effective in US States. Since similar independent institutions do not exist in the EU, the treaty could have had in reality no significant impact.[8] Furthermore, there are also some contributions which argue that borrowing restrictions are generally ineffective, for example Dafflon and Pujol (2001). Thus, an empirical investigation on the specific impact of the Maastricht criteria on fiscal outcomes in EU countries is warranted.

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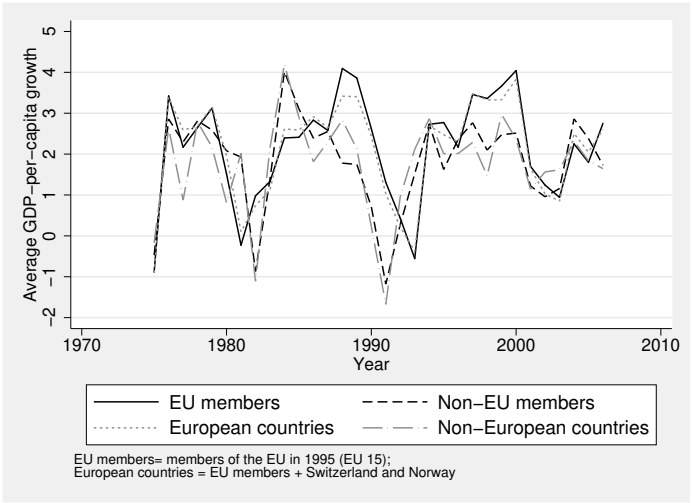
[6] The sources for these data can be found in table 1.

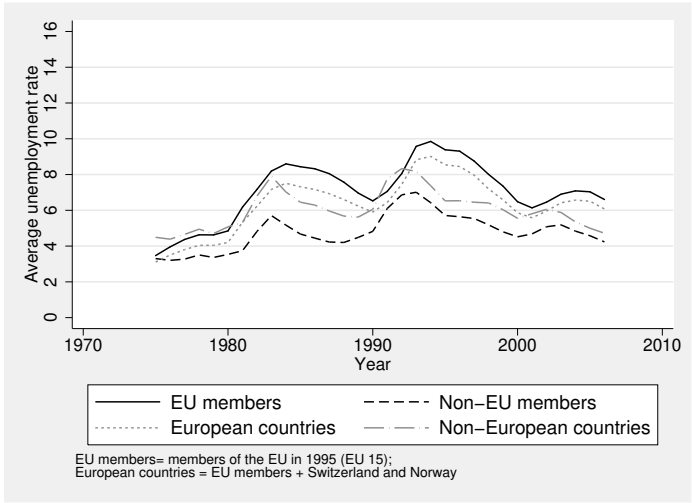
[7] The conclusion that balanced budget rules matter is based, inter alia, on contributions by Alt and Lowry (1994), Poterba (1994), and Poterba (1995a).

[8] A comparison between US perspectives on balanced budget rules and the European viewpoint underlying the Maastricht criteria is provided by Corsetti and Roubini (1996).

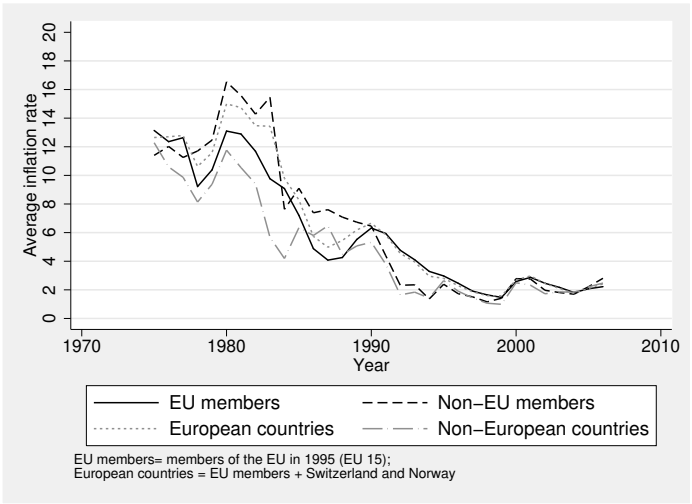
Figure 1: Key fiscal and macroeconomic variables in OECD countries, 1975-2006



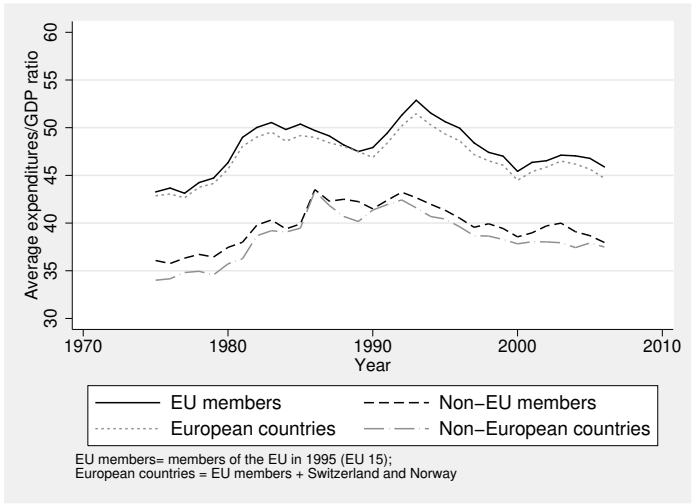
(a) GDP per capita growth



(b) Unemployment

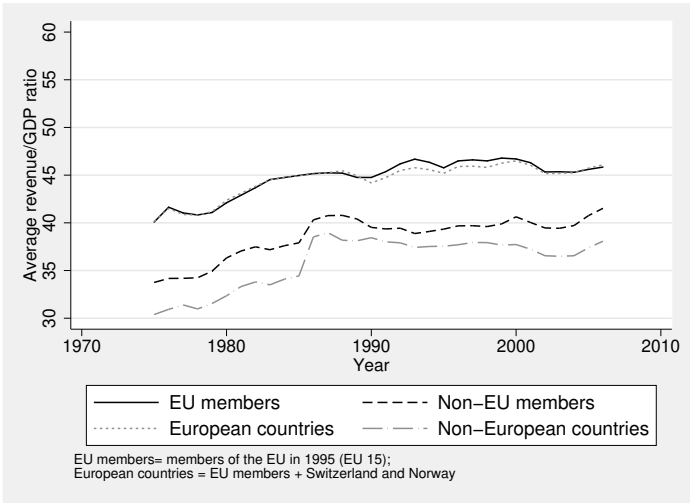


(c) Inflation

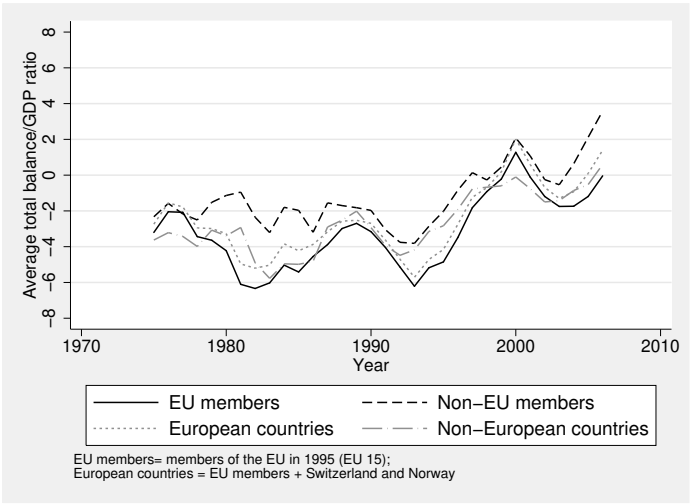


(d) Expenditures/GDP

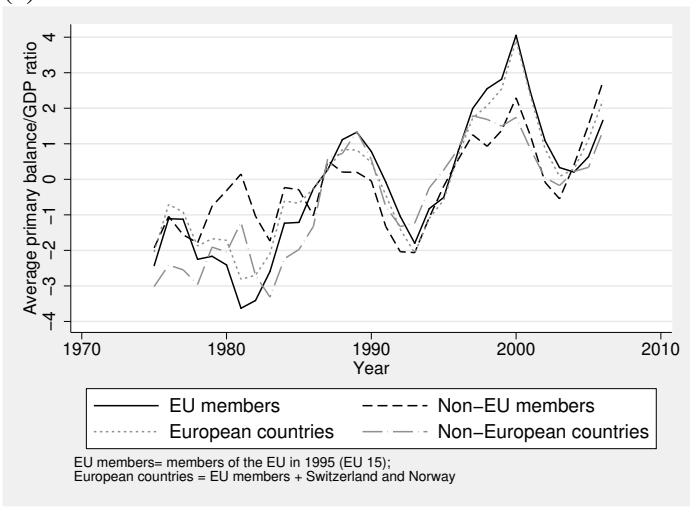
Figure 1: Key fiscal and macroeconomic variables in OECD countries, 1975-2006



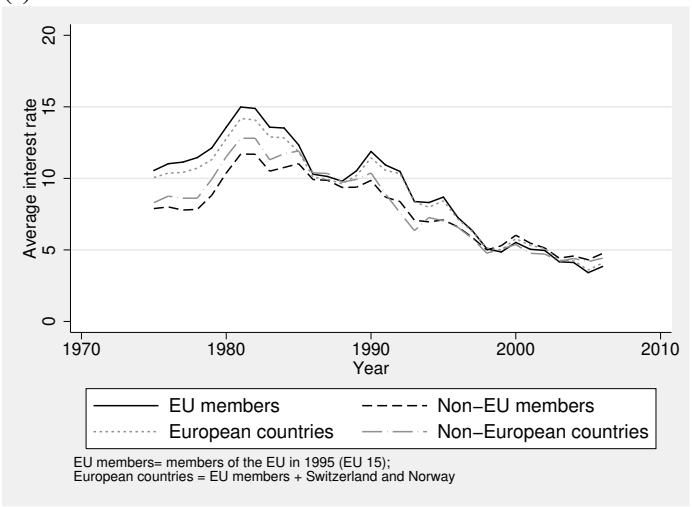
(e) Revenues/GDP



(f) Total balance/GDP



(g) Primary balance/GDP



(f) Interest rate

A number of studies have hitherto explored the impact of the Maastricht treaty on fiscal outcomes empirically. Busemeyer (2004) finds that it has on average led to an improvement in the fiscal behaviour of member states. However, his results might suffer from misspecification and inefficiency because he only estimates pooled OLS models, and apparently does not control for potential heteroscedasticity and autocorrelation. Rotte and Zimmermann (1998) and Rotte (1998) reach the same conclusion by using a similar methodology as the one applied in this paper. However, they too fail to control for autocorrelation in their panel dataset and only use a small number of control variables. Buti and Giudice (2002) conclude on the basis of descriptive statistics that the Maastricht treaty has been effective in limiting deficits in the period immediately before the introduction of the Euro. Von Hagen (2006) also finds that the Maastricht treaty has constrained policy-makers before the start of the EMU, but that the effect has disappeared once the Euro was introduced.

On the other hand, Galì and Perotti (2003) find that the Maastricht treaty has not resulted in less anti-cyclical fiscal policies in member states. While their study does not necessarily indicate that the treaty has led to an increase of deficits, it shows that fiscal stabilization still is an available instrument in the political toolkit. Blot and Serranito (2006) confirm that fiscal policies have converged, but generally reject the notion that the Maastricht treaty has been the cause for the convergence. They instead find that convergence has preceded the Maastricht treaty. De Haan and Sturm (2000) find that there is only weak evidence that the Maastricht treaty has improved fiscal balances. Finally, Freitag and Sciarini (2001) explore this issue by estimating pooled OLS models with data on a number of EU countries. They find no significant direct effect of the treaty on the primary balance once they control for autocorrelation, but identify several indirect effects.

Apart from fiscal variables, the Maastricht treaty also addressed several macroeconomic variables. It explicitly required that inflation and interest rates should be relatively low before the start of the third phase of EMU. Simple descriptive statistics on these variables for EU countries show that they have indeed declined in the early nineties. However, as with the fiscal variables, this observation does not necessarily imply that the Maastricht treaty has been the cause for this outcome.

Busetti et al. (2007) find that the period before the introduction of the Euro has been characterized by a convergence in inflation rates. With regard to interest rates, Camarero et al. (2002) find that the majority of EU countries had already converged or were in the process of catching up in the same period. However, while much of this literature is focused on whether the Maastricht criteria have led to a convergence of macroeconomic variables, it is less well researched whether convergence has actually led to a decline in inflation and interest rates.

The Maastricht treaty might also have had an indirect influence on macroeconomic variables that are not explicitly mentioned in the treaty, in particular on economic growth and unemployment rates. Theoretically, there are several channels through which the prospect of monetary unification might have influenced economic activity. On the one hand, asymmetric shocks cannot be absorbed by exchange rate adjustments in a system of fixed exchange rates (second stage of EMU) or full monetary integration (third

stage of EMU). Secondly, the loss of monetary autonomy to an institution such as the ECB which is exclusively concerned with price stability could lead to lower growth rates and higher unemployment in traditionally high-inflation countries. Soukiazis and Castro (2003) and Lombard (2000) indeed find that the Maastricht treaty has been harmful for growth and unemployment in the EU. Similarly, Soukiazis and Castro (2005) argue that it had a relatively small effect on the convergence of real economic variables, and that convergence of some real economic variables has been on average lower in the post-Maastricht period.

One problematic feature in some of the aforementioned studies is that they only use data on EU countries and control for the effects of the Maastricht treaty with a dummy that is 0 before 1992 and 1 thereafter, or by running separate regressions for the pre- and post-Maastricht periods. These studies therefore cannot discriminate whether the estimated effect of the Maastricht intervention indeed captures the impact of the treaty or the impact of some international trend in the post-Maastricht period that affected EU and non-EU countries in the same manner. Other studies neglect that heteroscedasticity and/or autocorrelation could be present, or only use a small number of control variables. One of our contributions is that we take these potential problems into account in the empirical section of this paper.

III Methodological issues, data, and empirical specification

III.1 The difference-in-difference approach

We use in this paper the difference-in-difference methodology which is widely employed in applied empirical work to establish the causal effect of some non-random policy intervention (Angrist and Krueger, 1999). The effect β_m of an intervention– in our case the Maastricht treaty– on some variable of interest *y*– in our case *y*∈ {GDP per capita growth, unemployment rate, inflation rate, expenditure-to-GDP ratio, revenues-to-GDP ratio, total balance-to-GDP ratio, primary balance-to-GDP ratio, interest rate}– is given in the difference-in-difference methodology by the following formula:

$$\beta_m = \left(\bar{y}_{at}^{m} - \bar{y}_{bt}^{m}\right) - \left(\bar{y}_{at}^{no} - \bar{y}_{bt}^{no}\right) \qquad (1)$$

The superscript *m* denotes the subjects that received the treatment (were subject to the Maastricht criteria), the superscript *no* denotes the subjects that did not receive the treatment (were not subject to the Maastricht criteria). The subscript *bt* denotes the time period before the treatment started (the period before 1992), and the subscript *at* denotes the period after the treatment started (the post 1992 period). Consequently, the expression $\bar{y}_{at}^{m}$ denotes the average of the variable of interest in the treatment group after the treatment, and $\bar{y}_{bt}^{m}$ the average of the variable in the treatment group before the treatment. Similarly, $\bar{y}_{at}^{no}$ and $\bar{y}_{bt}^{no}$ denote these averages for the control group. The effect β_m is then calculated as the difference of two differences, hence the difference-in-difference terminology.

For concreteness, we illustrate the advantages of the difference-in-difference methodology by using public deficits as the example for the variable of interest: One way to identify the impact of the Maastricht treaty on public deficits is to compare the average deficits in EU countries before and after the treaty was signed. However, while a simple comparison of the mean values cancels out the effect of group-specific characteristics, it cannot control for the influence of international trends that coincided with the adoption of the treaty.

Another method to calculate the impact of the treaty is a comparison between the mean values of public deficits in EU and non-EU countries for the period after the signing of the treaty. However, while this approach can control for the presence of international trends, it cannot control for systematic group-specific differences between the treatment and control groups.

The difference-in-difference methodology tries to deal with both problems: the potential presence of common trends and group-specific heterogeneity. The first difference in formula 1 pertains to the difference of the average value of public deficits before and after the Maastricht treatment in the *treatment* group, $\left(\bar{y}_{at}^{m} - \bar{y}_{bt}^{m}\right)$. The second difference is the difference of public deficits between the pre- and post treatment periods in the *control* group, $\left(\bar{y}_{at}^{no} - \bar{y}_{bt}^{no}\right)$. Thus, these differences cancel out group specific effects in the treatment and control groups. As stated, they do not control for international trends that impact the treatment and control groups in the same manner. However, when the second difference is subtracted from the first, common trends in the control and treatment groups are cancelled out. Therefore, the remaining difference between the two differences can be ascribed to the effect of the Maastricht treaty.

The necessity to apply the difference-in-difference methodology in this paper follows from the fact that the countries which were subject to the Maastricht criteria were not randomly chosen. In particular, all countries which received the "Maastricht treatment" had to be located in Europe. Even though the reasons for monetary integration were primarily political and had to do with the wider project of European integration (Garrett, 1993), this non-randomness could lead to biased estimates due to unobserved heterogeneity and/or reversed causality without the application of an appropriate methodology.

Technically, the critical assumption for the validity of the difference-in-difference methodology is that the variables of interest in both the treatment and the control group have followed the same time trend during the sample period. That is, there should be no statistical difference between the treatment and control groups. Since all countries in our sample are high-income OECD countries, and the control group also consists of a number of European countries that are not EU members, it seems to be appropriate to assume that there were no systematic differences between the two sets of countries during the time-frame of our analysis. This assumption is also vindicated by the plots in figure 1 which generally suggest similar trends in EU and non-EU OECD countries.

While the formula in equation 1 can be directly applied, the difference-in-difference estimator is usually implemented in a regression context. We therefore estimate the following model

$$y_{it} = \beta_0 + \beta_1 EU\ \ Member + \beta_2 Post-1992\ \ Period + \beta_3 Maastricht\ \ Intervention + \varepsilon_{it}, \quad (2)$$

where $y_{it} \in$ {GDP per capita growth, unemployment rate, inflation rate, expenditure-to-GDP ratio, revenues-to-GDP ratio, total balance-to-GDP ratio, primary balance-to-GDP ratio, interest rate} denotes the variable of interest in country *i* at year *t*, *EU Member* is a dummy variable that assumes 1 for all countries which signed the Maastricht treaty (EU 15) and else is 0, *Post-1992 Period* is a dummy that is 1 after 1992 and 0 before, *Maastricht Intervention* is a categorical interaction variables that is 1 for the EU 15 countries after the start of the "Maastricht treatment" and 0 else (see the next section for a more detailed discussion on the definition of this variable), and ε_{it} is an error term that is normally distributed. The estimated coefficient on the Maastricht variable, β_3, is identical to the estimated effect of the Maastricht treaty in equation 1, that is $\beta_3=\beta_m$.

Within this regression framework, additional covariates can be easily added to further reduce the danger of biased estimates by conditioning the effect of the Maastricht treaty on a number of explanatory variables. We extend equation 2 accordingly, and estimate additionally the following general model in different reduced-form specifications:

$$y_{it} = \alpha_i + \omega_t + \beta_3 Maastricht\ \ Intervention + \beta_4 X_{it} + \varepsilon_{it}, \quad (3)$$

where X_{it} is a set of economic, institutional and demographic control variables that are listed in table 1, α_i country fixed effects, and ω_t year fixed effects. The *EU Member* and *Post-1992 Period* variables are dropped in this specification because they are perfectly collinear with a subset of the country and year fixed effects, respectively.

III.2 Maastricht treaty, EMU, and Outsiders

Our dataset collects information on 23 OECD countries for the 1975-2006 period. Fifteen of these countries have signed the Maastricht treaty (EU 15) and are therefore classified as the treatment group. The remaining eight countries constitute the control group (see footnote 2 and 3 for a list of the countries in the treatment and control groups).

Even though the Maastricht treaty was not fully ratified until 1993 in the original signatory countries (EU 12), its provisions were common knowledge in 1992. Countries that were contemplating to participate in the process of full monetary integration could start in 1992 to adjust their fiscal and economic policies accordingly. We therefore assume that the treatment started in 1992 for the former EU 12 countries.

The assumption that the Maastricht treatment started in 1992 is probably inappropriate for Austria, Finland, and Sweden (the former EFTA members). These countries joined the EU not until 1995. Since it is a reasonable conjecture that the Maastricht treaty has had no effect on these three countries before their official accession, we code the Maastricht intervention variable for them accordingly.

Several authors argue that the incentives of member states to achieve the convergence criteria before the start of the third phase of the EMU have been stronger than they were after the introduction of the common currency. The argument behind this viewpoint is that the denial of membership was a severe enough threat to discipline governments, thus leading to favourable fiscal and economic outcomes in the pre-Euro period (Hughes Hallett and Lewis, 2008). However, after members states had been admitted to the Euro-area, the threat of exclusion ceased to be available. Therefore, the Stability and Growth Pact stipulated an "excessive deficit procedure" whose aim was to penalize fiscal profligacy by the imposition of large fines. This emphasis of the deficit-criterion in the pact is understandable since monetary authority was transferred to the supra-national ECB with the beginning of the third phase of EMU, leaving potential fiscal profligacy by member states as the biggest threat to the stability of the common currency.

It is contentious whether the excessive deficit procedure can be as credible a threat as the denial of accession into the common currency area. The excessive deficit procedure relies on concerted action by member states, and a mutual condemnation of a country that breaches the deficit limit is largely viewed as rather unlikely. This point of view was vindicated by the repeated breach of the 3% deficit limit by Germany and France, and the subsequent failure of the EU commission to follow through with the deficit procedure. Hence, there might have been a structural break in the EU in 1999, and we take this possibility into account in the empirical analysis.

Another important question is how to deal with Denmark, Great Britain, and Sweden, which are all members of the EU 15 but do not participate in the third phase of the EMU. On the one hand they have ratified the Maastricht treaty and therefore have been to some extent subject to its provisions, at least before the official start of the third phase of the EMU. On the other hand, the commission is probably incapable to enforce the criteria for these three countries since the Stability and Growth Pact is ambiguous in that respect. It is therefore open to debate whether they should be treated as members of the treatment or the control group. Since we are primarily concerned with the effect of the Maastricht treaty and not with the actual introduction of the common currency, we choose to include them in the treatment group. However, we check whether the results are robust to an alternative classification.

III.3 Data

The dependent and independent variables are described in table 1. Note that a logistic transformation is applied to the unemployment rate, the expenditure-to-GDP ratio, and the revenue-to-GDP ratio in the regressions. The rationale for this transformation is that these three variables in their level form are theoretically constrained to assume values between 0 and 1, contradicting the normality-assumption for the error term. Summary statistics on the dependent variables are presented in table 2. We calculate these summary statistics for the unemployment rate, the expenditure-to GDP ratio, and the revenue-to-GDP ratio in their levels for easier interpretability.

Several interesting facts can be asserted on the basis of these statistics. Firstly, there are no significant differences in the average growth rates of EU and Non-EU countries. On the other hand, EU members

seem to have on average an unemployment rate that is 2.5 percentage points higher than in the remaining OECD countries. They also have higher expenditures, revenues and interest rates. While the total balance has been on average significantly lower in EU-countries during the sample period, the primary balance between both sets of countries is not significantly different. This observation might be construed as preliminary evidence for the fact that the traditionally high debt levels in some EU countries have continued to put pressure on total balances even as primary balances were improving. Finally, EU countries display lower inflation rates than non-EU countries.

Another interesting comparison can be made between the pre- and the post-Maastricht periods, that is before and after 1992. This comparison reveals that the pre-1992 period exhibits lower unemployment rates and substantially higher inflation and interest rates than the post-1992 period. Both total and primary balances are higher in the post-1992 period. Expenditures-to-GDP ratios have remained constant whereas the revenue-to-GDP ratio has increased slightly. There are no significant differences in average growth rates between the two periods.

Table 1: Definition and Source of Variables

Variable	Description	Source
	Dependent variables	
GDPGR	GDP per capita growth	Own calculations based on OECD Annual National Accounts (calculated as log-differences)
UNEMP	Unemployment rate (logistic transformation)	OECD Economic Outlook No. 83
INFL	Growth rate of CPI	OECD Economic Outlook No. 83
EXPGDP	Expenditure/GDP (logistic transformation)	OECD Economic Outlook No. 83
REVGDP	Revenue/GDP (logistic transformation)	OECD Economic Outlook No. 83
TOTBAL	Total balance/GDP (=[expenditures-revenues]/GDP)	OECD Economic Outlook No. 83
PRIMBAL	Primary balance/GDP(=[expenditures-revenues-interest payments]/GDP)	OECD Economic Outlook No. 83
INTEREST	Interest rate on long-term government bonds	OECD Economic Outlook No. 83
	Institutional variables	
EU member	Dummy=1 if EU member state as of 1995 (EU 15)	Own calculation
Post 1992	Dummy=1 if year ≥ 1992	Own calculation
Maastricht	Dummy=1 if EU 12 member state and year ≥ 1992, Dummy=1 if Austria, Finland, or Sweden and year ≥ 1995	Own calculation
EMU int. (1992)	Dummy=1 if EU 12 country *and* is participating in the 3. stage of EMU, Dummy=1 if Austria or Finland and year ≥ 1995	Own calculation
EMU int. (1999)	Dummy=1 if country is participating in the 3. stage of EMU and year ≥ 1999	Own calculation
	Exogenous controls	
Openness	Trade Openness([exports+imports]/GDP)	OECD Macro Trade Indicators
Working	Share of population between 15-65	OECD Population and Labour Force Statistics
Population	Logarithm of Population	OECD Population and Labour Force Statistics
Investment	Gross capital formation/GDP	Own calculations based on OECD

		Annual National Accounts
Left	Index of the ideology of the government, higher values indicate more leftist ideology	CPDS I Dataset 1960-2006 (Armingeon et al., 2008)
Herf. index	Herfindahl index of government concentration, higher values indicate less fragmented governments	DPI 2006 Dataset (Beck et al., 2001)
Plurality	Index for the voting system, higher values indicate more elements of plurality rule	CPDS I Dataset 1960-2006 (Armingeon et al., 2008)/ Own calculations when observations are missing
President	Dummy=1 if presidential system	CPDS I Dataset 1960-2006 (Armingeon et al., 2008)
Federation	Dummy=1 if federation	Own calculations, different constitutions

[1] All OECD data except the data on investments have been downloaded with the OECD.Stat interface which provides access to different OECD databases. Data for the investment variable have been downloaded with an alternative interface provided by the OECD [2] For Germany before 1991 (before unification), data on West-Germany is used. They are retrieved from previous versions of the OECD Economic Outlook database.

Table 2: Summary statistics on dependent variables

	GDPGR	UNEMP	INFL	EXPGDP	REVGDP	TOTBAL	PRIMBAL	INTEREST
EU	2.154	7.061	5.962	47.889	44.749	-3.142	-0.124	8.954
SD	(2.189)	(3.661)	(5.687)	(7.676)	(7.890)	(4.105)	(3.208)	(4.461)
N	480	480	479	463	463	463	458	439
Non-EU	1.826	4.777	6.460	39.891	38.753	-1.136	-0.106	7.700
SD	(2.170)	(2.772)	(9.661)	(6.037)	(7.743)	(4.298)	(2.945)	(3.411)
N	256	256	255	230	230	230	230	239
Europe	2.120	6.329	6.478	47.008	44.570	-2.440	-0.037	8.646
SD	(2.232)	(3.773)	(7.916)	(7.752)	(8.029)	(4.532)	(3.162)	(4.350)
N	576	576	574	544	544	544	539	518
Non-Europe	1.753	6.042	4.906	38.760	36.150	-2.608	-0.411	8.078
SD	(1.994)	(2.575)	(4.337)	(5.701)	(5.647)	(3.158)	(2.956)	(3.462)
N	160	160	160	149	149	149	149	160
Pre 1992	1.997	5.665	9.458	45.029	41.602	-3.429	-1.012	11.118
SD	(2.454)	(3.709)	(8.645)	(8.619)	(8.851)	(4.256)	(3.009)	(3.927)
N	391	391	389	348	348	348	343	340
Post 1992	2.089	6.949	2.389	45.442	43.926	-1.515	0.771	5.891
SD	(1.840)	(3.227)	(1.766)	(7.546)	(7.604)	(4.075)	(2.975)	(2.356)
N	345	345	345	345	345	345	345	338
Overall	2.040	6.267	6.135	45.234	42.759	-2.476	-0.118	8.512
SD	(2.187)	(3.548)	(7.313)	(8.099)	(8.330)	(4.272)	(3.120)	(4.162)
N	736	736	734	693	693	693	688	678

IV Benchmark results

The results obtained by estimating equation 2 are collected in table 3. The estimated coefficients for the Maastricht intervention dummy in this table are equivalent to the effect of the Maastricht treaty calculated according to formula 1. Inference is conducted in these and all subsequent models with heteroscedasticity and autocorrelation robust standard errors. We use heteroscedasticity robust standard errors since cross-section specific variances in the error ε are likely to exist due to country size differences.[9] Statistical tests

[9]For example, the unemployment rate in a large country might display less fluctuation than in a small country because asymmetric shocks in individual regions might cancel each other out.

also tend to reject the homoscedasticity assumption. We use autocorrelation-robust standard errors because both statistical tests and plots[10] of the residuals indicate the presence of autocorrelation.[11]

The results in this table indicate that the Maastricht treaty was irrelevant for most fiscal and macroeconomic variables. The only exceptions are the primary balance and the interest rate. Apparently, the Maastricht intervention has led to a significant improvement of primary balances and caused a reduction in interest rates. However, since the models in table 3 are rather sparsely specified, this can only be a preliminary conclusion, and as such requires further substantiation.

Note also that the group and the period specific effects explain significantly more of the variation than the Maastricht intervention dummy. For example, EU member states seem to have structurally a larger government, worse fiscal balances, and higher interest rates than non-EU members. Similarly, the post-1992 period seems to be characterized by lower inflation and interest rates, and higher unemployment rates throughout all OECD countries.

Table 3: Impact of the Maastricht Treaty on economic variables, 1975-2006, basic OLS models

	GDPGR b/t	UNEMP b/t	INFL b/t	EXPGDP b/t	REVGDP b/t	TOTBAL b/t	PRIMBAL b/t	INTEREST b/t
EU member	0.172	0.584	-1.254	0.384***	0.286*	-2.446*	-1.082	2.384*
	(0.452)	(1.662)	(-0.382)	(3.059)	(1.869)	(-1.797)	(-1.447)	(1.906)
Post 1992	-0.125	0.535**	-8.110***	0.102	0.151***	1.187	0.328	-3.721***
	(-0.294)	(2.526)	(-2.923)	(1.547)	(3.533)	(1.318)	(0.326)	(-5.569)
Maastricht	0.347	-0.204	1.662	-0.111	-0.065	1.036	2.278**	-2.415**
	(0.649)	(-0.851)	(0.598)	(-1.207)	(-0.932)	(0.974)	(2.077)	(-2.741)
N	736	736	734	693	693	693	688	678
F	0.718	4.272	18.127	3.748	5.734	2.662	5.918	31.696
R2	0.007	0.163	0.237	0.224	0.142	0.100	0.116	0.437
RMS error	2.183	0.714	6.400	0.295	0.323	4.063	2.940	3.131

[1] Hypothesis tests are based on heteroscedasticity and autocorrelation robust standard errors [2] Stars indicate significance levels at 10% (*), 5% (**) and 1% (***) [3] t-statistics in parentheses

A natural extension of the models in table 3 is to include country and year fixed effects. Country fixed effects control for unobserved heterogeneity at the country level, year fixed effects control for contemporaneous correlation between countries due to time-specific shocks. Results for such models are reported in table 4. The Maastricht intervention dummy continues to be insignificant in these models for most dependent variables. Moreover, its effect on the primary balance is now also insignificant, even though the sign of the coefficient remains positive. Its effect on the interest rate remains significantly negative.

[10] The only exception is the GDP per capita growth variable for which the plots are ambigious. The statistical tests, however, unambigiously indicate the presence of autocorrelation.

[11] This is done by clustering the standard errors at the country level. As an additional robustness check, we have also experimented with a kernel-estimator implemented in Stata's ivreg2 command. According to the documentation of the command, this procedure leads to estimated standard errors that resemble Newey-West standard errors. We obtain essentially the same results with this procedure.

Table 4: Impact of the Maastricht Treaty on economic variables, 1975-2006, basic fixed effects models

	GDPGR b/t	UNEMP b/t	INFL b/t	EXPGDP b/t	REVGDP b/t	TOTBAL b/t	PRIMBAL b/t	INTEREST b/t
Maastricht	0.134	-0.234	1.730	-0.031	-0.000	0.651	1.926	-1.673*
	(0.276)	(-0.939)	(0.568)	(-0.386)	(-0.002)	(0.538)	(1.634)	(-2.002)
N	736	736	734	693	693	693	688	678
F	31.952	31.614	59.557	104.546	24.157	60.415	52.838	488.857
R2	0.275	0.403	0.484	0.283	0.372	0.333	0.317	0.731
RMS error	1.823	0.408	4.553	0.159	0.115	2.646	2.462	1.892

[1] Hypothesis tests are based on heteroscedasticity and autocorrelation robust standard errors [2] All models are estimated with country- and time fixed effects (not shown) [3] Stars indicate significance levels at 10% (*), 5% (**) and 1% (***) [4] t-statistics in parentheses

Another obvious extension to equation 2 is to add additional control variables. Results from reduced-form models with additional demographic and institutional control variables are reported in table 5. Obviously, the conclusions with regard to the impact of the Maastricht treaty from the above models are confirmed. The Maastricht intervention variable remains insignificant for all dependent variables except the interest rate.

Table 5: Impact of the Maastricht Treaty on economic variables, 1975-2006, full OLS models

	GDPGR b/t	UNEMP b/t	INFL b/t	EXPGDP b/t	REVGDP b/t	TOTBAL b/t	PRIMBAL b/t	INTEREST b/t
EU member	0.259	0.488	0.512	0.254*	0.167	-2.198	-0.504	2.666**
	(0.703)	(1.631)	(0.207)	(1.776)	(0.838)	(-1.076)	(-0.464)	(2.107)
Post 1992	0.383	0.367	-6.225**	-0.035	0.039	1.821*	0.481	-3.763***
	(1.044)	(1.571)	(-2.301)	(-0.459)	(0.501)	(1.762)	(0.429)	(-6.316)
Maastricht	-0.173	-0.102	2.968	-0.061	-0.036	0.545	1.732	-1.704*
	(-0.349)	(-0.409)	(0.922)	(-0.666)	(-0.386)	(0.555)	(1.538)	(-2.014)
Openness	0.015***	-0.002	-0.056***	-0.001	-0.000	0.016	0.009	-0.027***
	(3.338)	(-1.103)	(-2.819)	(-0.926)	(-0.260)	(1.232)	(0.890)	(-4.546)
Working	-0.024	-0.021	-0.912**	-0.002	-0.002	0.010	0.212	-0.228**
	(-0.523)	(-0.336)	(-2.714)	(-0.158)	(-0.097)	(0.033)	(1.622)	(-2.625)
Population	0.083	0.147	-1.807**	-0.007	-0.030	-0.537	-0.273	-0.814**
	(0.633)	(1.655)	(-2.804)	(-0.203)	(-0.643)	(-1.026)	(-0.928)	(-2.533)
Investment	0.153***	-0.057***	0.209**	-0.037***	-0.024***	0.305**	0.159*	-0.061
	(5.083)	(-3.241)	(2.289)	(-4.363)	(-2.854)	(2.488)	(1.854)	(-0.830)
Left	0.037	-0.018	-0.365*	0.036**	0.053***	0.394**	0.196	-0.024
	(0.583)	(-0.419)	(-1.903)	(2.571)	(2.968)	(2.153)	(1.511)	(-0.107)
Herf. index	1.039*	0.195	-0.734	-0.389***	-0.461**	-1.605	-1.643	1.995
	(2.058)	(0.616)	(-0.224)	(-3.026)	(-2.780)	(-0.789)	(-1.291)	(1.250)
Plurality	-0.016	0.016	0.858	0.016	0.040	0.506	0.690	0.335
	(-0.058)	(0.088)	(0.982)	(0.159)	(0.410)	(0.449)	(1.348)	(0.606)
President	0.227	-0.260	-1.526	-0.167*	-0.077	2.244*	0.339	-1.026
	(0.651)	(-0.929)	(-1.189)	(-1.931)	(-0.714)	(1.767)	(0.472)	(-1.612)
Federation	-0.229	-0.031	-0.395	-0.044	-0.065	-0.554	0.174	-0.464
	(-1.195)	(-0.137)	(-0.330)	(-0.522)	(-0.623)	(-0.477)	(0.248)	(-0.488)
N	715	715	713	675	675	675	670	657
F	38.802	9.028	14.864	11.635	6.979	10.217	3.121	27.004
R2	0.111	0.412	0.434	0.483	0.394	0.282	0.199	0.565
RMS error	2.037	0.601	5.426	0.237	0.267	3.666	2.806	2.772

[1] Hypothesis tests are based on heteroscedasticity and autocorrelation robust standard errors [2] Stars indicate significance levels at 10% (*), 5% (**) and 1% (***) [3] t-statistics in parentheses

We find with regard to the control variables that more open economies have significantly lower inflation and interest rates than economies that are relatively closed. They have also higher growth rates. The working variable, which measures the inverse of the dependency ratio of the population, is generally insignificant, except in the inflation and interest rate models where it is significantly negative. More populous countries have significantly lower inflation and interest rates. The investment variable is positively and significantly related to economic growth and inflation, and negatively to unemployment. Investments seem also to significantly improve fiscal balances, apparently through a higher-than-average reduction in expenditures. These results strongly reaffirm the importance of investments for fiscal and macroeconomic stability, and are thus not particularly surprising.

Another significant covariate is the Left variable. It has a significantly positive effect on the expenditure and revenue-to-GDP ratios, suggesting that left-wing administrations spend and tax more. The effect on the inflation rate, on the other hand, is significantly negative, suggesting that left-wing administrations are generally associated with lower inflation rates. Government fragmentation, as measured by the Herfindahl index, has a significant effect on economic growth and the expenditure and revenue-to-GDP ratios. The negative coefficient in the expenditure and revenue models indicates that coherent governments tend to spend and tax less than fragmented governments. The positive coefficient in the growth model indicates that coherent governments are associated with higher economic growth. The plurality rule variable is generally insignificant. The presidential rule variable has a significantly negative effect on expenditures, and a significantly positive effect on total balances. The federation variable is consistently insignificant.

The final extension of the preceding models consists in estimating the fully specified models according to equation 3, which include all control variables, cross-section and year fixed effects simultaneously. Because of the cross-section fixed effects, time-constant variables cannot be included in these models. The results are collected in table 6.

While these results confirm most of the previous findings with regard to the Maastricht treaty (the coefficient on the Maastricht intervention dummy is insignificant in the first seven models), the Maastricht intervention dummy is now also insignificant in the interest rate model. Thus, the results in table 6 suggest that the Maastricht treaty has been altogether irrelevant for fiscal and macroeconomic outcomes in the EU. Since the full fixed effects models are the ones with the most complete and reliable specifications, we consider this as our preferred finding from the benchmark regressions. However, we continue to investigate this issue in the next section in more detail.

Table 6: Impact of the Maastricht Treaty on economic variables, 1975-2006, full fixed effects models

	GDPGR b/t	UNEMP b/t	INFL b/t	EXPGDP b/t	REVGDP b/t	TOTBAL b/t	PRIMBAL b/t	INTEREST b/t
Maastricht	-0.931	-0.230	1.562	0.014	0.008	-0.261	1.283	-0.771
	(-1.687)	(-0.939)	(0.690)	(0.229)	(0.167)	(-0.252)	(1.148)	(-1.021)
Openness	0.037***	0.005	0.069	-0.004	-0.003	0.018	0.036	0.021
	(3.332)	(0.845)	(1.573)	(-1.282)	(-1.672)	(0.484)	(1.417)	(0.835)
Working	0.099	-0.070	-0.964**	-0.018	0.002	0.449	0.257	-0.551**
	(1.382)	(-1.176)	(-2.484)	(-0.689)	(0.086)	(1.482)	(1.449)	(-2.631)

Population	-5.226*	-0.387	0.850	0.067	-0.142	-5.624	-0.250	13.847***
	(-1.898)	(-0.394)	(0.062)	(0.218)	(-0.481)	(-0.961)	(-0.040)	(3.405)
Investment	0.208***	-0.045***	0.199	-0.018**	-0.005	0.314*	0.281**	-0.015
	(3.930)	(-3.219)	(1.706)	(-2.122)	(-0.919)	(2.052)	(2.596)	(-0.275)
Left	0.081	0.009	0.254	0.006	0.002	-0.101	-0.065	0.197
	(1.494)	(0.430)	(1.168)	(0.724)	(0.352)	(-0.693)	(-0.504)	(1.427)
Herf. index	0.321	-0.091	-6.400*	0.049	0.069	0.372	-0.235	-1.692
	(0.593)	(-0.562)	(-1.744)	(0.674)	(1.288)	(0.221)	(-0.173)	(-1.621)
N	715	715	713	675	675	675	670	657
F	33.756	22.227	22.626	14.330	8.046	26.732	23.456	156.656
R2	0.361	0.488	0.526	0.381	0.385	0.433	0.403	0.789
RMS error	1.682	0.369	4.278	0.143	0.107	2.472	2.310	1.697

[1] Hypothesis tests are based on heteroscedasticity and autocorrelation robust standard errors [2] All models are estimated with country- and time fixed effects (not shown) [3] Stars indicate significance levels at 10% (*), 5% (**) and 1% (***) [4] t-statistics in parentheses

V Robustness checks

One explanation for the rather pessimistic finding in the benchmark regressions might be that the Maastricht treaty has had conflictive effects before and after the introduction of the common currency in 1999. From this point on, the threat of non-admittance to the common currency area was effectively unavailable. Therefore, any disciplining effect of the Maastricht criteria on potential fiscal profligacy might have vanished, thus attenuating the estimated effect of the treaty on fiscal variables. Equally, monetary authority was transferred in 1999 to the supranational ECB which is exclusively concerned with price-stability. The Maastricht treaty's effect on inflation might therefore differ between the pre- and post 1999. Similar arguments can be applied with regard to economic growth and the unemployment rate.

In order to control for potential structural changes after 1999, we reestimate equation 3 (the fully specified fixed effects model) after additionally including a dummy variable, *EMU intervention (1999),* that is 0 before 1999 and 1 thereafter for the EU countries that actually introduced the Euro. For the sake of brevity, we only report the results with regard to the intervention variables in table 7, even though all control variables are included in the estimated models.[12] These models produce interesting results. The Maastricht intervention variable is insignificant for all macroeconomic and fiscal variables, thereby confrming the previous findings. The *EMU intervention (1999)* variable, however, is significantly negative in the growth and primary balance models.

The fact that the coefficient on the Maastricht variable is insignificant whereas the coefficient on the *EMU intervention (1999)* is significantly negative in the primary balance model indicates the existence of conflictive effects of the treaty before and after the start of the common currency. Apparently, the Maastricht intervention was neutral for fiscal outcomes before the start of the third stage of EMU. Once the third stage had actually begun, however, the Maastricht convergence criteria ceased to have any disciplining effect, and fiscal profligacy started to set in.

The results also indicate that the provisions in the Maastricht treaty and the Stability and Growth Pact have had a negative effect on economic growth after the start of the third stage of EMU. A reasonable explanation for this finding is that the restrictions on the fiscal autonomy of member states have been neutral in the immediate aftermath of the adoption of the Maastricht treaty, but became detrimental for economic growth once the common currency was introduced and monetary authority was completely transferred to the ECB. Presumably, the exclusive concern of the ECB for price stability precluded the use of monetary instruments to conduct stabilization policies. Indeed, the coefficient of the *EMU intervention (1999)* variable is negative, albeit insignificant, in the inflation model.

Table 7: Impact of the Maastricht Treaty on economic variables, 1975-2006, full fixed effects models, EMU intervention (1999)

	GDPGR b/t	UNEMP b/t	INFL b/t	EXPGDP b/t	REVGDP b/t	TOTBAL b/t	PRIMBAL b/t	INTEREST b/t
Maastricht	-0.638	-0.254	1.828	-0.021	-0.014	0.058	1.725	-0.531
	(-1.135)	(-1.108)	(0.808)	(-0.405)	(-0.310)	(0.065)	(1.576)	(-0.764)
EMU int. (1999)	-0.895*	0.075	-0.812	0.108	0.070	-0.983	-1.361*	-0.778
	(-1.737)	(0.408)	(-0.738)	(1.535)	(1.090)	(-1.292)	(-1.841)	(-0.705)
N	715	715	713	675	675	675	670	657
F	23.618	26.048	20.400	4.990	9.304	32.125	72.615	220.041
R2	0.368	0.489	0.527	0.395	0.394	0.437	0.411	0.791
RMS error	1.674	0.369	4.279	0.142	0.106	2.467	2.297	1.692

[1] Hypothesis tests are based on heteroscedasticity and autocorrelation robust standard errors [2] All models are estimated with country- and time fixed effects and additional control variables (not shown) [3] Stars indicate significance levels at 10% (*), 5% (**) and 1% (***) [4] t-statistics in parentheses

Another potential problem with the benchmark regressions is the treatment of the three signatories of the Maastricht treaty which, for different reasons, did not introduce the common currency: Denmark, Great Britain, and Sweden. While they have been included in the treatment group in the benchmark regressions, an almost equally valid case can be made for including them instead in the control group. If the signing of the Maastricht treaty did not have any effect on these countries because they were, for example, planning not to introduce the common currency in the first place, including them in the control group might lead to an attenuation of the estimated effects.

We therefore re-estimate equation 3 with a different set of treatment and control groups. That is, we include Denmark, Great Britain, and Sweden in the control rather than in the treatment group. We operationalize this reclassification by replacing the Maastricht intervention dummy in these models with the *EMU intervention (1992)* variable that is 0 before 1992 and 1 thereafter for all countries that participate in the third phase of the EMU (for Austria and Finland it is 1 after 1995). We report for brevity only the results with regard to the *EMU intervention (1992)* variable in table 8, even though all control variables are included in the estimated models. According to table 8, the *EMU intervention (1992)* variable is significantly negative in the growth model, while it is insignificant in the remaining models.

[12] The complete results are available upon request.

This robustness check reaffirms the previous findings. While the results in table 8 continue to indicate a generally insignificant effect of the Maastricht treaty, they also show that those EU member states which actually introduced the common currency in 1999 have experienced lower growth rates than the remaining OECD countries.

Table 8: Impact of the Maastricht Treaty on economic variables, 1975-2006, full fixed effects models, Reclassification of Denmark, Great Britain, and Sweden into control group

	GDPGR b/t	UNEMP b/t	INFL b/t	EXPGDP b/t	REVGDP b/t	TOTBAL b/t	PRIMBAL b/t	INTEREST b/t
EMU int. (1992)	-0.968*	-0.069	1.404	0.070	0.081	0.164	1.547	-0.213
	(-1.899)	(-0.320)	(0.777)	(1.028)	(1.286)	(0.168)	(1.671)	(-0.246)
N	715	715	713	675	675	675	670	657
F	65.809	14.466	17.742	8.937	10.913	52.085	39.678	109.489
R2	0.364	0.479	0.526	0.390	0.406	0.433	0.411	0.787
RMS error	1.677	0.372	4.279	0.142	0.105	2.473	2.296	1.704

[1] Hypothesis tests are based on heteroscedasticity and autocorrelation robust standard errors [2] All models are estimated with country- and time fixed effects and additional control variables (not shown) [3] Stars indicate significance levels at 10% (*), 5% (**) and 1% (***) [4] t-statistics in parentheses [5] The treatment and control groups are distinguished by whether they participate in the third stage of the EMU

Overall, we find in this section that the restrictions imposed by the Maastricht convergence criteria on the fiscal autonomy of member states were either irrelevant or even outright harmful for fiscal and macroeconomic outcomes.

VI Conclusion

The aim of this paper was to explore whether the Maastricht treaty has had any significant effect on fiscal and macroeconomic outcomes in EU countries. We find in a number of benchmark regressions that the treaty was irrelevant for the overwhelming majority of fiscal and economic variables. We identify in initial specifications only two variables as potential exceptions: the primary balance and the interest rate. However, more complete specifications suggest that the Maastricht treaty was irrelevant even for these two variables.

The notion that the Maastricht treaty has not been particularly beneficial is reaffirmed in a number of robustness checks. In fact, a first set of robustness checks indicate that once the common currency was introduced, the countries in the Euro zone exhibited significantly lower growth rates and worse fiscal outcomes than the remaining OECD countries. The finding that the treaty was detrimental to economic growth is corroborated in a second set of robustness checks, where the countries that do not participate in the third stage of EMU are classified as members of the control group.

We thus conclude that the belief by the supporters of the Maastricht treaty that it would lead to a sustained improvement of fiscal balances and macroeconomic stability in the Euro-area was wrong. Neither did the treaty improve fiscal balances in the long run, nor did it enhance the macroeconomic

performance of member states. On the contrary, there is some evidence that its provisions have had a negative effect on economic growth and fiscal outcomes after the introduction of the common currency.

Appendix

While the reduced form models are sufficient for obtaining consistent estimates, they might be inefficient because all available control variables are routinely included. That is, irrelevant covariates might be present in some specifications, which could lead to inflated standard errors, and consequently to insignificant estimates.

In order to explore whether the Maastricht intervention was indeed not beneficial (i.e. either irrelevant or outright harmful) for fiscal and macroeconomic outcomes or whether this finding is a consequence of inefficiently specified models, we estimate in this appendix equation 3 with a structural specification. However, these structural models could suffer from endogeneity problems, and OLS could be inconsistent. Therefore, we use an instrumental variables approach to obtain consistent estimates. In table 9, we provide a concise description of our specifications. In particular, we describe for each model the potentially endogenous variables (if any), and the instruments that are used to deal with this problem. The results are collected in table 10. From this table, the complete specifications can be retrieved.

Table 9: Explanatory variables and instruments in TSLS regressions

Model	Explanatory variable(s)	Instruments
GDPGR	(INFL)	-
UNEMP	INFL, (GDPGR)	Left
INFL	UNEMP	Population, Working
EXPGDP	REVGDP, (UNEMP)	Population, Openness
REVGDP	EXPGDP, (GDPGR)	Left, Herf. index
TOTBAL	(INTEREST), (UNEMP), (GDPGR)	-
PRIMBAL	(UNEMP), (GDPGR)	-
INTEREST	(INFL), (EXPGDP), (REVGDP), (GDPGR)	-

[1] The rationale for these specifications can be found in the main text [2] Variables of interest which are treated as exogeneous in the respective models are in parantheses (see main text for explanation)

We try to specify the models according to economic theory. However, for the sake of brevity we only discuss the use of the variables of interest (GDP per capita growth, unemployment rate, inflation rate, expenditure-to-GDP ratio, revenue-to-GDP ratio, total deficit-to-GDP ratio, primary deficit-to-GDP ratio, and the interest rate) as explanatory variables. The results in the TSLS models are not always unambiguous because the instruments are weak in some models. Unfortunately, alternative instruments are not easily available. Therefore, we avoid broad conclusions and only investigate whether the Maastricht intervention dummy continues to display either an insignificant or a negative effect on fiscal and economic outcomes.

We include in the first two models the inflation rate as an explanatory variable. The theoretical rationale behind this specification is that politicians, believing in the Philips-curve relationship, might have an incentive to choose high inflation rates in times of economic crisis in order to increase economic activity.

In the second model, where unemployment is the dependent variable, we include the growth rate as an additional explanatory variable because labour demand might increase when the economy expands.

We include in the third model, where the inflation rate is the dependent variable, the unemployment rate as explanatory variable. We do not include the growth rate as explanatory variable in this model because it seems likely that it is not a low level of growth as such but rather high unemployment which prompts governments to increase inflation rates.

While these specifications preclude reversed causality between inflation and growth and unemployment and growth, they imply that inflation and unemployment are simultaneously determined, which causes OLS to be inconsistent in the second and third model. Thus, we use only the simple two-way fixed effects estimator in the first model, whereas an instrumental variable approach is additionally used in the second and third model.

We find in the first model, where the growth rate is the dependent variable and no instruments are used, that the results with regard to the Maastricht treaty in the benchmark regressions are confirmed: the coefficient has a negative (albeit insignificant) sign.

In the second model, where the unemployment rate is the dependent variable, we use the ideology of the government as an instrument for the inflation rate.[13] The idea is that left-wing governments are more likely to exploit the Philips-curve relationship by choosing high inflation rates in order to reduce unemployment. For this instrument to be valid, we must assume that government ideology has no direct impact on unemployment. Unfortunately, due to the lack of overidentifying restrictions (we only have one instrument) the validity of this assumption cannot be tested. Thus, the appropriate test statistic (Hansen's J) is missing for this model. Furthermore, a test on the relevance of the instrument indicates that it might be weak, so that the estimates from this model might be unreliable. This conjecture is confirmed by the fact that none of the explanatory variables, including the Maastricht intervention dummy, are significant in this model.

In the third model, where the inflation rate is the dependent variable, the unemployment rate is instrumented with two instruments: the population size and the working variable. The theoretical rationale behind these instruments is that the unemployment rate could be correlated with the total number of people and the available workforce in the country. Since two instruments are available, Hansen's J test statistic can be calculated. It indicates that the instruments are valid. However, the instrument relevance test indicates that they might be weak. Thus, the estimates from this model might also be unreliable. We note, however, that the Maastricht intervention dummy remains insignificant in this model.

In the fourth model, where the expenditure-to-GDP ratio is the dependent variable, we include the revenue-to-GDP ratio and the unemployment rate as explanatory variables. The rationale behind this specification is that an exogenous increase in revenues might lead to more spending. Equally, an increase

[13] Note that the growth rate does not need to be instrumented in this model since it is, according to our specification, not endogeneous to the unemployment rate (in contrast to the inflation rate) . Therefore, one instrument is sufficient to identify the model.

in unemployment might lead to higher expenditures for social security. However, reversed causality could be a problem with regard to the revenue-to-GDP ratio as governments might increase revenues because they want to spend more.[14] We therefore instrument the revenue-to-GDP ratio with the openness and the population size variables. The theoretical rationale for these instruments is (i) that more open countries might be constrained to set low tax rates because of higher exposure to international tax competition than relatively closed countries, and (ii) that more populous countries can set lower tax rates than less populous countries in order to finance pure public goods due to the larger tax base. The overidentification test indicates that these instruments are valid. While the relevance test indicates that they are weak, the p-value of the test is relatively low. We may consequently expect that the results are reliable. We find that the Maastricht intervention dummy continues to display an insignificant coefficient.

In the fifth model, where the revenue-to-GDP ratio is the dependent variable, we include the expenditure-to-GDP variable and the growth rate as explanatory variables. An increase in growth could lead to an increase in the revenue-to-GDP ratio if the tax system is progressive. Equally, governments might want to increase revenues if they intend to spend more (see the argument in the previous paragraph). Since our specifications indicate that the expenditure-to-GDP variable could be endogenous, we instrument this variable by the government ideology and fractionalization variables. The theoretical rationale for these instruments is that left-wing and more fractionalized governments are often thought to lead to increased spending. While the overidentification test suggests that the instruments are valid, the relevance test indicates that they are potentially weak. The estimates could therefore be again unreliable. However, note that the Maastricht intervention dummy remains insignificant in this model.

The last three models are estimated without any instruments because the specifications in these models rule out reversed causality. Therefore, the overidentification and instrument relevance tests are missing. In the model with the total balance as dependent variable, we include the growth, unemployment and interest rates as explanatory variables. The theoretical rationale for including the unemployment and interest rates is that an increase in both variables could increase expenditures for social security and interest payments. On the other hand, an increase in the growth rate may increase revenues.

In the model with the primary balance as dependent variable, we only include the growth and unemployment rates because primary balances are already adjusted for interest payments.

In the model with the interest rate as dependent variable, we include the growth and inflation rates as explanatory variable because governments and central banks usually react to the current growth and inflation rates by adjustments in monetary policy, which might in turn impact the interest rate on government bonds. We also include the revenue and expenditure to GDP variables as controls in this model. The revenue-to-GDP variable is included because the availability of more (tax) revenue could improve the creditworthiness of the government, thus leading to lower interest rates. The expenditure-to-GDP ratio is included because a high level of spending might reduce its creditworthiness (when it is controlled for revenues), thus leading to higher interest rates.

[14] Note again that our specifications preclude reversed causality between unemployment and public expenditures.

We find that the conclusion with regard to the Maastricht intervention variable does not change in any of these models compared to the benchmark regressions. Its effect is generally insignificant. Overall, the results from the reduced-form regressions are confirmed by the structural models

Table 10: Impact of the Maastricht Treaty on economic variables, 1975-2006, fixed effects models with TSLS

	GDPGR b/t	UNEMP b/t	INFL b/t	EXPGDP b/t	REVGDP b/t	TOTBAL b/t	PRIMBAL b/t	INTEREST b/t
Maastricht	-0.731	-0.415	3.208	-0.016	0.024	0.110	1.472	-0.468
	(-1.417)	(-1.032)	(0.723)	(-0.412)	(0.655)	(0.116)	(1.468)	(-1.166)
GDPGR		0.041		-0.006	0.003	0.125	0.192***	0.061
		(0.299)		(-1.523)	(0.394)	(1.411)	(2.791)	(1.033)
UNEMP			8.033	0.136***		-3.577***	-2.229***	
			(1.094)	(4.000)		(-5.332)	(-3.501)	
INFL	-0.084**	0.094						0.502***
	(-2.064)	(0.321)						(5.755)
EXPGDP					0.634			1.460
					(1.611)			(1.520)
REVGDP				1.046***				-2.797*
				(3.432)				(-1.864)
INTEREST						-0.089		
						(-0.744)		
Population	-5.442*	-1.120						5.366***
	(-1.725)	(-0.642)						(2.727)
Working	0.018	-0.014		-0.017**		0.296	0.231	-0.281***
	(0.246)	(-0.066)		(-2.222)		(1.208)	(1.006)	(-3.104)
Investment	0.229***							
	(4.831)							
Openness	0.044***	-0.004	0.045		-0.001	0.012	0.029	-0.002
	(3.291)	(-0.154)	(0.671)		(-0.331)	(0.364)	(1.306)	(-0.195)
Left			0.014	0.005		-0.171	-0.091	0.126
			(0.073)	(0.804)		(-1.158)	(-0.729)	(1.271)
Herf. index				-0.007		-0.045	-0.382	-0.139
				(-0.111)		(-0.028)	(-0.305)	(-0.197)
N	727	724	724	675	678	632	670	631
F	24.138	1.200	0.458	24.626	5.098	7.301	4.542	26.205
RMS error	1.613	0.599	5.731	0.094	0.080	2.246	2.217	1.242
Overid. test	.	.	0.489	0.427	0.337	.	.	.
I. relevance test	.	0.638	0.382	0.142	0.235	.	.	.

[1] Hypothesis tests are based on heteroscedasticity and autocorrelation robust standard errors [2] All models are estimated with country- and time fixed effects (not shown) [3] Stars indicate significance levels at 10% (*), 5% (**) and 1% (***) [4] t-statistics in parentheses [5] The rows for the overidentification and instrument relevance tests list the appropriate p-values

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