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What makes fiscal consolidations last? A survival analysis of budget cuts in Europe (1960–2004)

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Abstract This article examines the political and economic determinants of the relative duration of fiscal consolidations in Europe. The study focuses on the fifteen Member States that formed the EU between 1960 and 2004, and applies survival analysis techniques to their fiscal data. We find evidence that the probability of ending a period of fiscal consolidation depends on the debt level, the magnitude of the adjustment, the relative contribution of spending cuts, and the degree of cabinet fragmentation. Most importantly we also find that under a stricter definition of fiscal consolidation, political variables, such as coalition size and election year, gain importance with respect to economic variables as predictors of the probability of ending an episode of fiscal consolidation. This relative importance of political variables weakened in the run-up to EMU, probably because countries *had* to consolidate irrespective of their political constraints.

Keywords Public finance · Duration analysis · Fiscal consolidation · Fiscal adjustment

JEL Classification C41 · H30

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1 Introduction

Between 1992 and 1998, the fulfillment of the Maastricht convergence criteria depended mainly on the relative ability of different EU Member States to reduce their public deficits below the 3% GDP target. From 1999 on, remaining within the limits imposed by the Stability and Growth Pact depends on the ability of these countries to maintain the fiscal consolidation they started some years ago.[1]

The process of European Monetary Union (EMU) launched a wave of fiscal adjustments around Europe.[2] This drew the attention of some prominent scholars, who begun to study aspects of the process, such as the type of fiscal adjustments, the quality of these adjustments and the factors behind successful consolidations.[3]

Nevertheless, it remains to be investigated why some consolidation experiences last longer than others. Only Strauch (1999) and Von Hagen et al. (2001) have approached this issue somewhat systematically before, but they used a smaller sample and they did not focus on both the economic and political factors behind the observed differences in the duration of fiscal consolidations.

Therefore, in this paper we try to answer two related questions: what makes consolidations last? And what are the economic and political factors that explain the duration of fiscal adjustments?

For that purpose, we analyze the time spells between two consecutive years of fiscal expansion, or in other words, the number of years between the beginning and the end of a fiscal consolidation. We do this using the methodology of duration models, applying it to data for the fifteen EU Member States between 1960 and 2004.

The article proceeds as follows. In Sect. 2, we explain our criteria to select periods of fiscal consolidation and we present our data. In Sect. 3, we briefly describe the main aspects of duration models and we present the empirical results of the non-parametric and the parametric estimations of our model. In Sect. 4, we check for the robustness of our results when we control for the temporal heterogeneity of our sample (to control for the 'Maastricht effect'), and when we use a *stronger* definition of fiscal consolidation. The final considerations in Sect. 5 recapitulate the main findings of this article.

2 Duration of fiscal consolidations in the EU: Data and variables

In this study we use annual data between 1960 and 2004 for the fifteen EU Members States at the time: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden and the United Kingdom. To define our dependent variable we use data on cyclically adjusted budget balances. This variable expresses the budget balances (Total Public Revenues minus Total Public Expenditures)

[1] In this article, fiscal consolidations and fiscal adjustments are both used to refer to any process of budget deficit reduction that lasts for more than one year. Refer to footnote 12 for the technical definition used in the statistical analysis.

[2] See European Commission (2000a, 2000b), and Gobbin and Van Aerle (2001), for further information about the process of public deficit reduction in the run to EMU.

[3] Among the most important studies are those of Giavazzi and Pagano (1990), McDermott and Wescott (1996), Alesina and Perotti (1996), Alesina et al. (1998), Buti and Sapir (1998), Heylen and Everaert (2000), Von Hagen et al. (2001), and Von Hagen and Strauch (2001). For a comprehensive review of all the previous works in the field, and an original contribution to the different dimensions and consequences of fiscal adjustments, see Mulas-Granados (2006).

Table 1 Descriptive statistics: Failure and duration

	Failure	Duration
Mean	0.491	2.084
Std. Dev.	0.501	1.481
Variance	0.253	2.183
Skewness	0.086	1.849
Kurtosis	1.008	6.953
No. of failures	277	
Observations	565	

Table 2 Descriptive statistics: Failure and duration by periods

Periods	Failure mean	Std. dev.	Duration mean	Std. dev.	Freq.
62/72	0.532	0.502	1.734	1.022	79
73/77	0.547	0.501	1.560	0.889	75
78/81	0.717	0.454	1.633	1.057	60
82/87	0.400	0.493	2.056	1.319	90
88/92	0.661	0.478	1.804	1.212	56
93/98	0.220	0.399	3.151	2.107	108
99/04	0.421	0.511	1.940	1.176	97
All	0.491	0.502	2.084	1.456	565

adjusted by the economic cycle,[4] as a percentage of the Gross Domestic Product of each country.

Based on this data, we generate a dummy variable called "*Failure*", which takes value zero when the annual variation of the cyclically adjusted budget balance is bigger than zero (years of fiscal consolidation), and changes to value one, when the annual variation is zero or lower than zero (years of fiscal expansion). Using the dates in which a failure event occurs, we build a new variable called "*Duration*" that counts the intervening years between two consecutive failures, that is, the time span that the fiscal consolidation lasts. In our sample, the minimum number of years that a consolidation lasts is one year, and the maximum is ten years.

In Table 1 we present the structure of our data on *Failure* and *Duration*. As can be seen, the total number of observations is 565. The average duration of fiscal consolidations is 2.08 years. The number of registered failures is 277, and the average probability of ending a fiscal consolidation is 49%.

In Table 2, seven periods can be identified, all with different average durations and probabilities of failure. It is very interesting to observe that from 1961 to 1981, the average duration of fiscal consolidations was around 1.6 years, and the average probability of end-

[4]We use data from AMECO, the Macroeconomic Database of the European Commission. The Commission's method to estimate the cyclically adjusted series involves three steps. In the first step, the output gap is computed as the difference between the actual output and an estimated output trend, applying the Hodrick–Prescott (HP) filter. In the second step, the budget sensitivity to the output gap is computed. This allows to compute the cyclical component of the budget. Finally, the cyclically adjusted budget balance is obtained by deducting the cyclical component from the actual government budget balance. For further details, see European Commission (2000b).

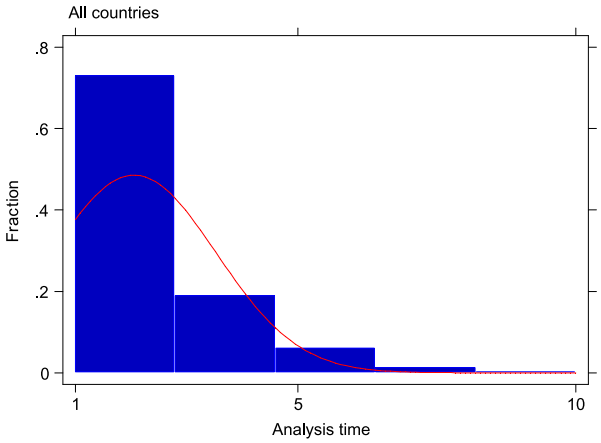

Fig. 1 Duration of fiscal consolidations in the EU, 1960–2004

ing the consolidation was well above 50%. Between 1982 and 1992, the average duration increased until it reached 1.9 years and the probability of failure decreased to remain around 50%. Finally, during the 1990s, and especially from 1992 to 1998 (the Maastricht period), the average duration of fiscal consolidations reached 3 years with a probability of ending the consolidation of only 22%. Again, from 1999 to 2004 and once EU countries joined the euro, the average duration decreased to 1.9 years and the probability of ending a fiscal adjustment episode increased to 42%.

Figure 1 shows the duration of fiscal consolidations in the period 1960–2004, where 45% of fiscal consolidations lasted one year, 20% two years, 15% three years, and 20% lasted four years or more.

3 Duration analysis: Estimation results

Typically, duration analysis involves two steps, first a non-parametric analysis in which the dependence of duration of fiscal adjustments on time is analyzed. And secondly, a parametric analysis in which other factors, apart from time dependency, are included as possibly accounting for the observed variation in duration of adjustment episodes.

3.1 Non-parametric estimation: The time dependency of duration

This section proceeds very briefly with the non-parametric analysis.[5] What this analysis tries to disentangle is the positive or negative dependence of fiscal consolidations on their accumulated duration. This is typically done by estimating the two following functions:

(a) The survivor function, which is defined as:

$$S(t) = \Pr(T \geq t) = 1 - F(t) \tag{1}$$

[5]For those readers interested in these techniques, in EEG-WP 18-02 we offer a more detailed mathematical derivation and a more comprehensive non-parametric analysis, where we also divide the sample by groups of countries and sets of years.

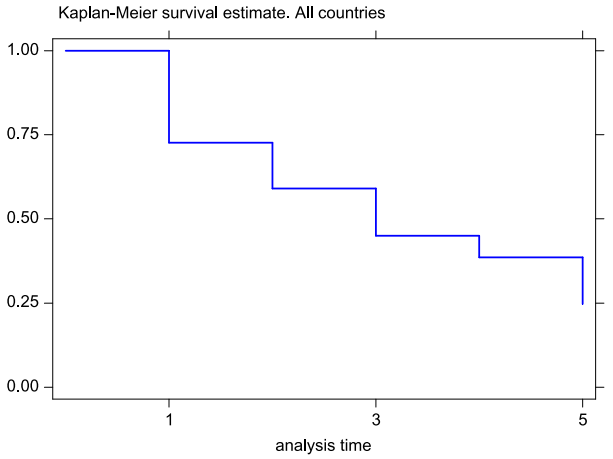

Fig. 2 Kaplan–Meier survivor function

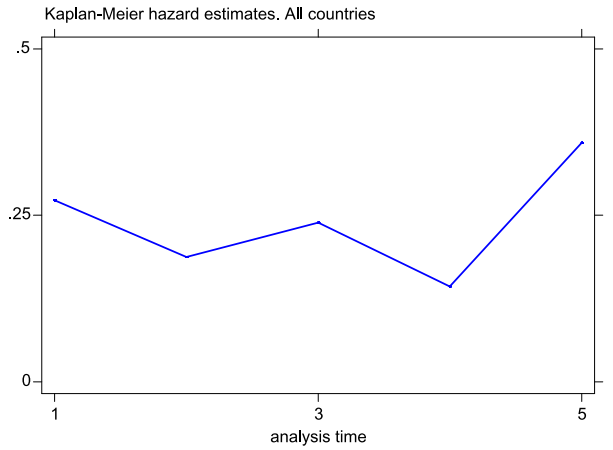

Fig. 3 Kaplan–Meier hazard function. All countries

and gives the probability that the duration of the fiscal consolidation (T) is greater than or equal to t.[6]

(b) The hazard function, which is defined as:

$$h(t) = \Pr(T = t / T \geq t) \tag{2}$$

and gives, for each duration, the probability of ending a consolidation episode, conditioned on the duration of the consolidation through that moment.

Figure 2 shows the estimated survivor functions for the 15 EU member states, where we can see that less than 50% of episodes last 3 years or more.

The estimated hazard function, in Fig. 3, gives further evidence of the positive dependence of fiscal consolidations on their accumulated duration. The convexity of that function

[6] T is the discrete random variable that measures the time that passes between the beginning of a fiscal consolidation until its transition to a non-consolidation period. For further details on duration models and the related estimation techniques, see Kiefer (1988), McCloughan and Stone (1998), and Maroto and Mulas-Granados (2001).

implies that the probability of ending a fiscal consolidation is an increasing function in t, conditional on duration. That hazard rate is higher after one year of consolidation, after three years of consolidation, and much higher after five years or more of uninterrupted consolidation.

3.2 Parametric estimation. The economic and political determinants of duration

The non-parametric analysis that was presented in the previous section is well suited for describing the actual duration of fiscal adjustment episodes and analyzing the dependence of those consolidations on their accumulated duration. Nevertheless, non-parametric analysis has limitations; it does not allow one to analyze other factor that may explain the probability of ending fiscal consolidations. To address this issue, this section will perform a parametric analysis of duration. This will be done estimating a *Model of Proportional Hazard* (PH), which is the duration model that has usually been used to characterize the hazard function, and it assumes that the hazard function can be split as follows:

$$h(t, X) = h_0(t) \cdot g(X), \tag{3}$$

where $h_0(t)$ is the baseline hazard function that captures the dependency of data to duration, and $g(x)$is a function of individual variables. This function of explanatory variables is a negative function usually defined as $g(x) = \exp(X'\beta)$. Note that in this proportional specification, regressors intervene re-escalating the conditional probability of abandoning the period of fiscal consolidation, not its own duration.

This model can be estimated initially without imposing any specific functional form on the baseline hazard function, following the *Cox Model* (1972)[7]

$$h(t, X) = h_0(t) \cdot \exp(X\beta). \tag{4}$$

Or an alternative estimation can be done, by imposing one specific parametric form to the function $h_0(t)$. In this case, the models most commonly used are the *Weibull Model* and the *Exponential Model*. In the first one, $h_0(t) = pt^{p-1}$, where p is a parameter that has to be estimated. When $p = 1$, the *Weibull Model* is equal to the *Exponential Model*, where there exists no dependency on duration. On the other hand, when the parameter $p > 1$, there exists a positive dependency on duration, and a negative dependency when $p < 1$. Therefore, by estimating p, it is possible to test the hypothesis of duration dependency of fiscal consolidations.

In the vector of explanatory variables we include a set of economic and political variables that are expected to be related to different lengths of fiscal consolidation. We therefore test the role of the following variables:

(1) Number of failures: this variable simply controls for the accumulated number of failures (ends of fiscal consolidations) that have taken place in each country before the current consolidation.

(2) Debt-to-GDP ratio: this is a continuous variable that measures the public debt with respect to Gross Domestic Product for each country. We expect that higher Debt/GDP ratios will be associated with longer periods of fiscal consolidation, and thus associated with lower probabilities of ending the consolidation.

[7]Mathematically, the baseline hazard function, $h_0(t)$, is defined for all time t in which a change has taken place, and it is not defined for other moments of time. But the survivor function $S_0(t)$ is defined for all values of t.

(2) Strength of consolidation: this continuous variable is the result in absolute terms of subtracting the annual variation of the cyclically adjusted budget balance to the chosen threshold that determines when a fiscal consolidation takes place.

(3) Quality of the adjustment: this variable measures the contribution of primary expenditures to the total deficit reduction achieved in each consolidation year. Let Contribution $= (X_t - X_0)/(S_t - S_0)$, be the contribution of primary expenditures X to the adjustment in the surplus S, achieved between the first year of the consolidation episode 0, and the year under consideration t.[8]

(4) Coalition size: this variable measures the number of political parties in government for each country and each year of our sample.

(5) Cabinet size: this variable measures the number of spending ministers in the cabinet for each year and each country. The inclusion of both cabinet size and coalition size is related to the idea that fragmentation in decision-making is negative for expenditure control (Weingast et al. 1981; Roubini and Sachs 1989).[9]

(6) Election year: this is a dummy variable, with value 1 when there was a general election in year t in country i. And it is zero when there is no election.

We have estimated the functional forms discussed in the previous sections by maximum likelihood, using 501 observations and 245 failures. Table 3 contains the parameter estimates for these alternative hazard function models. Recall that a positive parameter indicates an increase in the hazard rate, that is, an increase in the probability that the consolidation will end in period $t + 1$, given that it lasted through period t.

As we can see in Table 3, the three alternative specifications give almost identical results. All explanatory variables are significant and show the expected signs: the higher the Debt/GDP ratio and the higher the contribution of primary expenditures to deficit reduction, the less probable it is that the consolidation ends; the stronger the adjustment, the larger the number of spending ministers in the cabinet, the larger the number of accumulated failures, and during election years, the higher the probability that the fiscal consolidation ends, and a fiscal expansion starts. The only unexpected result comes from the insignificance of the Coalition size variable. As we will see later in Sect. 4.1, this non-result probably is caused by cases of very institutionalized coalition governments that have decisively reduced public deficits with the same strength of single party governments in the run-up to EMU. These were specially the cases of Belgium, the Netherlands, Denmark and Italy, all with coalition governments of three to five parties that launched several fiscal consolidations during the 1990s.

The p parameter in the Weibull estimation is statistically significant, positive and bigger than one, which means that the hazard function grows with time (recall Fig. 3).

Given that we have several possible parametric models, how can we discriminate among those we have estimated? When parametric models are nested, the likelihood-ratios or the Wald tests can be used to discriminate between them. This can certainly be done in the case of the Weibull versus Exponential models. But when models are not nested, these tests are unsuitable and the task of discriminating between models becomes difficult. A common approach to this problem is to use the Akaike Information Criterion (AIC). Akaike (1974) proposed penalizing each log likelihood to reflect the number of parameters being estimated in a particular model and then comparing them. For this purpose, the AIC can be defined as:

$$AIC = -2 \cdot (log\, likelihood) + 2(c + q + 1), \tag{5}$$

[8] In this concrete definition of the variable, we follow Von Hagen et al. (2001).

[9] For the definition of both coalition and cabinet size, we follow Perotti and Kontopoulus (2002). Cabinet size only includes ministers with spending capacity.

Table 3 Parametric estimation of proportional hazard model

Duration	Cox	Exponential	Weibull
N. Failures	0.014***	0.013***	0.032***
	(8.69)	(9.57)	(13.29)
Debt/GDP	−0.012***	−0.011***	−0.015***
	(−5.26)	(−5.11)	(−5.78)
Strength of adjustment	0.082	0.068	0.111*
	(1.63)	(1.47)	(1.82)
Quality of adjustment	−0.045***	−0.043***	−0.049***
	(−4.66)	(−4.95)	(−4.18)
Coalition size	0.019	0.016	0.036
	(0.37)	(0.31)	(0.73)
Cabinet size	0.114***	0.102***	0.149***
	(3.94)	(3.87)	(3.92)
Election year	0.153	0.164	0.181*
	(1.30)	(1.43)	(1.89)
Constant		−2.582***	−4.955***
		(−8.47)	(−11.65)
P			2.701***
			(19.99)
AIC	1987.11	710.12	503.34
Wald chi2(7)	157.19	171.44	260.41
No. of failures	245	245	245
Number of obs.	501	501	501

Absolute z-statistics in parentheses. Robust variance–covariance matrix used
*Significant at 10%; **significant at 5%, ***significant at 1%

where c is the number of model covariates (explanatory variables) and q is the number of model-specific auxiliary parameters. Although the best-fitting model is the one with the largest log likelihood, the preferred model is the one with the smallest AIC value. As we can see in Table 3, according to the AIC criteria, the Weibull estimation is the parametric model that best fits our data. In Table 3, we can also see the Wald test statistics, normally used for computation of the significance level of the estimate parameters. These tests confirm the superiority of the Weibull estimation.

Finally, there exists an additional method to test the power of each model, through graphic analysis of the Cox–Snell (1968) residuals. These residuals are defined as follows:

$$\hat{e} = -\log S(t/x). \tag{6}$$

If the model fits the data, then the plot of the cumulative hazard versus $\hat{e}$ should be a straight line with slope equal to unity and beginning at the origin. As can be observed in Fig. 4, the *Weibull plot* clearly satisfies the exponential requirement for most of the time, except for larger residuals, where the slope appears to exceed unity. This confirms that the *Weibull* model should be our preferred model.

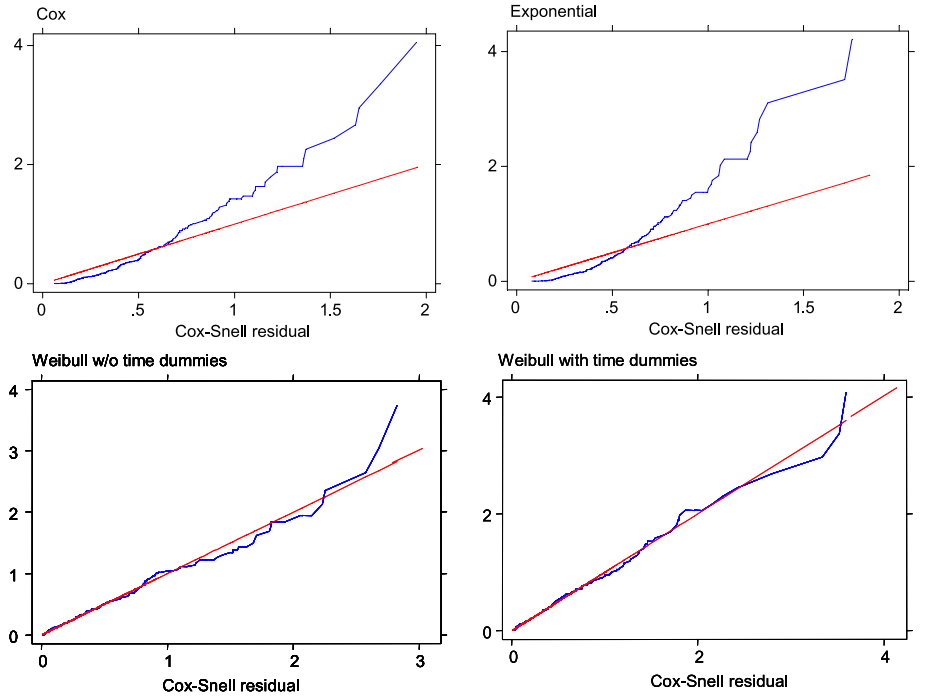

Fig. 4 Cox–Snell residuals to evaluate fit of 3 regression models

4 Robustness of our results

4.1 Controlling for sample heterogeneity: The 'Maastricht effect'

The previous results are subject to a possible criticism, related to the likely bias of our estimations due to the presence of the 'Maastricht effect'. The Maastricht Treaty and the possibility of entering into EMU if the fiscal criteria were fulfilled arguably was one of the most successful factors driving fiscal consolidations in Europe in the second half of the 1990s. If this was the case, 'traditional' factors such as fragmentation of governments could have been less important during the 1990s than in other periods, because the external constraint imposed by the Maastricht criteria implied that governments (whatever their composition) simply *had* to consolidate. A similar argument could also be made in relation to the degree of indebtedness. Those countries with unsustainable levels of debt may have been *forced* to consolidate despite the effect of 'traditional factors' or the Maastricht criteria.

In fact, when we perform Cox regression-based tests for equality of survival curves by countries and by period, we can see that our sample shows temporal heterogeneity, but no spatial heterogeneity[10]. Therefore we need to introduce controls for the temporal heterogeneity. There are two ways to do this: to include dummies that control for time effects or to split the sample into the period before and after the Maastricht Treaty. We do both.

[10]Due to space constraints these tests are not reported here. Nevertheless, they are available in EEG-WP 18-02 (although they were performed on a slightly shorter sample).

First we repeat the parametric analysis of Sect. 3.2, but now we include dummy variables for each period except the final period. Results in Table 4 confirm our previous findings. After controlling for periods, where all control variables were statistically significant, the only explanatory variable that has lost statistical significance is the Cabinet Size, while Debt/GDP, Number of failures and Quality of adjustment, remained as strong predictors of the probability of ending the fiscal consolidations. Again, the AIC statistics show that the Weibull estimation is the best model for our data. The analysis of the Cox–Snell residuals (Fig. 4) also confirms this statement.

Table 4 Parametric estimation of proportional hazard model with temporal heterogeneity

Duration	Cox	Weibull
N. Failures	0.015***	0.033***
	(7.92)	(12.48)
Debt/GDP	−0.008***	−0.008***
	(−2.57)	(−2.19)
Strength of adjustment	0.088*	0.106*
	(1.75)	(1.87)
Quality of adjustment	−0.039***	−0.040***
	(−3.77)	(−2.98)
Coalition size	0.017	0.015
	(0.37)	(0.21)
Cabinet size	0.052*	0.073*
	(1.71)	(1.79)
Election year	0.091	0.098
	(0.77)	(0.69)
1962–1972	1.928***	2.256***
	(5.11)	(5.25)
1973–77	1.582***	1.978***
	(4.35)	(4.76)
1978–81	1.899***	2.251***
	(5.32)	(5.66)
1982–87	1.269***	1.473***
	(3.78)	(4.16)
1988–92	1.747***	1.951***
	(5.31)	(5.20)
1993–98	1.434***	1.666***
	(4.21)	(4.78)
Constant		−6.290***
		(−11.34)
P		2.840***
		(20.41)
AIC	2039.88	499.87
Wald chi2(13)	217.69	332.13
No. of failures	245	245
Number of obs.	501	501

Absolute *z*-statistics in parentheses. Robust variance–covariance matrix used
*Significant at 10%; **significant at 5%, ***significant at 1%

Table 5 Parametric Weibull estimation by sample: the 'Maastricht effect'

Duration	Pre-Maastricht (1960–92)	Post-Maastricht (1993–04)
N. Failures	0.031**	0.028**
	(9.41)	(8.23)
Debt/GDP	−0.005**	−0.007**
	(−3.52)	(−5.15)
Strength of adjustment	0.102*	0.109*
	(1.84)	(1.86)
Quality of adjustment	−0.045**	−0.019*
	(−5.22)	(−1.82)
Coalition size	0.034**	0.011
	(1.99)	(0.19)
Cabinet size	0.188**	0.070
	(3.98)	(1.01)
Election year	0.099*	0.087
	(1.81)	(0.60)
Constant	−7.399**	−5.009**
	(−10.34)	(−9.31)
P	2.988**	2.324**
	(19.66)	(20.42)
AIC	461.33	408.51
Wald chi2(13)	323.50	298.34
No. of failures	182	63
Number of obs.	327	174

Absolute *z*-statistics in parentheses. Robust variance–covariance matrix used
*Significant at 10%;
**significant at 5%,
**significant at 1%

To be sure of these results, we now split the sample in two periods: pre-Maastricht period (1960–1992) and post-Maastricht period (1993–2000). And we estimate the baseline model (from Sect. 3.2), using the Weibull procedure (which has demonstrated to be the most adequate one) for both periods.[11]

Results in Table 5 show that important predictors of duration such as Quality of the Adjustment, Coalition Size, Cabinet Size and Elections lose statistical significance during the 1990s. Only the Debt/GDP and the accumulated Number of Failures remain as strong predictors in both periods. In fact, after splitting the sample, we observe that some variables (Elections and Cabinet Size) which were surprisingly insignificant in the original estimation of Sect. 3.2, regain their expected explanatory power for the period previous to the Maastricht Treaty. These results, confirm the existence of the 'Maastricht effect' whereby countries were forced to consolidate regardless of external constraints and government characteristics in the run up to EMU.

[11] Note that we always perform all estimations in this article using the EU-15 member states. When we divide our sample to test for the effect of the Maastricht period we do not exclude from the sample those countries which did not adopt the euro (UK, Sweden and Denmark). In a previous and longer version of this article we tested for the effect of excluding these countries from the sample, and results were not at all affected by their exclusion.

4.2 Changing the definition of fiscal adjustments

To conclude the robustness analysis, in this last section we replicate the parametric estimation of Sect. 3.2, but with a change in the definition of fiscal consolidation. Now we consider that a fiscal consolidation takes place in a given year if the cyclically adjusted budget balance with respect to GDP in that year increased by 1% or more from the previous year. By changing the threshold from 0% to 1% we want to test the sensitivity of our results to different definitions of fiscal adjustment. We can say that the 0% threshold is the minimum threshold that one can impose to differentiate fiscal consolidation years from fiscal expansion ones. The 1% threshold is the most common in the literature on fiscal adjustments,[12] because it discriminates in favor of strong consolidation experiences, where the political commitment to reduce the public deficit is strong and cannot be attributed to unintended outcomes.

As we can see in Table 6, the number of failures under the *Stronger* definition (the 1% threshold) is larger than under the *Weaker* definition (390 versus 237). Furthermore, under the *Stronger* definition, the average probability of ending the fiscal consolidation is much higher than under the previous definition (77.8% versus 47.6%), and the average duration is much lower (1.29 years versus 2.05). The maximum duration under this new threshold is four years.

In Fig. 5 we show the Kaplan–Meier survivor and hazard estimates for both thresholds. As we can see, the probability of maintaining the consolidation after the first year decreases even more under the new definition (0.6 versus 0.4) than what it did under the initial definition. These differences are maintained for longer durations, because the probability of maintaining the consolidation after the second year decreases 0.2 under the new definition, when it only decreased about 0.1 under the initial definition. This behavior is translated into a smoother estimated hazard function, that clearly shows higher positive dependency on accumulated duration under the *Stronger* definition than under the *Weaker* one.

Table 6 Descriptive statistics: Failure and duration by threshold

	Failure weaker	Stronger	Duration weaker	Stronger
Mean	0.491	0.779	2.084	1.292
Std. dev.	0.501	0.413	1.481	0.621
Variance	0.253	0.172	2.183	0.386
Skewness	0.086	−1.344	1.849	2.321
Kurtosis	1.008	2.799	6.953	8.341
No of failures	277	395		
Observations	565	581		

[12] In the literature, fiscal consolidations are defined as periods in which the cyclically adjusted primary balance (current revenues minus current expenditures, excluding interest payments) increased by at least 1.25% of cyclically adjusted GDP two consecutive years, or when it increased by 1.5% or more in one year and was positive but less that 1.25% the previous or the subsequent year. Because we are doing duration analysis we cannot impose to our definition any time restriction, as they do. Therefore the threshold that we should have applied is the amelioration of the cyclically adjusted primary balance by 1.25%. But because we want to use cyclically adjusted data that includes interest payments in order to include the Debt/GDP ratio as an explanatory variable, we decided to take as "the literature's threshold" the amelioration of the CABB (including interest payments) by 1% or more.

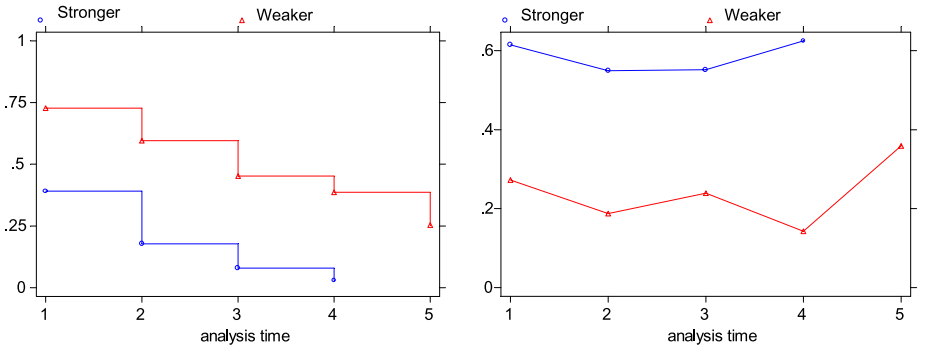

Fig. 5 Kaplan–Meier survivor and hazard functions by threshold

Table 7 Parametric Weibull estimation by threshold

Duration	Weaker	Stronger
Debt/GDP	−0.015**	−0.014**
	(−5.71)	(−4.98)
Strength of adjustment	0.115*	0.106**
	(1.89)	(2.19)
Coalition size	−0.039	0.125**
	(−0.73)	(2.67)
Cabinet size	0.146**	0.075**
	(3.92)	(2.32)
N. Failures	0.033**	0.024**
	(13.28)	(15.92)
Quality of adjustment	−0.049**	−0.024
	(−4.13)	(−1.17)
Election year	0.181	0.213*
	(1.17)	(1.69)
Constant	−4.961**	−3.498**
	(−10.92)	(−9.66)
P	2.699**	3.555**
	(15.75)	(24.56)
AIC	525.15	347.98
Wald chi2(7)	266.42	357.68
No. of failures	243	362
Number of obs.	501	534

Absolute *z*-statistics in parentheses Robust variance–covariance matrix used
*Significant at 10%;
**significant at 5%

Finally, we estimate the same model that we estimated with the initial threshold, but now under the new definition of fiscal consolidation. We expect the coefficients of all explanatory variables to maintain their signs and their statistical significance.

In Table 7 below, we present a comparison of the Weibull estimations under the *Weaker* (threshold 0%) and the *Stronger* (threshold 1%) definitions of fiscal consolidation.

As can be observed by looking at the results above, the effect of the Debt/GDP ratio, the Strength of adjustment, the Size of the cabinet and Number of failures is the same under both definitions: the larger the level of Debt, the less likely it is that the consolidation ends; and the larger the Strength of adjustment, the Cabinet and the Number of accumulated failures, the more probable is that the consolidation finishes.

Nevertheless, under the stronger definition, the Quality of the adjustment is no longer statistically significant. While the two political variables, such as Coalition size and Election year, suddenly gain statistical significance (Coalition now shows the expected sign). Under the new, stricter definition, larger coalitions, larger cabinets, and election years increase the probability of ending a fiscal consolidation. Or in other words, under stricter definitions of fiscal consolidation, economic explanatory variables lose predictive power in favor of political variables. These results indicate that stronger fiscal adjustments are more likely to end when spending authority is divided amongst more members of the cabinet, when a larger number of political parties, in all likelihood having very different budget priorities, comprise the ruling government coalition, and when an election is looming.

5 Concluding remarks

In this article we have examined the duration of fiscal consolidations in the European Union. To do this we have applied the methodology of duration models to annual data on cyclically adjusted budget balances for the 15 EU Member States between 1960 and 2004. We have studied the time spells between two fiscal expansions, or in other words, the number of years between the beginning and the end of fiscal consolidation episodes, calculating the hazard and the survivor functions for those consolidations.

First, we have done a non-parametric analysis where we have only taken into account time, in order to assess the impact of duration on the probability of maintaining a fiscal consolidation. Results suggest that this probability decreases rapidly after the first year and decreases less dramatically for longer durations.

Second, we have performed a parametric analysis, in order to include more variables that could influence the probability of ending fiscal consolidations. We have found that the level of debt, the fragmentation of the cabinet (measured by the number of parties in government and the number of spending ministers), the strength of the adjustment, and the quality of the adjustment (measured by the contribution of primary expenditures to the total amelioration of the budget balance), helped to explain the probability of ending the fiscal consolidations.

Interestingly, these results vary when we split the sample and we change the criteria to select episodes of fiscal adjustment. On the one hand, the explanatory power of economic variables was robust to different alternative estimations that tried to control for time heterogeneity but political variables lost their relevance. The fact that cabinet fragmentation and elections became insignificant when we split the sample and estimate our model for the post-Maastricht period, indicates that in the run-up to EMU countries simply *had* to consolidate, regardless of electoral constraints and the government's composition. On the other hand, we also showed that under a *Stronger* definition of fiscal adjustments, political variables gained importance with respect to economic variables as predictors of the probability of ending fiscal consolidations.

We consider this study the first attempt to analyze systematically the determinants of duration of fiscal consolidations episodes in the European Union. Our results are very relevant to better understand the determinants of longer or shorter experiences of fiscal adjustment. For example, the process of pro-cyclical fiscal policies denounced by the European Commission after the completion of EMU (European Commission 2001), and the subsequent

ending of most fiscal consolidation episodes originally launched in the mid 1990s to qualify for the third stage of EMU, can be more easily interpreted from the new perspective that our results provide. It certainly seems that once every country had qualified for the third stage of EMU, the combined effect of accumulated duration, economic slowdown, forthcoming elections and relaxed political commitment towards adjustment, definitively drove many of those fiscal consolidations to an end.

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