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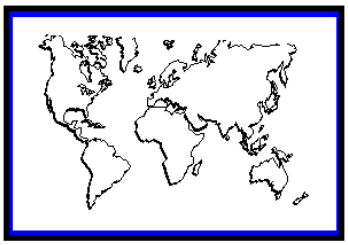

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VULNERABILITY TO SHOCKS IN EMU: 1991-2004*

Oscar Bajo-Rubio
(Universidad de Castilla-La Mancha and Instituto de Estudios Fiscales)

Carmen Díaz-Roldán
(Universidad de Castilla-La Mancha)

Abstract

In this paper we analyze the nature of the shocks hitting the EMU member countries over the period 1991-2004, as well as for the two subperiods before and after 1999, i.e., the start of EMU. To this end, we first evaluate the relative importance of symmetric *vs.* asymmetric shocks, and then extract their temporary component. Our final aim would be assessing the vulnerability of the EMU countries to temporary and asymmetric shocks, which would be the most harmful case for the operation of a monetary union.

Key words: Monetary union, EMU, asymmetric shocks, temporary shocks

JEL classification: E65, F33, F41

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1. Introduction

Starting in January 1st 1999, 12 European countries have formed a monetary union, the so called Economic and Monetary Union (EMU). However, as stressed by the literature on optimum currency areas initiated in Mundell (1961), the presence of asymmetric shocks (i.e., those requiring a different optimal policy response in different countries) means a potential difficulty for the adequate working of a monetary union. The argument is well known: a common monetary policy for all the member countries of the union cannot be the proper instrument when facing asymmetric shocks. The ultimate reason is that forming a monetary union means for each member country, not only surrendering monetary policy independence, but also losing the exchange rate *vis-à-vis* the other members of the union as a policy instrument; and this in turn raises the importance of fiscal policy in order to cope with asymmetric shocks (Bajo-Rubio and Díaz-Roldán, 2003). Accordingly, in the years before the start of EMU a large number of empirical studies, using different methodologies, have appeared, aiming to characterize the kind of shocks hitting the European economies as well as the main features of their business cycle; a non exhaustive list would include, among others, Cohen and Wyplosz (1989), Bayoumi and Eichengreen (1993), von Hagen and Neumann (1994), Helg *et al.* (1995), Bayoumi and Prasad (1997), Forni and Reichlin (2001), Barrios and de Lucio (2003) or Artis *et al.* (2004).

In an influential contribution, Cohen and Wyplosz (1989) have argued that it is not enough to determine whether shocks are symmetric or asymmetric. More specifically, the distinction between permanent and transitory shocks would be also relevant. The basic argument runs as follows. Faced to a permanent, e.g., adverse output shock, a country would respond optimally through the corresponding fall in demand, so the trade balance would remain in equilibrium. But, if the same shock were transitory, the optimal response would be to maintain spending roughly unchanged, which would be achieved through a trade deficit via a real exchange rate appreciation. However, in the search of a new equilibrium the countries would overreact, on failing to recognize the trade balance externality that appears in a monetary union; and this inefficiency would occur for both symmetric and asymmetric shocks (although to a lesser extent for the former). Therefore, asymmetric *and* temporary shocks would be those more potentially harmful for the operation of a monetary union [see Cohen and Wyplosz (1989) for details].

On the other hand, Frankel and Rose (1998) claim that a greater economic integration would lead to increased trade, which would result in more highly correlated business cycles. Although this effect might be offset by an increase in industrial specialization by country, and hence more asynchronous business cycles resulting from industry-specific shocks [as argued, e.g., by Krugman (1993)], Frankel and Rose present evidence from twenty industrialized countries over a thirty-year period, supporting their hypothesis. As an implication of these results, Frankel and Rose argue that, by expanding trade among members and increasing the correlation of their business cycles, EMU might be more desirable *ex post* than *ex ante*.

Some evidence on the above lines is provided in Rose and Engel (2002) using a sample of 210 countries between 1960 and 1996. Countries that are members of a currency union, Rose and Engel conclude, would have more trade and more highly synchronized business cycles, as compared with countries having their own monies. In turn, Alesina *et al.* (2002) find, from a similar data set, that the formation of a monetary union would tend to increase the volume of bilateral trade and the co-movement of prices among members, but would not be systematically related to the co-movement of outputs. However, Tenreyro and Barro (2003) observe that the estimation of the effects of a monetary union on economic variables could be affected by a problem of endogeneity. Once this problem is addressed, using an instrumental variables approach, Tenreyro and Barro obtain that the co-movement of outputs would actually decrease following the formation of a monetary union, which they interpret as consistent with the view that currency unions lead to greater sectoral specialization. Notice, on the other hand, that none of these papers analyze the case of EMU.

In this paper we re-examine the issue of the nature of the shocks hitting the EMU member countries, *before and after* the start of EMU, given the availability of time series long enough for such an exercise. As a particularly interesting feature of our results, we should be able to understand whether the formation of EMU had led to a greater similarity of the participating economies (confirming Frankel and Rose's arguments) or, on the contrary, to an increase in specialization, which would have important consequences on the working of EMU in practice. The empirical methodology, together with the main results, is presented in the next section; the final section concludes.

2. Methodology and empirical results

Cohen and Wyplosz (1989) proposed a simple method for assessing the relative importance of, first, symmetric *versus* asymmetric shocks; and, second, permanent *versus* temporary shocks. Denoting as X_1 and X_2 the levels of a particular variable for two economies:

- First, in the spirit of Aoki (1981), symmetric shocks are identified with their sum, X_1+X_2, and asymmetric shocks with their difference, X_1-X_2. Next, the relative importance of symmetric *versus* asymmetric shocks would be evaluated by their corresponding standard deviations.
- Second, the temporary component of both symmetric and asymmetric shocks is calculated. Next, the ratio of the standard deviation of these temporary components over the standard deviation of each original series would measure the extent of permanent *versus* temporary shocks, for either symmetric or asymmetric shocks.

This procedure was applied by Cohen and Wyplosz to three variables (real GDP, GDP deflator, and real wages) for the period 1965-1987, to analyze the kind of shocks experienced by, on the one hand, France and Germany, and, on the other hand, either "Europe" (made as the sum of France and Germany) or the United States. They concluded that, from the point of view of the shocks they faced, a monetary union would make more sense between France and Germany, than between "Europe" and the United States.

In this section we apply the above method to real GDP data (in million of euros, at 1995 prices and exchange rates, seasonally adjusted), for all the countries participating in EMU (except Luxembourg), against the whole euro zone (excluding the country concerned, in each case). In addition, we have also considered the case of the three EU members that chose not to participate in EMU from the start, i.e., Denmark, Sweden, and the United Kingdom. The data are quarterly, cover the period 1991.1 through 2004.4 (except for Ireland, Portugal and Sweden, where the data are available from 1997.1, 1995.1, and 1993.1, respectively), and are taken from Eurostat. Finally, the exercise has been performed for the whole period, and for the two subperiods 1991.1-1998.4 and 1999.1-2004.4, in order to assess whether the nature of the shocks

faced by the European economies would have changed, before and after the start of EMU.

The results for the whole period are presented in Table 1. In part A of the table, columns (1) and (2) show, respectively, the size of symmetric and asymmetric shocks, as measured by their standard deviation; and column (3) shows their relative importance, assessed by the ratio of the standard deviation of symmetric shocks to that of asymmetric shocks (so that a ratio above one would mean a greater weight of symmetric shocks). In turn, part B of the table shows the ratio of the standard deviation of the temporary component to the standard deviation of the original series, for both symmetric and symmetric shocks; where the temporary component has been calculated using three alternative methods: a linear trend, a quadratic trend, and the Hodrick-Prescott filter.

As can be seen, for all the EMU countries symmetric shocks would have been quantitatively more important than asymmetric shocks over the period of analysis[1]. However, when computing their temporary component, the latter would have been clearly higher for asymmetric than for symmetric shocks, with the exceptions of Germany, Ireland, and, to a lower extent, Spain and Italy. Finally, the pattern for the three countries that chose not to participate in EMU is not very different from that followed by the rest.

The results before and after the start of EMU appear in tables 2 and 3, respectively. First, we can see that the relatively greater importance of symmetric shocks (i.e., a favourable event for the performance of EMU) would have decreased, from the first subperiod to the second, for Belgium, Germany, Greece, Italy, Austria, the Netherlands, Spain and Portugal (in the last three cases, rather slightly), remaining unchanged for Ireland. On the contrary, symmetric shocks would have been relatively

[1] Notice that, denoting as var and cov the variance and covariance, respectively:

$$\text{var}(X_1+X_2) = \text{var}(X_1) + \text{var}(X_2) + 2\,\text{cov}(X_1, X_2)$$

$$\text{var}(X_1-X_2) = \text{var}(X_1) + \text{var}(X_2) - 2\,\text{cov}(X_1, X_2)$$

so that the standard deviation of (X_1+X_2) will be higher (lower) than the standard deviation of (X_1-X_2), provided that the covariance between X_1 and X_2 was positive (negative). In other words, the result obtained in Table 1 (i.e., that symmetric shocks would have been quantitatively more important than asymmetric shocks) would imply that the real GDP of each EMU member country would have been positively correlated with that of the rest of the euro zone.

more important once EMU in force, only for France and Finland and, interestingly, for the three "outsiders" (Denmark, Sweden and the United Kingdom).

Second, when looking at the temporary component of symmetric shocks, during the second subperiod it would have decreased, or remained at similar levels, for France, Greece, Italy, Ireland, Finland, and Spain, increasing for the rest. Finally, the temporary component of asymmetric shocks would have remained roughly unchanged in the EMU subperiod for Belgium, Spain, Ireland, and Finland; it would have fallen only for Germany, Greece, and Italy, and increased for France, the Netherlands, Austria, Portugal, and the three "outsiders" (Denmark, Sweden and the United Kingdom).

3. Conclusions

In this paper we have analyzed the nature of the shocks hitting the EMU member countries over the period 1991-2004, as well as for the two subperiods before and after 1999, i.e., the start of EMU. According to our results, during the whole period symmetric shocks would have clearly predominated over asymmetric shocks, which would be in principle "good news" for EMU. However, despite their lower relative weight, the temporary component of asymmetric shocks would have been higher than that of symmetric shocks. In other words, although asymmetric shocks would have been less important in quantitative terms than symmetric shocks, when occurring, they would have been potentially more harmful. These results, on the other hand, would not be too different to those found for the three countries that chose not to participate in EMU from its start.

Next, we analyzed the change between the two subperiods, before and after the start of EMU in January 1999. First, the relatively greater importance of symmetric *vs.* asymmetric shocks would have decreased in most cases (although sometimes very slightly), increasing only for France and Finland, as well as for the three "outsiders" (Denmark, Sweden and the United Kingdom). Turning to the importance of the temporary component of shocks, the results were less clear-cut. In particular, regarding the degree of temporariness of asymmetric shocks (the most harmful case for a monetary union, according to Cohen and Wyplosz), this would have decreased only for Germany, Greece, and Italy.

Although these results should be taken with a lot of caution, due to the still short period of time available for analysis, they would support to some extent an increased specialization in production following the formation of EMU. In addition, our results do not allow to discern any different pattern between the European "centre" and "periphery" [as in, e.g., Bayoumi and Eichengreen (1993)], or for the three countries that chose not to participate in EMU from its start.

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Table 1. Vulnerability to shocks in EMU: Whole period 1991.1-2004.4

Table 1A. Symmetric vs. asymmetric shocks

	Symmetric (1)	Asymmetric (2)	Ratio (1)/(2)
Belgium	0.0740	0.0042	17.27
Germany	0.0690	0.0213	3.23
Greece	0.0887	0.0220	4.02
Spain	0.0891	0.0168	5.28
France	0.0748	0.0037	20.24
Ireland	0.0924	0.0477	1.93
Italy	0.0678	0.0118	5.71
Netherlands	0.0836	0.0126	6.59
Austria	0.0769	0.0055	13.78
Portugal	0.0616	0.0092	6.64
Finland	0.0959	0.0229	4.18
Denmark	0.0783	0.0083	9.37
Sweden	0.0789	0.0094	8.32
United Kingdom	0.0874	0.0136	6.40

Table 1B. Temporary component of the shocks

	Symmetric			Asymmetric		
	L	Q	HP	L	Q	HP
Belgium	15.74	14.96	9.68	99.32	84.77	76.52
Germany	21.54	20.29	9.70	29.21	16.37	12.12
Greece	22.74	15.65	7.67	55.76	36.42	22.71
Spain	20.96	18.14	7.50	30.40	23.79	17.24
France	21.86	19.43	9.18	92.09	84.49	68.96
Ireland	19.16	8.86	11.33	19.16	11.99	13.69
Italy	21.47	20.48	9.95	38.27	25.00	19.96
Netherlands	22.25	22.23	8.34	72.71	85.16	22.79
Austria	19.60	19.14	7.45	95.22	66.67	53.14
Portugal	25.68	12.87	11.01	99.32	37.30	40.26
Finland	23.41	21.69	9.56	47.49	46.87	30.82
Denmark	20.49	20.44	8.74	94.10	64.75	42.91
Sweden	11.57	10.08	7.73	42.87	38.93	34.74
United Kingdom	17.94	17.29	6.25	45.70	41.67	25.21

Note: L, Q, and HP denote the method used to smooth the original series, i.e., a linear trend, a quadratic trend, and the Hodrick-Prescott filter, respectively.

Table 2. Vulnerability to shocks in EMU: Subperiod 1991.1-1998.4

Table 2A. Symmetric vs. asymmetric shocks

	Symmetric (1)	Asymmetric (2)	Ratio (1)/(2)
Belgium	0.0371	0.0034	10.84
Germany	0.0330	0.0076	4.34
Greece	0.0377	0.0067	5.63
Spain	0.0409	0.0077	5.24
France	0.0333	0.0043	7.74
Ireland	0.0292	0.0150	1.95
Italy	0.0338	0.0035	9.60
Netherlands	0.0451	0.0117	3.84
Austria	0.0392	0.0058	6.74
Portugal	0.0314	0.0094	3.33
Finland	0.0492	0.0174	2.82
Denmark	0.0442	0.0104	4.25
Sweden	0.0393	0.0068	5.70
United Kingdom	0.0467	0.0128	3.63

Table 2B. Temporary component of the shocks

	Symmetric			Asymmetric		
	L	Q	HP	L	Q	HP
Belgium	26.12	17.92	19.30	76.50	80.75	75.07
Germany	26.08	17.15	18.76	51.86	28.50	34.10
Greece	35.51	17.13	21.62	97.62	74.23	79.24
Spain	30.37	13.68	17.72	61.13	25.24	33.99
France	28.39	16.11	18.83	58.05	56.63	52.87
Ireland	21.24	12.63	21.18	24.74	20.82	24.70
Italy	27.80	18.87	20.21	82.08	78.33	75.18
Netherlands	22.89	10.69	13.52	22.78	16.22	17.20
Austria	18.56	10.92	12.53	48.71	38.80	39.19
Portugal	11.71	6.40	11.09	24.19	24.17	24.12
Finland	41.06	16.01	22.31	74.97	34.57	43.88
Denmark	21.84	16.66	16.97	43.86	42.20	40.01
Sweden	19.93	11.97	11.74	19.04	34.15	38.83
United Kingdom	17.39	10.84	11.93	31.81	30.56	29.18

Note: See Table 1.

Table 3. Vulnerability to shocks in EMU: Subperiod 1999.1-2004.4

Table 3A. Symmetric vs. asymmetric shocks

	Symmetric (1)	Asymmetric (2)	Ratio (1)/(2)
Belgium	0.0273	0.0071	3.84
Germany	0.0264	0.0127	2.08
Greece	0.0433	0.0213	2.03
Spain	0.0357	0.0081	4.39
France	0.0299	0.0028	10.49
Ireland	0.0582	0.0298	1.95
Italy	0.0258	0.0069	3.73
Netherlands	0.0243	0.0078	3.11
Austria	0.0265	0.0062	4.26
Portugal	0.0235	0.0087	2.69
Finland	0.0349	0.0076	4.56
Denmark	0.0264	0.0047	5.55
Sweden	0.0320	0.0047	6.70
United Kingdom	0.0339	0.0058	5.81

Table 3B. Temporary component of the shocks

	Symmetric			Asymmetric		
	L	Q	HP	L	Q	HP
Belgium	30.11	21.82	26.04	87.64	68.65	77.76
Germany	35.40	20.14	28.17	24.63	21.25	22.51
Greece	14.32	11.52	12.86	23.01	20.93	21.71
Spain	21.70	12.40	17.32	41.20	30.99	35.64
France	31.58	18.94	25.39	95.40	87.01	89.57
Ireland	23.16	12.67	19.00	22.10	19.56	21.04
Italy	34.77	18.75	27.36	29.41	26.51	27.55
Netherlands	40.90	22.82	32.34	26.99	26.97	26.78
Austria	28.42	18.94	23.45	72.84	51.29	61.89
Portugal	44.87	23.79	35.06	36.97	35.83	36.30
Finland	21.77	16.75	18.88	70.20	53.57	61.31
Denmark	29.25	49.38	23.74	65.10	78.95	56.21
Sweden	23.33	16.44	19.62	87.14	63.34	74.62
United Kingdom	19.89	13.82	16.63	65.15	31.91	50.41

Note: See Table 1.