Measuring monetary conditions in Europe: Use and limitations of the monetary conditions index

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1999

DE ECONOMIST 147, NO. 2, 1999

MEASURING MONETARY CONDITIONS IN EUROPE: USE AND LIMITATIONS OF THE MCI*

BY

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Summary

The Monetary Conditions Index is a composite index of interest and exchange rates frequently used by (central) banks, the IMF, and the OECD. This paper considers the benefits and weaknesses of the MCI in the light of large macroeconometric models. It follows that the impact of the exchange rate on GDP relative to the impact of the short-term interest rate is substantially lower under a monetary union. For most countries, including a long-term interest rate in the MCI only affects the level of the MCI and not its turning points.

Key words: Monetary Conditions Index, EMU

1 INTRODUCTION

Some recent articles criticise the use of a Monetary Conditions Index (MCI). An MCI for a given country is a weighted average of a short-term interest rate and an exchange rate, expressed as deviations from their values in a base year. The weights represent the relative effect of the interest rate and the exchange rate on economic growth.

The estimates of these weights have recently been strongly criticized.[1] In spite of this – mainly academic – criticism, several policymakers are in favour of the MCI.[2] Interest rates reflect the monetary conditions coming from pressure on the domestic market whereas the exchange rate reflects pressure stemming from abroad. The two types of rates can strengthen or offset each other, with an increase in both the interest and the exchange rate tightening the economy. On the other hand, if a higher interest rate would be accompanied by a depreciation, the monetary stance might be unchanged or even eased. From this point of view a

* For comments on this paper I gratefully acknowledge Peter van Els, Martin M.G. Fase, and two anonymous referees.

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1 See Eika, Ericsson, and Nymoen (1996) as well as Ericsson, Jansen, Kerbeshian, and Nymoen (1997) who show that the parameter estimates are often imprecise and unstable.

2 IMF, OECD, Davies and Simpson, all 1996.

De Economist **147**, 183–203, 1999.

single index that captures the trade-off pressure from interest and exchange rates seems to be attractive.

The main aim of this paper is to look at the issue from a different angle to that pursued in previous empirical research which ended to adopt a single IS-equation framework. The monetary transmission channels to GDP, through interest and exchange rates, are more complex than the simple IS-equation framework may suggest.

We study the monetary transmission channels to GDP from interest rate and exchange rate changes via consumption, investment, and trade. This is carried out with existing global econometric models in which the roles of interest and exchange rates are established in more detail than in reduced-form IS-equations. In addition, these models provide the opportunity to verify changes in MCI weights when different shocks to the economy occur.

Moreover, this study constructs an MCI for the Economic and Monetary Union (EMU). The EMU brings about considerable changes in monetary policy in that a single interest rate is set by the European Central Bank for the member countries and a common exchange rate with each country outside the union applies. Intra-EU trade is considerable but the EMU area as a whole is a more closed economy than most individual European economies. One may therefore be inclined to think that the role of the exchange rate in relation to interest rates becomes far less important in the EMU context, a relation further investigated here.

The outline of the paper is as follows. Section 2 provides some background information. Section 3 presents the simulation results obtained with two global macromodels, NiGEM (the National Institute Model, London) and EUROMON (De Nederlandsche Bank). Section 4 concludes.

2 BACKGROUND

Ericsson and Kerbeshian (1997) provide an extensive synopsis of the recent, mainly unpublished literature on MCIs. This section briefly reviews the origin and construction of the MCI and summarises the main (dis)advantages mentioned in the literature. It concludes with a motivation and outline of the methodology adopted in this study.

2.1 *History*

The concept of the MCI was introduced by the Bank of Canada (BoC). Canadian monetary policy, like elsewhere, had undergone a shift in attention from intermediate towards final policy targets. The focus was therefore much more on price stability and growth. Since February 1991 the BoC has explicitly targeted inflation, as laid down in a joint declaration by the BoC and the government. Between 1995 and 1998 the inflation target was set within the hands of 1% and 3%.

Duguay (1994), Friedman and others (see Friedman (1993)), drew attention away from monetary aggregates and focused on interest and exchange rates, considering both as information variables with respect to the monetary stance. Duguay estimated a model for Canada, i.e.

$$\Delta y_t = \underset{(0.13)}{0.13} + \underset{(0.11)}{0.52}\,\Delta y_t^* + \underset{(0.11)}{0.45}\,\Delta y_{t-1}^* - \underset{(0.22)}{0.40}\,(\Delta_8 RR_t/8) - \underset{(0.12)}{0.15}\,(\Delta_{12} q_t/12). \tag{1}$$

In equation (1) y_t is real GDP in period t, y_t* real US GDP, and Δ_i the i-th difference operator. RR_t is the nominal 3-month commercial interest rate minus inflation, where inflation is calculated as the annual rate of change in the Canadian GDP deflator (one quarter lagged). q_t is the bilateral US exchange rate minus the ratio of the Canadian GDP deflator to the US GDP deflator. An increase (decrease) of q_t represents an appreciation (depreciation) of the Canadian real exchange rate. All variables, except the interest rate, are in natural logarithms, with standard deviations presented in parentheses. Duguay estimated this equation with quarterly data covering the period 1980-1990, the adjusted R^2 is equal to 0.64, and the Durbin-Watson statistic is 1.96.

From Duguay's model it follows that the exchange rate and the interest rate influence GDP growth; they are significant at the 10% level. An increase (decrease) in the real short-term interest rate decreases (increases) GDP by 0.4%. An appreciation (depreciation) of 1% in the exchange rate *ceteris paribus* depresses (stimulates) GDP growth by 0.15%, which is thus roughly about one third of the effect of a 1%-point increase (decrease) of the short-term interest rate *ceteris paribus*.

Monetary conditions are tightened by either an increase in the interest rate or an appreciation of the exchange rate. They ease if the interest rate is lowered or the exchange rate depreciates. The BoC adopts Duguay's findings in the apparently logical step of combining interest and exchange rate developments in one single index. '*In a flexible exchange rate regime monetary policy operates through two channels – the interest rate and the exchange rate -...if there are exogenous shocks to the exchange rate, monetary policy actions should typically offset their effects on aggregate demand...*' (Freedman (1994)).

Since the beginning of the nineties the BoC has used the MCI as an operational target. This index of monetary conditions is updated monthly. Bands are furthermore derived from the BoC's small structural Quarterly Model. Some other central banks have followed the BoC in adopting MCI measures, but the extent to which they are used in monetary policy differs. The Reserve Bank of New Zealand is also a main user (see Nadal-De Simone et al. (1996) and Dennis (1997)). The calculation and presentation of MCIs on a regular basis by other financial institutions is nowadays quite common, with the IMF, OECD, and commercial banks etc. all using the index.

2.2 *Construction of the MCI*

The MCI is usually constructed as

$$MCI_t = \beta_1 (R_t - R_0) + \beta_2 (q_t - q_0), \tag{2}$$

where subscript t represents the time index, R the nominal short-term interest rate, and q the nominal trade-weighted exchange rate (in natural logarithms). β_1 and β_2 are the weights on the interest and the exchange rates, respectively, and are estimated parameters. The index year, indicated by subscript *0*, is the beginning of the sample period.

It may be trivial, but important to keep in mind that neither the magnitudes of β_1 or β_2 nor the level of the MCI have any real meaning. The MCI is a true index which means that only the size of β_1 relative to β_2 is of relevance. The ratio β_1/β_2 is directly related to the openness of the economy under consideration. In the closed economy case it is undetermined as the restriction $\beta_2=0$ holds. The more open the economy is however, the lower the ratio β_1/β_2.

In most studies the estimate of β_1/β_2 exceeds one. At the BoC, for instance, it is equal to 3, following the Duguay (1994) study: the ratio is 0.40/0.15, which is rounded to 3. The interpretation is that a 1%-point increase (decrease) in the short-term interest rate *ceteris paribus* brings about the same changes in monetary conditions as a 3% appreciation (depreciation) *ceteris paribus* in the trade-weighted exchange rate.

2.3 *An Assessment of the Relevant Literature*

As stated, the arguments in favour of the MCI are *simplicity, convenience, and broadness*, i.e. it is an *improvement on using the interest rate* as *the* only indicator of monetary conditions (as well as the exchange rate which is sometimes used). In the literature four main shortcomings of the MCI are mentioned, viz:

1 The short-term interest rate and the exchange rate are *not the only factors* that influence monetary conditions. Other factors such as the long-term interest rate and asset prices are also important to assess the monetary stance (see Kennedy and Van Riet (1995) and Smets (1997)).

This shortcoming is evident in most MCIs currently in use. For European countries it is known that the long-term interest rate plays an important role in the monetary transmission mechanism via the term structure. Investment and consumption behaviour is often dependent upon long rates. The MCIs for some countries may therefore lack at least one important element.

2 The weights attached to the interest and exchange rates are not directly observed and are *model dependent*. The Norwegian and Swedish central banks, for instance, employ an aggregate GDP and an aggregate GDP plus inflation model,

respectively, of which parameter non-stability is demonstrated by Eika, Ericsson, and Nymoen (1997).

For sure, the effects are hard to estimate when using a single IS-equation as in (1). For Canada the exchange rate is only significant at the 10% level. For other countries estimated GDP equations turn out to be unstable, see for instance the results for Norway in Eika et al. (1996), the estimated confidence intervals for the MCI coefficients of several countries in Ericsson et al. (1997), or the VAR-study for the Euro-zone by Gruijters (1999).

3 Interest and exchange rates are *added straightforwardly*. King (1997) states *'...that any attempt to construct a simple monetary conditions index is akin to adding together apples and oranges... One refers to an exogenous instrument of monetary policy, the other to an endogenous variable, which may be responding to changes in interest rates or to other shocks to either the domestic or overseas economy.*[3]

This point is more conceptual. However, the criticism applies to many other indicators that are baskets of relevant variables as well.

4 The relation between interest and exchange rates is assumed to be time independent. As King (1997) argues '*It makes little sense to trade-off interest rates and the exchange rate according to some pre-ordained constant weights. ... If the 4:1 rule* (*for the UK*) *were correct, then the appreciation of the sterling since the beginning of August* (*of 17% of the dollar-sterling rate*) *was equivalent to an increase in interest rates of no less than 4.5 percentage points...*'

Interest rates and exchange rates have effects on the economy that can indeed change over time. However, this is difficult to tackle and requires the estimation of non-linear models or models containing time-varying parameters. We refrain from this in this study.

2.4 *Methodology Adopted in this Study*

In order to find the appropriate MCI weights several model simulations are carried out in the same vein as in Kennedy and Van Riet (1995), i.e. by closing other transmission channels. Our analyses cover five EMU countries, namely Belgium, France, Germany, Italy, the Netherlands, and the UK.

Some important points need to be mentioned:

– MCIs are sometimes expressed in *nominal* terms and some times in *real* terms. A nominal MCI is easier to construct as no measure of inflation is needed, which is particularly convenient when calculating a trade-weighted exchange rate. The choice of a nominal MCI also seems to be more appropriate as economic behaviour often reacts on the basis of nominal interest rates in the short run. Perceived inflation can be important, but this is hard to measure empirically. Whichever choice is made, nominal or real, one should be consistent so that the interest and

3 'Exogenous' in this context should be interpreted as in the hands of the monetary authorities.

exchange rates are in the same terms in both the estimated equations as well as the presented MCI. In the literature this is often not the case. In the following, consistency is aimed at, but unfortunately sometimes unavoidably violated.
– We look at the *trade-weighted* exchange rate rather than a *bilateral* exchange rate; economies trade with more than one country and usually in more than one foreign currency.
– Like in many other studies our analyses will only focus on real GDP effects, despite inflation being the final policy target. The reason for this is that monetary conditions are important for GDP growth, which usually influences inflation with some lag. The indicator for monetary conditions is hence not to be seen as an inflation forecast but rather as an indicator for the monetary stance that precedes inflation tendencies.[4]

3 THE MCI CALCULATED FROM LARGE MACROECONOMETRIC MODELS

This section analyses the role of interest and exchange rates in large macroeconometric models. The transmission channels are described, the simulation design is discussed and simulation results for individual countries and the EMU are presented.

3.1 *Interest and Exchange Rate Channels*

We use NiGEM (April 1997 version) and EUROMON (1997 version).[5] NiGEM contains most European countries, but also the US and Japan, in detail, along with some other blocks of countries. EUROMON focuses on eight European countries: Belgium, Denmark, France, Germany, Italy, the Netherlands, Spain, and the UK. The only exogenous foreign influences concern US and Japanese exchange rates, their interest rates, imports, and trade prices. In EUROMON the Netherlands and Belgium are modelled in detail. NiGEM includes model-consistent expectations concerning long-term interest rates, exchange rates, and wages. Term-structure equations in both models allow shocks to the short-term interest rate to affect long-term interest rates. In NiGEM this process is modelled in a forward looking way, where the 10-year bond rate is the geometric average of the future 3-month rates over 40 quarters. In EUROMON the long rate depends on the current and lagged domestic short rates, German short and long rates, and the US short rate.

The extent to which the interest rate affects GDP depends among other things upon the interest elasticities of consumption and investment, and the consumption and investment shares in GDP. The impact of interest rate changes in terms

4 We realize that this implies that some direct channels to inflation are neglected, such as the channel running from an exchange rate depreciation via higher import prices to inflation.
5 See for instance NiGEM (1997) and De Bondt, Van Els, and Stokman (1997).

of GDP growth in relation to the impact of the exchange rate evidently also depends on the openness of an economy. Interest and exchange rates are closely linked. Domestic monetary policy has an impact on short-term interest rates almost instantaneously, but on exchange rates as well as far as uncovered interest parity holds. This is the case in most structural models. Foreign monetary policy affects the bilateral exchange rate in a similar way and, depending on the foreign country's influence of course, domestic interest rates at a later stage.

Table 1a reports the interest rate semi-elasticities country-wise. The short-term interest rate is the 3-month interest rate and the long-term interest rate is the 10-year bond rate. For those countries where no elasticities are reported, the interest or exchange rates were probably not found to be statistically significant for the sample period. All reported elasticities are significant. A comparison between NiGEM and EUROMON shows that some of the elasticities are quite similar. However, it is striking that French and German consumption patterns do not depend on interest rates in NiGEM. Furthermore, the short-term interest rate influences business investment in Italy and the UK in EUROMON, whereas NiGEM takes the long-term interest rate into account. The exchange rate channel runs via world export prices, on through exports and then elasticities of imports and exports are difficult to present as they also depend on the trade weights.

TABLE 1A – LONG-RUN SEMI-ELASTICITIES WITH RESPECT TO INTEREST RATES

	NiGEM			EUROMON		
	Consumption	Business investment	Housing investment	Consumption	Business investment	Housing investment
Belgium	−0.018*	–	–	−0.017*r*	−0.034	−0.025
France	•	−0.042	−0.018*s*	−0.004	−0.021	−0.025
Germany	•	−0.101	−0.043*s*	−0.004	−0.13	−0.029
Italy	−0.002*s*	−0.013**	–	−0.002*s*	−0.035*s*	−0.025
Netherlands	−0.014*	–	–	−0.004	−0.033	−0.029
UK	−0.008*s*	−0.112	−0.034*s*	−0.003*s*	−0.010*s*	−0.044*s*

Note: Figures concern nominal long-term interest rates, except for:
s = normal short-term rate;
r = real long-term interest rate.
Further symbols:
* = only total Belgian and Dutch personal sector demand is included in NiGEM;
** = only Italian total investment is included in NiGEM;
− = not estimated as a separate equation;
• = interest rate not included.

TABLE 1B – LONG-RUN ELASTICITIES WITH RESPECT TO RELATIVE PRICES

	NiGEM		EUROMON	
	Exports	Imports	Exports	Imports
Belgium	−0.40	−0.39	−0.58	−0.24
France	−0.63	−0.59	−0.58	−0.85
Germany	−0.66	−0.37	−0.80	
Italy	−0.49	−0.73	−1.62	−0.05
Netherlands	−1.61	−0.22	−1.00	
UK	−0.82	−0.16	−0.69	−0.17

Note: For Germany and the Netherlands no relative prices are included in the long-run relationship of the import equation.

Table 1b reports the long-term elasticities with respect to relative prices. These only concern the exports and imports of goods. The NiGEM export elasticities with respect to relative prices (own export price in comparison with weighted export price), are in the range of −1.61 to −0.40, and in EUROMON of −1.62 to −0.58. In both NiGEM and EUROMON the world trade elasticities are fixed at one. The NiGEM import elasticities with respect to import prices vary from −0.73 in Italy to −0.16 in the UK, in EUROMON from −0.85 in France to −0.05 in Italy. The sales elasticities in EUROMON are fixed at one, whereas a time trend captures the impact of increasing openness. In NiGEM, on the other hand, these elasticities are estimated and found to be much higher than one. Fluctuations in exchange rates will affect imports and exports to a greater extent when the relative price elasticities are larger (in absolute value), and for this reason the elasticities in Table 1b are important to our analyses.

3.2 *Carrying out the Simulations*

To assess the size of the β-coefficients in the MCI, we first analyse the impact on GDP of (i) a 1%-point decrease in the domestic short-term rate (ii) a 1%-point decrease in the domestic long-term interest rate and (iii) a 1% depreciation of the domestic currency. These three shocks are performed for each country. To investigate the extent of the GDP response to a change in the short rate, *ceteris paribus*, the long rate as well as the exchange rate channel have to be closed. In order to do so, the long-term interest and exchange rates are exogenized. We analyze the effect of the second shock, a change in the long-term interest rate – *ceteris paribus* – in the same way, i.e. the short-term rate and exchange rates are exogenized. The effect of the exchange rate on GDP is analysed by a 1% depreciation of the domestic currency with both interest rates exogenous.

The shocks to the short-term rate, long-term rate, and exchange rate are carried out over a five-year period, for each country under investigation. Other countries in the models are kept endogenous so that, like in the real world, they can be influenced by and in turn react to the shock. Each shocked variable is returned to its baseline value after the five-year period. The five-year shock period is arbitrary, but is long enough to identify short-term reactions and short enough to keep the whole economic system in balance. The exogenous variables are exogenized for the whole simulation period. The types of shock chosen hamper a free choice of policy or exchange rate rule in NiGEM; shocking the short-term interest rate inevitably imposes fixed nominal short rates and shocking the exchange rate inevitably imposes a fixed nominal exchange rate. We allow these assumptions to also prevail after the five years, for all countries, and for the long-term interest rate shocks. In shocking to exchange rate it should be noted that the bilateral nominal exchange rates (US$ in NiGEM and German-DM in EUROMON) are used.

The first-year impact responses are extremely small, and sometimes opposite or unexpected signs are found in the first quarter(s). The results seem unreliable, in particular when calculating the relative impact of interest and exchange rate effects on GDP. For this reason we consider the two-year responses. Table 2a reports the simulation results. The NiGEM and EUROMON shocks to the short-

TABLE 2A – TWO-YEAR RESPONSES OF REAL GDP TO INTEREST AND EXCHANGE RATE SHOCKS

	NiGEM (April 1997 version)			EUROMON (1997 version)		
	Impact on real GDP of a			Impact on real GDP of a		
	1%-point decrease in the nominal short-term interest rate	1%-point decrease in the nominal long-term interest rate	1% depreciation of the nominal effective exchange rate	1%-point decrease in the nominal short-term interest rate	1%-point decrease in the nominal long-term interest rate	1% depreciation of the nominal effective exchange rate
Belgium	0.024	*0.375*	0.261	0.050	*1.074*	0.173
France	0.028	*0.381*	0.199	0.075	*0.267*	0.096
Germany	0.400	*0.514*	0.147	0.035	*0.543*	0.063
Italy	0.024	*0.277*	0.162	*0.339*	0.126	0.080
Netherlands	0.091	*0.575*	0.219	0.326	*0.574*	0.114
UK	0.252	*0.406*	0.142	*0.513*	0.133	0.217

Note: The strongest effects are printed in *italic*.

TABLE 2B – TWO-YEAR RESPONSES OF REAL GDP TO INTEREST AND EXCHANGE RATE SHOCKS

	NiGEM	EUROMON
	Impact on real GDP of a 1%-point decrease in the nominal short-term interest rate	Impact on real GDP of a 1%-point decrease in the nominal short-term interest rate
Belgium	*0.342*	*0.404*
France	0.193	0.075
Germany	*0.620*	*0.182*
Italy	0.146	*0.404*
Netherlands	0.205	*0.239*
UK	*0.425*	*0.562*

Note: Figures are printed in *italic* if the short-term interest rate effect is stronger than the exchange rate effect (see Table 2a).

term interest rate concerning Belgium and the Netherlands come from simulations carried out for Germany. Shocking the short-term interest rate, keeping the long-term interest and exchange rates exogenous, hardly shows a direct effect on Belgian or Dutch GDP. Belgian and Dutch interest and exchange rates are directly linked to the German ones, and therefore shocks in Germany are fully reflected in the neighbour rates of these two small countries. We only measure the indirect effect or short-term interest rate changes on Dutch and Belgian GDP. To assess the impact of the long-term and short-term interest rates, shocks are simulated again without exogenizing long rates. So for each country, one more simulation is carried out. Table 2b reports these results.

3.3 *The Monetary Conditions in the Individual Countries*

Table 2a shows that the long-term interest rate strongly affects GDP growth. The effects are often more than twice as strong as the impact of short-term rates. For Italy and the UK there is a clear distinction between the NiGEM and EUROMON responses. In the former, the effects of the long-term interest rates are the strongest. This difference comes from the fact that long-term rates are significant in NiGEM whereas short-term rates are significant in EUROMON, as shown in Table 1a.

From Table 2b it follows that the GDP responses sometimes fall between the values for the short and long-term interest rate shocks in Table 2a. In other cases, see the NiGEM responses for Germany or the EUROMON responses for Italy and the UK, the responses are even stronger than the short-term rate responses reported in Table 2a. The short-term responses in Table 2b, however, never ex-

ceed the sum of the short and long-term effects in Table 2a. For this reason, the impact of the exchange rate in relation to the interest rate is stronger in the case where long rates are endogenous (Table 2b).

Figure 1 shows the calculated MCIs. Three boxes are presented for each country. The first shows the original quarterly interest rates and exchange rates (in natural logarithms) indexed in 1990.I, for the period 1990.I-1996.IV. The exchange rate is the nominal trade-weighted exchange rate. The second box shows the MCI according to the NiGEM and EUROMON results, calculated by using the weights of the two-year responses given in Table 2a. The third box shows the NiGEM and EUROMON results where the long-term interest rate is not included as a separate factor in the MCI. The weights on the short-term interest rate and the exchange rate are taken from the simulation results when the long-term interest rate is endogenous (Table 2b). In all the MCIs the weights are rescaled such that they equal 1. These weights are reported below the boxes. In Figure 1,A,2, for example, 4:57:40 indicates a GDP impact effect from the short-term rate equal to 4, a GDP impact effect from the long-term rate equal to 57, and an effective exchange rate impact effect equal to 40, which follows directly from Table 2a.

It follows that the NiGEM and EUROMON weights are quite similar. The levels of the MCIs differ, i.e. they hardly cross each other, but the direction of change is the same. The Belgian MCI with the long-term rate included is much more erratic with the NiGEM weights than with the EUROMON weights. This is due to the fact that the exchange rate, which the first box shows to be erratic, has a larger weight in relation to the two interest rates. The third box for each country, where the long-term rates are not included in the MCI, also shows that the lines for the two models are close together, and somewhat closer than in the second box. The choice of model therefore does not seem to be of major importance, a result which provides support for consistently estimated weights.

Figure 2 compares the MCIs with and without the long-term interest rate for each country. In this box the NiGEM weights are used to calculate the MCI. They are represented by the solid lines in the second and third boxes of Figure 1. It follows that the MCIs show a strong level difference, in particular for Italy, the Netherlands, and the United Kingdom. In the case where the long-term rate is accounted for, monetary conditions are, by and large, tighter. A further striking feature is that the turning points in the MCI are often captured at the same moment in time in all countries under investigation. The results for France, however, are an exception; the two MCIs cross each other several times indicating that neither the turning points nor the direction of the MCI is similar. Turning point differences seem worse than having level differences. The inclusion of the long-term rates is thus not irrelevant in all cases. Moreover, long and short rates can move in opposite directions, and therefore an MCI with only a short-term interest rate and exchange rate included could wrongly reflect monetary conditions.

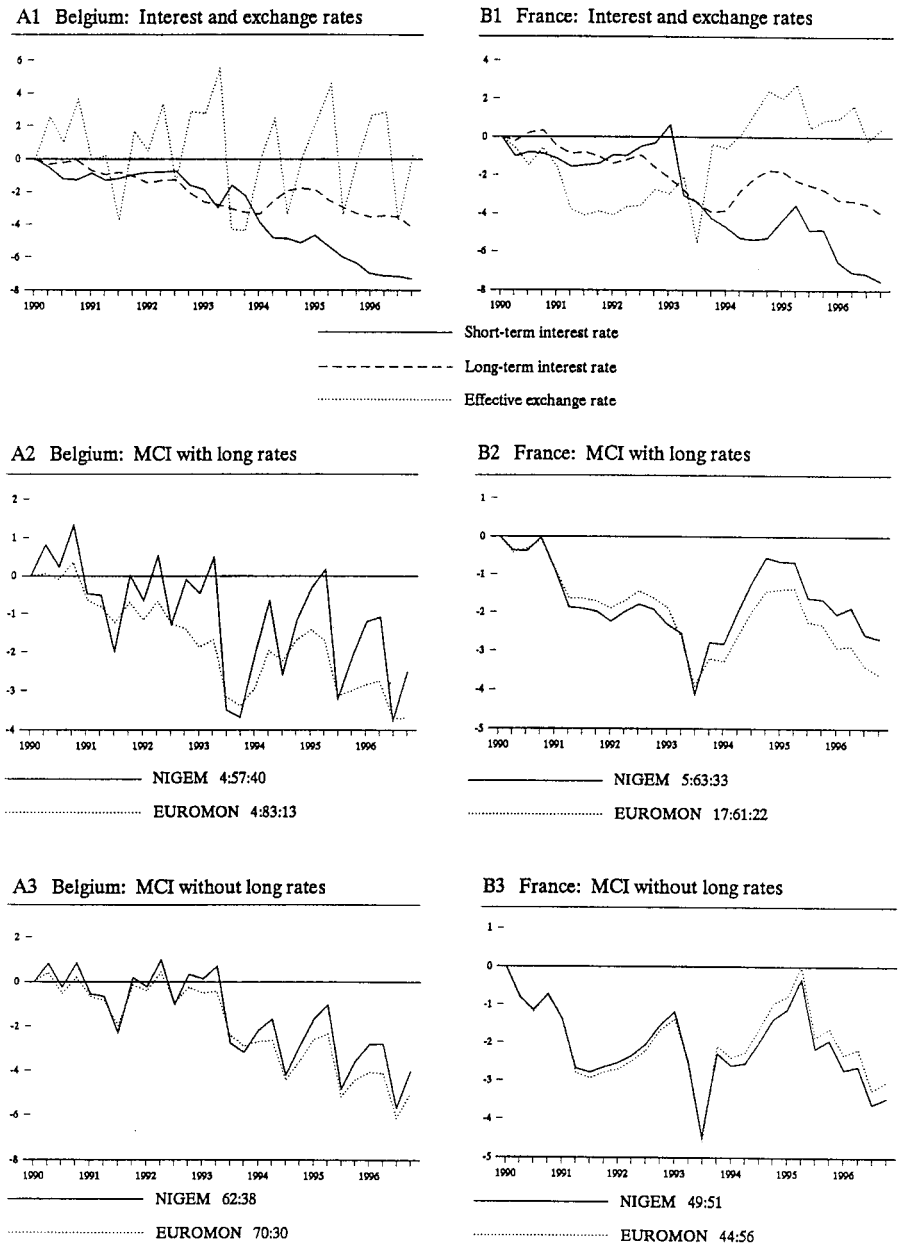

Figure 1 – MCIs per country

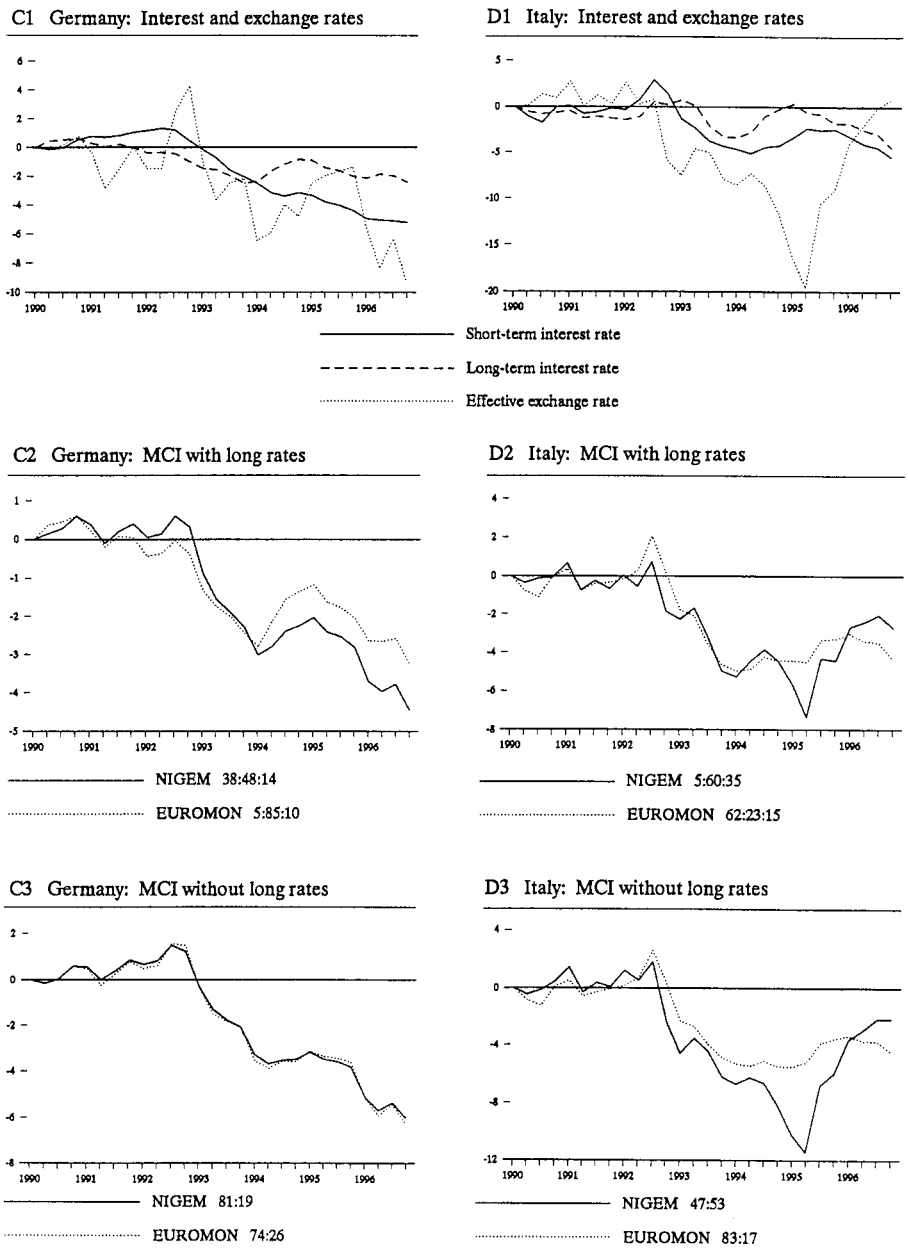

Figure 1 – MCIs per country

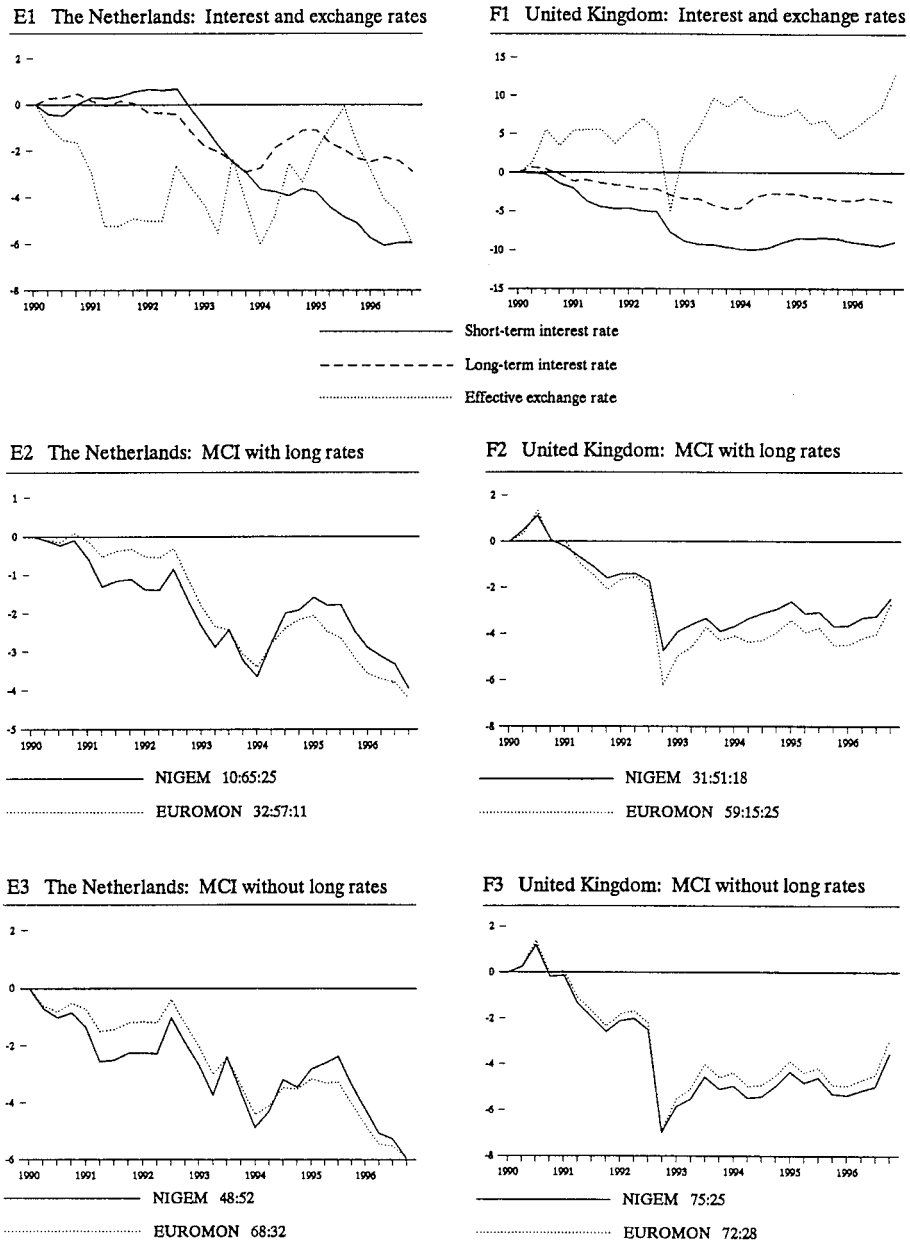

Figure 1 – MCIs per country

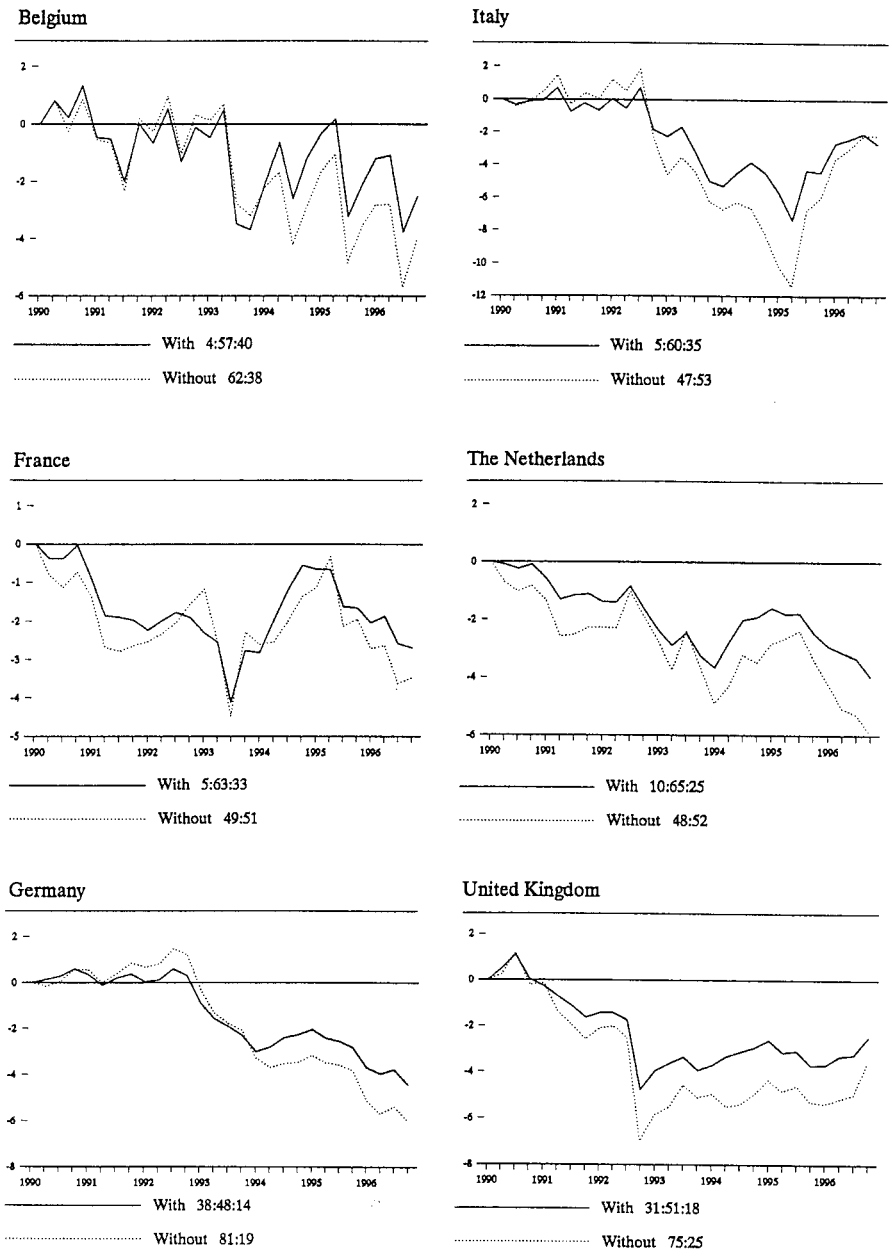

Figure 2 – MCIs with and without long-term interest rate

3.4 *The Monetary Conditions in the EMU*

The weights in the MCIs for EMU are calculated assuming that the union commenced in 1990. In EMU, the official money market rate is set by the European Central Bank. It can be assumed that the 3-month interest rates of EMU countries will be set to this rate straightaway, an assumption made in the following analysis. Long-term interest rates of the EMU countries may differ across countries. Long-term credit and government bonds, for instance, no longer contain currency risk in a one-currency area, but other types of (country) risk may remain. Under EMU one single currency will be exchanged with non-EMU countries.

The EMU as a whole is said to be a rather closed economy, like the US. In 1995 about 12% of GDP was exported to countries with a different currency, whereas imports from these countries amounted to 9.9% of GDP. For all European economies the transition to EMU involves a considerable reduction in exchange rate volatility, in particular for the very open economies such as Belgium and the Netherlands, which carried out 40% of their trade in foreign currencies in 1995. For this reason the exchange rate effects on GDP within the EMU are expected to diminish in comparison with the current situation where different currencies prevail. A single currency will also see exchange rate effects on GDP relative to interest rate effects on GDP diminishing. In calculating the MCI, the interest rate(s) weight will increase at the cost of the exchange rate (see Table 2a). Apart from trade, financial inflows and outflows will of course also have a considerable impact. These flows, however, are not explicitly represented in our modelling approaches, and therefore their impact on monetary conditions and their interrelationships cannot be measured.

NiGEM contains an option to simulate the EMU. We carry out simulations where Belgium, France, Germany, Italy, the Netherlands, and Spain are included in the EMU.[6]

EUROMON already contains a small union, consisting of Belgium, Denmark, France, Germany, and the Netherlands. To simulate EMU Italy and Spain are added to the union.

Table 3 presents the GDP responses for three simulations: a short-term interest rate decrease of 1%-point, a long-term interest rate decrease of 1%-point, and an exchange rate depreciation of the EMU currency of 1%, all lasting for 5 years and returning to baseline thereafter. Like the simulations for the individual countries in Table 2, the pure effect of these shocks is measured by exogenizing the other two rates. The final column contains the simulations of the short-term rate shock with endogenous long-term rates.

The NiGEM results show that the absolute effect on EMU GDP following the exchange rate depreciation of the EMU currency – the euro – is smaller than for each of the individual countries (see Table 2a): the effect in the second year is

6 In NiGEM (April 1997 version) only these countries can be included in the EMU.

TABLE 3 – TWO-YEAR RESPONSES OF REAL GDP TO INTEREST AND EXCHANGE RATE SHOCKS UNDER EMU

	Including long-term rates			Long-term rates endogenous
	Nominal short-term interest rate	Nominal long-term interest rate	Nominal effective exchange rate	Nominal short-term interest rate
NiGEM	0.210	0.372	0.139	0.349
EUROMON	0.127	0.436	0.032	0.256

The shocks are similar to those presented in Tables 2a-2b, except for the EMU.

0.139 whereas the effect in Germany without EMU is 0.147 (the country with the smallest effect), and in Belgium without EMU it is equal to 0.261 (the country with the highest effect). The same holds for the EUROMON results. Exchange rate fluctuations thus have a lower influence on EMU GDP with EMU imposed than without EMU, a result due to the fact that the EMU is a more closed economy. The interest rate effects are not lower, as the NiGEM short-term interest effect is 0.210 in the second year which is much higher than the effects for Belgium (0.024), France (0.028), Italy (0.024), and the Netherlands (0.091) without EMU. The EUROMON effects also fall between the short-term effects for the individual countries. The same holds for the results reported in the final column of Table 3, which shows the short-term interest rate effects when the long-term interest rate channel is allowed to operate.

In NiGEM the exchange rate effect on GDP is about one quarter of the sum of the short-term rate and long-term rate effects (0.139/0.582), and one eighteenth (0.032/0.563) in EUROMON. The sum of the interest rate effects in comparison with the exchange rate effect is thus larger with EMU than without, cf. Belgium, France, Italy, and the Netherlands (Figure 1). The ratio of the interest rate effect to the exchange rate effect is thus evidently lower without EMU than with EMU imposed. In NiGEM, the relative effect without EMU for Germany, which is 86:14, is almost equal to the effect with EMU imposed.

Figure 3 presents the ex post MCI results for EMU. The three rates (indexed in 1990.I) are shown in the first box. The second box contains (i) the MCI with the short-term rate, long-term rate and exchange rate and (ii) the MCI with only the short-term rate and exchange rate with NiGEM weights imposed, the third box similarly with EUROMON weights imposed. The exchange rate of the EMU is the nominal dollar-ecu rate. An increase (decrease) of this rate indicates an appreciation (depreciation) of the ecu. The weights, rescaled to sum to one, are again reported beneath the box.

The MCIs show a clear tightening in the beginning of 1992 when Italy had to increase its interest rate in order to support the lira. Following the removal of the

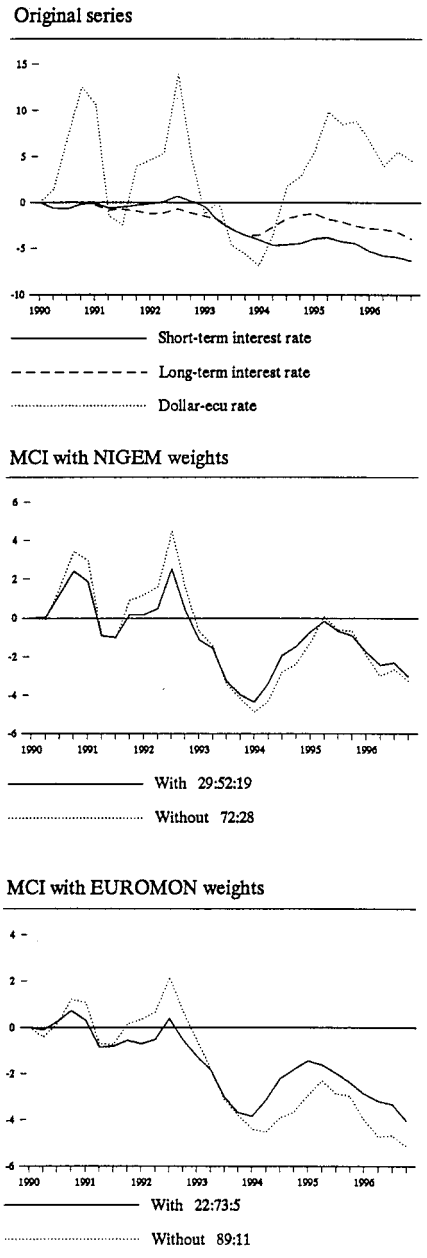

Figure 3 – MCIs for the EMU

lira from the EMS (as well as the UK pound), monetary conditions in the EMU countries eased, reflecting lower short-term interest rates and a further depreciation of the ecu up until 1994. A comparison of the two MCIs, as with most MCIs in Figure 1, does not suggest that the inclusion of the long-term rate makes a significant difference in the development of the MCI. Neither do the two models differ much – compare the second and the third box in Figure 3. The level of the MCI with the long rate included exceeds the other MCI from 1994 onwards, as the spread (in relation to base 1990.1) between the long and short rates increased during this period.

3.5 *Summary*

Table 4 summarizes the weights for the short-term interest rate, long-term interest rate, and the exchange rate. These MCI weights indicate higher pressure from interest rates than exchange rates, and higher pressure from long-term rates than from short-term rates.

TABLE 4 – MCI-WEIGHTS

	NiGEM			EUROMON		
	Nominal short-term interest rate	Nominal long-term interest rate	Nominal effective exchange rate	Nominal short-term interest rate	Nominal long-term interest rate	Nominal effective exchange rate
Belgium	4	57	40	4	83	13
France	5	63	33	17	61	22
Germany	38	48	14	5	85	10
Italy	5	60	35	62	23	15
Netherlands	10	65	25	32	57	11
UK	31	51	18	59	15	25
EMU	29	52	19	22	73	5

Note: See Tables 2a-2b and 3.

4 CONCLUSIONS

The construction of the MCI has recently been under a wave of criticism. Some points are definitely justified, such as the wide confidence intervals used for the estimated weights. These points would however, to a certain extent, also pertain to other empirical measures used by policymakers which are often reported with no confidence intervals at all. This criticism provides no contribution towards a better understanding of the monetary stance.

This paper uses the methodology of the MCI and provides an in-depth examination of the GDP effects of interest and exchange rates in Europe. This is carried out using macromodels which, in contrast to the often adopted partial IS-curve analysis, describes the economic consequences of monetary policy more completely. From these macromodels MCI weights are obtained.

In line with other macromodel simulation results obtained by Kennedy and Van Riet, we find strong impact effects on GDP following exchange rate changes in comparison with interest rate changes for several European countries. This contradicts estimates of – often reported – MCIs in which the interest rate is attributed a higher weight. Yet, the results in the first year are extremely small as agents react sluggishly to changes, and therefore deriving weights from them is not sensible. For this reason we use the two-year responses.

Like the study by Kennedy and Van Riet our results also suggest that the inclusion of the long-term interest rate is sensible. In most cases MCIs with only a short-term interest rate and exchange rate differ from MCIs that also include the long-term rate. However, the difference is more profound in the levels than in the turning points or the sign of the change. During periods in which the yield curve changes sign, i.e. the short-term rate no longer falls below the long-term rate, or vice versa, the inclusion of long-term rates in the MCI can become important.

In comparison with the individual country effects, the impact of the exchange rate on GDP under EMU diminishes provided that the EMU trades with other EU countries, the US, and Japan in accordance with current trade patterns. The EMU exchange rate effects are not only lower in absolute levels, but also in relation to the interest rate effect on GDP. The influence of exchange rate fluctuations on GDP can, however, not be neglected. As the exchange rate continues to bring about important changes in GDP growth via imports and exports, which will lead to inflation in the end, monetary conditions are better reflected by developments in both the short-term interest rate and the effective exchange rates.

Once again, we wish to stress the importance of using weights obtained by models that specify consumer and investment behaviour and exports and imports in detail. Monetary policy which affects interest rates, affects consumption and investment directly, and changes in exchange rates affect exports and imports by their effect through prices. The transmission of monetary policy and/or exchange rate fluctuations to GDP is not a long process, but cannot be measured precisely from aggregate IS-equations alone.

We emphasise that the MCI should be presented with care; it is an improvement on presenting the interest rate or the exchange rate alone, but both underlying components should still be readily available to explain significant changes in the MCIs development.

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