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Pietro Biroli, Gilles Mourre and Alessandro Turrini*

The Adjustment Mechanism in the Euro Area

This paper analyses the adjustment mechanism in the euro area prior to the crisis. Results show that the real exchange rate adjusted to redress cyclical divergences and that after monetary unification, real exchange rate dynamics became less reactive to country-specific shocks but also less persistent. Regulations affecting price and wage nominal flexibility and employment protection play a role in the adjustment mechanism. Indicators of product and labour regulations appear to matter for both the reaction of price competitiveness to cyclical divergences and for the inertia of competitiveness indicators.

Since the early debate on the European Economic and Monetary Union (EMU), adjustment to asymmetric shocks in the absence of a flexible nominal exchange rate has been perceived as a major challenge to participating countries. In particular, it has been stressed that the euro area scores less well than other monetary unions, notably the US, in terms of wage and price flexibility. In light of the optimal currency area theory,¹ this has implications for the desirability of monetary unification, since in the presence of asymmetric shocks, the slow adjustment of wages and prices would not permit the adjustment in competitive-

ness necessary to bring actual output back in line with potential output.²

After more than a decade of experience with EMU, the simultaneous presence of non-negligible inflation and growth differentials across euro area countries and diverging real exchange rates and current account balances in some eurozone countries has led to doubts about the effectiveness of the competitiveness channel as a tool for intra-area adjustment. The issue has become even more relevant since the global recession of 2008, as the global financial market shocks had largely country-specific effects and intra-euro area growth differences widened dramatically.

The aim of this paper is to assess the effectiveness of the euro area adjustment mechanism and the role played by regulatory frameworks in product and labour markets. There is wide consensus that structural reforms are the way forward to improve the resilience of the euro area. For instance, the 2006 Commission Annual Progress Report on the Growth and Jobs Strategy and the 2011 and 2012 Commission Annual Growth Survey emphasise that reforms in product and labour markets need to be consistent with an efficient intra-area adjustment mechanism. In spite of the wide agreement on the potential role of structural reforms to improve the resilience of euro area economies, very few studies have analysed empirically whether, how and to what extent product and labour market regu-

* The views expressed in this paper are those of the authors only and do not necessarily represent those of the institutions with which the authors are affiliated. Eric Ruscher and Alfonso Arpaia provided valuable comments on a previous version of the paper.

1 P. Kenen: The Theory of Optimum Currency Areas: An Eclectic View, 1969, reprinted in: Exchange Rates and the Monetary System: Selected Essays of Peter B. Kenen, Edward Elgar Publishing, Aldershot 1994, here pp. 3-22; R. McKinnon: Optimum Currency Areas, in: American Economic Review, Vol. 53, No. 4, pp. 717-725, 1963; R. Mundell: A Theory of Optimum Currency Areas, in: American Economic Review, No. 51, Vol. 51, pp. 657-664, 1961.

2 Although there is a debate as to whether the nominal exchange rate works efficiently as a shock absorber or is rather a source of shocks to the economy (see e.g. M. Artis, M. Ehrmann: The exchange rate: A shock-absorber or a source of shocks?, CEPR Discussion Paper, No. 2550, London 2000).

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lations affect the reaction of relative prices to cyclical divergences.³

Our analysis focuses on the pre-crisis period to exclude from the sample exceptional and temporary variations in relevant macroeconomic variables. We estimate the response of real effective exchange rates (REER) and inflation differences to relative output gaps across euro area countries along the lines of Honohan and Lane⁴ and Arpaia and Pichelmann.⁵ We find that the REER behaves in such a way as to dampen country-specific shocks measured as differences between the domestic and the euro area average output gap. The estimates also suggest that after monetary unification, REER dynamics have become less reactive to cyclical divergences but also less persistent. Using a measure of price competitiveness which abstracts from changes in nominal parities (i.e. the difference between domestic inflation and that of euro area partners), it is confirmed that inflation differentials have become less persistent after monetary union, but their reaction to cyclical divergences has somehow increased. This evidence suggests that while a reduced reaction of the REER to country-specific shocks could be explained by the loss of intra-euro area nominal exchange rate adjustment, the reduced persistence of the REER could be related to the fact that inflation differentials among euro area countries appear to have become less persistent after monetary union.

We then assess whether indicators of product and labour market regulations matter for the reaction of relative prices to macroeconomic shocks. For this purpose, we check whether product and labour market regulations support a competitiveness adjustment in the face of country-specific demand shocks by interacting structural indicators with output gap differentials vis-à-vis the rest of the euro area and with a price competitiveness inertia term. These interactions allow us to gauge whether regulatory variables hamper or strengthen the response of price competitiveness to asymmetric demand shocks.

It appears that regulations, notably those affecting the nominal flexibility of prices and wages and that of employ-

ment, generally hamper the adjustment to idiosyncratic shocks at impact and increase the inertia of price competitiveness. In light of reduced price and EPL regulations in past decades across euro area countries, the result is consistent with the reduced persistence of inflation differentials and has implications for the design of adjustment-friendly product and labour market reforms.

Analytical approach

The impact of product and labour market structural characteristics on the working of the competitiveness channel is empirically examined by estimating alternative reduced-form equations for the real exchange rate.

First, we relate the real exchange rate to the cyclical condition of the country concerned compared with those of the rest of the euro area. The REER of a given country computed relative to the rest of the area is expected to depreciate (appreciate) whenever the output of the country concerned is below (above) that of the rest of the area. Such movements in the real exchange rate in turn affect competitiveness in such a way as to bring back the cyclical conditions in single countries in line with those prevailing in the euro area as a whole.

The estimated equation is as follows:

$$\Delta \log REER_{it} = \alpha + \alpha_i + \beta \Delta \log REER_{i,t-1} + \gamma \log REER_{i,t-1} + \eta (GAP_{i,t-1} - GAP_{EA-i,t-1}) + u_{it} \quad (1)$$

where subscripts i and t indicate countries and time periods respectively, while η denotes a particular regulatory variable. GAP denotes the output gap, α_i are country fixed effects and u_{it} are the error terms. The subscript $EA-i$ denotes variables referring to an aggregate composed by all euro area countries except country i .

The coefficient of the relative output gap captures the reaction of the REER to country-specific cyclical imbalances. The inclusion of the lagged change in the REER in Equation 1 allows us to take into account an inertia factor in the dynamics of competitiveness. The inclusion of the lagged level of the REER captures a mean reversion effect, i.e. a tendency for the REER level to be stable over time.⁶

As an alternative price competitiveness variable, relative inflation π ($\pi = \log REER - \log NEER$) is used instead of the

3 The term “regulation” in this paper is used interchangeably with “product and labour market institutions”. Strictly speaking, regulations refer to binding rules set by the government, such as price control, employment protection legislation and minimum wages. In this paper, the term also encompasses other institutions, such as the wage-setting mechanisms and institutions (often shaped by the social partners) and the unemployment benefit systems.

4 P. Honohan, P. Lane: Inflation Divergence, in: Economic Policy, Vol. 18, No. 37, 2003, pp. 357-394.

5 A. Arpaia, L. Pichelmann: Nominal and real wage flexibility in EMU, European Economy Economic Papers, No. 281, Brussels 2007.

6 The inclusion of per capita GDP to capture “equilibrium appreciation” in line with the Balassa-Samuels argument turns out to be largely insignificant.

REER. The purpose is to examine the responsiveness of relative prices abstracting from changes in nominal exchange rates. For this competitiveness variable, the change in the intra-area nominal effective exchange rate (NEER, which is obviously zero from 1999 onwards) is to be included among the explanatory variables to control for relative price movements linked to shifts in the exchange rate regime, central bank interventions or speculative capital movements affecting the exchange rate. Hence, the specification reads as follows:

$$\Delta\pi_{it} = \alpha + \alpha_i + \beta\Delta\pi_{i,t-1} + \gamma\log\pi_{i,t-1} + \delta\Delta\log NEER_{it} + \eta(GAP_{i,t-1} - GAP_{EA-i,t-1}) + u_{it} \quad (2)$$

The basic specification in Equation 2 is augmented in such a way to gauge the role of product and labour markets in driving the responsiveness of relative prices. Interaction terms between indicators of labour and product market regulations and both the relative output gap and the persistence variables were added. To avoid the loss of estimate precision due to high multicollinearity among regulation variables, each type of regulatory variable is introduced one at a time, and their interactions with the relative output gap and the relative inflation persistence are estimated separately.

Data and empirical implementation

Estimations are performed on a panel of euro area countries for the period from 1970 to 2006.⁷ The countries considered are the 12 countries that joined the monetary union in 1999, excluding Luxembourg and including Greece. The source of macroeconomic variables is the DG ECFIN AMECO database.

The REER is calculated on the basis of the GDP deflator. Since the aim of the analysis is to assess the functioning of the intra-euro area adjustment mechanism, the REER is computed with respect to the remaining euro area countries considered in the sample using “double” export weights that take into account export competition both in own and third markets. The NEER is computed with respect to the same set of partner countries and is measured in such a way that an increase means appreciation. The relative output gap variable is also constructed with respect to the remaining euro area countries included in the sample using GDP weights.

⁷ To obtain a sample of relatively homogenous countries and to avoid a highly unbalanced panel due to missing observations, Luxembourg and Slovenia are not included in the sample.

A wide range of indicators of regulations in product and labour markets, mainly developed for OECD countries, were tested.⁸ All regulatory variables increase with the strictness of regulations. Most of the regulatory variables vary both across countries and over time. All regulatory variables are standardised in such a way as to have zero mean and unit standard deviation. This standardisation facilitates the interpretation of results.

In estimating the empirical specifications illustrated above, a series of econometric difficulties are encountered. First, residuals might not be well-behaved due to heteroscedasticity and correlation within panels. Second, depending on the dynamic specification of the model, residuals might be autocorrelated. Third, the inclusion of the lagged dependent variable in a panel regression may lead to inconsistent estimates. Fourth, a more general inconsistency problem could arise from the endogeneity of some regressors. In particular, although the relative output gap variable is lagged, an endogeneity issue might still arise if the variable is highly persistent. Moreover, the (insufficient) reaction of competitiveness to shocks may also encourage policy makers to amend or reform the regulations/institutions, which might also raise an endogeneity issue.

Taking account of the above issues, Equations 1 and 2 are estimated using three different methods: fixed effects OLS with robust standard errors, fixed effects GLS with heteroscedastic panels and an AR(1) error autocorrelation structure, and GMM to avoid the inconsistency of GLS estimates in a dynamic panel and to correct for possible endogeneity of the regressors.

Competitiveness adjustment and monetary union

Table 1 reports the estimations for the basic specification in Equation 1, without the impact of institutions (i.e. the interaction terms). Separate estimations are provided for the periods 1970-2006 and 1999-2006 (EMU membership years, except for Greece).

Results appear relatively robust with respect to the estimation method adopted. In particular, the similarity of

⁸ P. Conway, G. Nicoletti: Product Market Regulation in the Non-Manufacturing Sectors of OECD Countries: Measurement and Highlights, OECD Economics Department Working Papers, No. 530, OECD Publishing, 2006; P. Conway, V. Janod, G. Nicoletti: Product Market Regulation in OECD Countries: 1998 to 2003, OECD Economics Department Working Papers, No. 419, OECD Publishing, 2005; A. Bassanini, R. Duval: Employment Patterns in OECD Countries: Reassessing the Role of Policies and Institutions, OECD Economics Department Working Papers, No. 486, OECD Publishing, 2006.

Table 1
Real effective exchange rate adjustment and cyclical divergence

	1970 - 2006			1999 - 2006		
	Fixed effect OLS	Fixed effect GLS	GMM	Fixed effect OLS	Fixed effect GLS	GMM
	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta \log \text{REER}(-1)$	0.232 (5.64)***	0.205 (4.40)***	0.238 (6.72)***	-0.019 (0.14)	-0.083 (0.88)	-0.174 (1.69)*
$\log \text{REER}(-1)$	-0.129 (3.69)***	-0.122 (6.20)***	-0.162 (5.03)***	-0.007 (2.09)**	-0.039 (1.72)*	-0.026 (1.06)
Relative output gap(-1)	0.684 (4.89)***	0.667 (6.11)***	0.714 (5.87)***	0.502 (7.43)***	0.512 (5.92)***	0.603 (11.14)***
Estimated AR error coefficient		0.0678			0.1407	
Observations	385	385	374	88	88	88

Notes: Dependent variable: $\Delta \log \text{REER}$, GDP deflator, with respect to the rest of the euro area partners. Fixed effects OLS is estimated with standard errors robust with respect to heteroscedasticity and within-panel error correlation. GLS estimates allow country fixed effects and assume residuals' first-order autoregression. GMM estimates are obtained with the Arellano-Bond procedure; relative output gap is considered as predetermined and estimated using past values. Absolute value of z statistics in parentheses. * significant at 10%, ** significant at 5%, *** significant at 1%.

GLS and OLS estimates and the small estimated autoregression coefficient for residuals suggest the autoregressive behaviour of residuals is not a major issue.

The REER appears to be characterised by a significant inertia component over the whole sample, which becomes much lower and insignificant after EMU. The REER appears to converge to a stable level over time, as indicated by the negative and significant coefficient of the lagged REER. Also, this element of convergence appears to have somehow weakened after EMU.

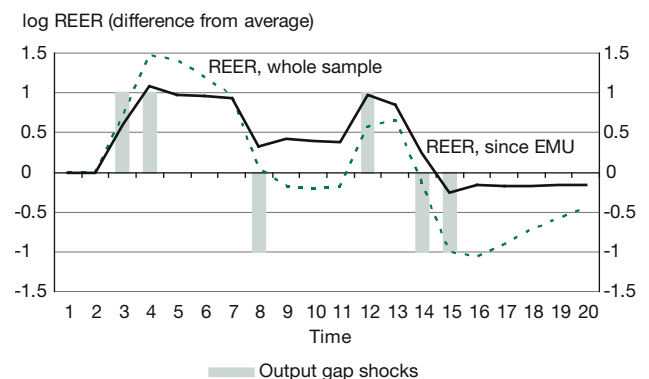
The real exchange rate appears to react positively and significantly to differences between the domestic and rest-of-area output gap. Each additional percentage point of output gap induces an increase by about 0.7 per cent per year at impact in the REER. This is in line with expectations and indicates that changes in competitiveness provide an effective channel of adjustment in the euro area. However, it appears that the reaction of the REER to relative cyclical conditions is lower when using a sample that starts after 1998. Although these results should be interpreted with care due to the small sample period following the establishment of EMU, they suggest that the response at impact of the REER to cyclical divergences may have weakened after the elimination of possible fluctuations in nominal parities. The REER also appears to have become less persistent after 1998.

Figure 1 simulates the typical response of the REER to a series of country-specific shocks affecting the relative output gap, distinguishing between the periods before

and after EMU. The graph shows that although the response of the REER to shocks was stronger before EMU, there was also a bigger risk of overshooting – with the REER continuing an appreciation (depreciation) trend even after the occurrence of a positive (negative) shock – associated with the higher persistence of REER developments.

While the reduced response of REER developments to cyclical divergences after EMU could be seen as con-

Figure 1
Reaction of REER to output gap divergences



Source: Own calculations based on DG ECFIN AMECO database.

Note: The graph plots the level of the log REER obtained expressing the equations in columns (3) and (6) in Table 1 in level terms and assuming a zero constant term and the relative output gap to be equal to the values reported in the graph.

Table 2
Price competitiveness adjustment and cyclical divergence

	1970 - 2006			1999 - 2006		
	OLS	GLS	GMM	OLS	GLS	GMM
	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta\pi(-1)$	0.587 (11.80)***	0.626 (20.69)***	0.546 (8.62)***	0.125 (1.50)	0.11 (1.22)	0.182 (2.18)**
$\pi(-1)$	-0.014 (3.25)***	-0.017 (7.54)***	-0.019 (2.87)***	-0.091 (2.44)**	-0.063 (3.01)***	-0.1 (2.78)***
Relative output gap(-1)	0.242 (3.74)***	0.265 (5.53)***	0.222 (3.23)***	0.356 (5.37)***	0.386 (4.92)***	0.358 (5.65)***
$\Delta\log\text{NEER}(-1)$	-0.099 (2.79)***	-0.093 (4.57)***	-0.094 (2.75)***			
Estimated AR error coefficient		-0.074			0.073	
Observations	385	385	374	88	88	88

Note: Dependent variable: $\Delta\pi = \Delta\log\text{REER} - \Delta\log\text{NEER}$, where REER is computed on the basis of the GDP deflator, and both REER and NEER are given with respect to the rest of the euro area partners. Fixed effect OLS is estimated with standard errors robust with respect to heteroscedasticity and within-panel error correlation. GLS estimates allow country fixed effects and assume residuals' first-order autoregression. GMM estimates are obtained with the Arellano-Bond procedure; relative output gap is considered as predetermined and estimated using past values. Absolute value of z statistics in parentheses. * significant at 10%, ** significant at 5%, *** significant at 1%.

sistent with the loss of the nominal exchange rate as a shock absorber, the fall in the inertia of REER changes after EMU is less obvious. Digging deeper into the determinants of relative price dynamics, abstracting from fluctuations in nominal exchange rates, could help interpret this result.

Table 2 reports estimates from Equation 2, using inflation differences as the dependent variable. Results suggest that relative price dynamics are characterised by an inertia component that is significant and stronger than that of the REER, that mean reversion is weaker compared with that of the REER and that the changes in relative prices are negatively related to changes in nominal exchange rates. Given that an increase in the NEER is interpreted as an effective nominal appreciation of the currency, the result points to standard inflationary effects of currency depreciations. Possibly in light of the presence of wage indexation schemes, these appear significant, in spite of the fact that inflation differences are computed on the basis of GDP deflators (hence, higher prices of imported final goods following nominal exchange rate depreciation are not expected to be reflected in this inflation measure).⁹ Regarding the impact response of relative prices to cyclical divergences, it appears to be smaller

9 Qualitative results in terms of competitiveness adjustment to shocks and competitiveness inertia in Table 2 hold irrespective of the inclusion of the NEER variable.

than that of the REER, as expected, but still significant. As for the role of EMU, it turns out that after 1998 the persistence term falls significantly (thus contributing to the reduced persistency of REER developments), while the reaction to output gaps is somehow strengthened. It should, however, be borne in mind that the results obtained for the EMU period are based on a fairly limited number of observations. All in all, the evidence suggests that price competitiveness reacts significantly to cyclical divergences. Although the loss of nominal exchange rate flexibility could have entailed a less effective response to country-specific shocks, the reduced inertia element after EMU suggests that the adjustment mechanism has become more apt to deal with a turbulent environment that requires a prompt response of relative prices to short-lived shocks.

The role of product and labour market regulations for the adjustment mechanism

Table 3 lists the regulation variables considered for interacting the shock and persistence terms and their average values across the sample countries before and after EMU. It appears that, with the exception of unemployment benefits and the corporatism indicator, all other regulation indicators tend to have lower values after 1998, especially product market regulation indicators.

Table 3
Average value of regulatory variables

Variable	Before 1999	After 1999
Overall product market regulation indicator	0.3	-1.8
Price controls	0.3	-0.9
Employment protection legislation	0.0	-0.1
Minimum wage	0.1	-0.4
Union density	0.1	-0.4
Unemployment benefits	-0.1	0.6
Corporatism	-0.1	0.3

Sources: Own calculations based on P. Conway, G. Nicoletti: Product Market Regulation in the Non-Manufacturing Sectors of OECD Countries: Measurement and Highlights, OECD Economics Department Working Papers, No. 530, OECD Publishing, 2006; A. Bassanini, R. Duval: Employment Patterns in OECD Countries: Reassessing the Role of Policies and Institutions, OECD Economics Department Working Papers, No. 486, OECD Publishing, 2006.

Note: Regulatory variables are standardised over the whole available sample. The overall product market regulation indicator is based on an OECD summary indicator of regulatory impediments to product market competition in seven non-manufacturing industries: gas, electricity, post, telecoms (mobile and fixed services), passenger air transport, railways (passenger and freight services) and road freight. Data are available for 1975-2003. The years 1970-1975 are assumed to have the same outcome as 1975. Price control values rely on OECD economy-wide indicators of state control on prices for 1998 and 2003. Years before 1998 are assumed to have the same outcome as 1998; years after 2003 are assumed to have the same outcome as 2003. The employment protection legislation index is based on OECD data considering both permanent and temporary labour contracts. There are some missing values for Germany, Finland and Portugal. No data are available for Greece. The unemployment benefit replacement rate index reports the country average replacement rate of unemployment benefits. There are some missing values for Germany, Finland and Portugal. No data are available for Greece. The minimum wage index is expressed as a percentage of the median wage. Data are available for 1982-2003. The corporatism indicator captures the degree of centralisation/co-ordination of the wage bargaining processes, which takes a value of one for decentralised and uncoordinated processes and values of two and three for intermediate and high degrees of centralisation/co-ordination respectively. The indices are standardised to have zero mean and unit variance.

These downward trends make regulations a strong candidate for explaining the reduction in competitiveness inertia after EMU.

Table 4 reports the results obtained by estimating the determinants of price competitiveness changes (inflation differentials) and interacting regulation variables with relative output gaps and, subsequently, with persistence terms. The estimation method is the GMM (column 3 in Table 2 reports the results of competitiveness determinants with no interactions). Only the value of interaction terms is reported in Table 4. Results are reported split-

ting the sample in such a way to include only the period following the monetary union and only observations where demand shocks are negative (so that the REER should be falling to fulfil its re-equilibrating role). This second check is relevant to gauge the effect of regulations that are a priori likely to have an asymmetric impact on adjustment depending on whether wages or prices are supposed to rise or fall. The coefficients displayed in the table represent the change in the reaction of inflation differentials to cyclical divergences or to their own lagged value. Recalling that the regulatory variables are standardised so as to have zero mean and a standard deviation of one, these coefficients measure the change in the reaction of inflation differentials associated with a one standard deviation change in each regulatory variable.

Regarding *product market regulations*, both the overall product market regulation indicator and the price controls variable turn out to significantly raise the persistence of competitiveness in periods of negative cyclical divergences. The result is in line with expectations. The overall product market regulation indicator considers a series of regulations and distortions to competition in public utilities, transport and postal services. It has been shown empirically that firms tend to reset their prices more frequently in markets more open to competition.¹⁰ The price controls indicator instead provides a measure of regulations directly aimed at controlling prices and applies to the whole economy. In such a case, the link between regulation and nominal rigidity is a direct one. The evidence shows that, in addition to increasing competitiveness inertia in periods of negative cyclical differentials, higher price controls appear to be significantly associated with a less efficient adjustment to cyclical divergences.

Note that the impact on competitiveness inertia changes signs and becomes significant when the sample is restricted to the post-EMU years. A possible explanation may have to do with the fact that the impact of these regulations is non-linear, since after 1998 regulations were on average much less stringent (see Table 3). A similar result is found for other regulations (employment protection, minimum wages) that are shown to raise competitiveness inertia over the whole period but to reduce it starting from 1999. Also in these cases, the explanation

¹⁰ For evidence on the euro area, see: S. Fabiani, M. Druant, I. Hernandez, C. Kwapil, B. Landau, C. Loupias, F. Martins, T. Matha, R. Sabbatini, H. Stahl, A. Stockman: The Pricing Behaviour of Firms in the Euro Area: New Survey Evidence, in: International Journal of Central Banking, Vol. 2, No. 3, 2006, pp. 3-47.

Table 4
Competitiveness adjustment, cyclical divergence, product and labour market regulation

Institution	Interaction term	Sample		
		All years (1970-2006)	Year \geq 1999	Relative output gap < 0
Product market:				
Overall product market regulation indicator	Relative output gap	-0.121 (1.23)	0.008 (0.05)	-0.13 (0.92)
	Persistence	0.084 (0.94)	-0.3 (2.21)**	0.226 (1.80)*
Price controls	Relative output gap	-0.149 (2.01)**	-0.281 (2.08)**	-0.069 (1.07)
	Persistence	0.067 (1.44)	-0.083 (2.68)***	0.096 (2.02)**
Labour market:				
Employment protection legislation	Relative output gap	-0.118 (2.39)**	-0.214 (1.87)*	-0.009 (0.15)
	Persistence	0.113 (10.11)***	-0.084 (1.46)	0.15 (5.76)***
Unemployment benefits replacement rate	Relative output gap	0.119 (0.96)	-0.305 (4.82)***	-0.002 (0.02)
	Persistence	0.008 (0.18)	0.265 (2.65)***	-0.04 (0.73)
Minimum wage	Relative output gap	-0.097 (0.68)	-0.364 (1.21)	-0.448 (2.08)**
	Persistence	0.213 (4.25)***	-0.023 (0.10)	0.211 (1.50)
High corporatism	Relative output gap	-0.029 (0.55)	0.112 (1.36)	-0.012 (0.12)
	Persistence	-0.113 (2.49)**	0.151 (1.58)	-0.126 (1.73)*
Intermediate corporatism	Relative output gap	-0.038 (0.63)	-0.106 (1.36)	-0.036 (0.34)
	Persistence	0.098 (2.13)**	-0.143 (1.58)	0.149 (2.18)**
Low corporatism	Relative output gap	0.205 (3.75)***		0.096 (1.25)
	Persistence	0.012 (0.78)		-0.068 (2.85)***

Note: The table reports the value of the coefficient of the interaction of product and labour market institution indicators with the relative output gap and the persistence variable using the same specification as in column (3) in Table 2 (GMM estimation). The “low corporatism” dummy variable takes a value of one when bargaining is decentralised and uncoordinated and zero otherwise. Absolute value of z statistics in parentheses. * significant at 10%, ** significant at 5%, *** significant at 1%.

could lie in the fact that these regulations were stringent, especially in the years preceding the monetary union.¹¹

Turning to the impact of *labour market regulations*, strict employment protection legislation (EPL) appears to both significantly reduce the responsiveness of relative inflation to cyclical divergence and raise its persistence. The estimated impact of EPL on competitiveness adjustment seems to be in line with expectations. EPL could generate labour hoarding during downturns, thus leading to pro-cyclical productivity reductions and hampering the required downward adjustment of unit labour costs. Moreover, in a bargaining setting, stricter EPL raises the bargaining power of workers and unions (“the insiders”)

that are in a better position to avoid wage cuts.¹² This is in line with recent evidence for OECD countries suggesting that EPL leads to higher nominal wage rigidity.¹³

The unemployment benefit variable has a different effect before and after monetary unification. While in earlier years the impact is largely insignificant, generous unemployment benefits after EMU are found to both reduce the responsiveness of relative inflation to cyclical divergences and raise its persistence. The finding could be explained by the fact that unemployment benefits rose over time on average (see Table 3). The result after 1998

11 It is important to stress that the small size of the sample after 1999 calls for caution when interpreting the results estimated after the creation of the EMU.

12 See e.g. S. Holden: The Costs of Price Stability: Downward Nominal Rigidity in Europe, in: *Economica*, Vol. 71, 2004, pp. 183-208. On the other hand, stricter EPL, by contributing to an increase in the unemployment of the “outsiders”, may exert downward pressures on their wages.

13 S. Holden, F. Wulfsberg: Downward Nominal Rigidity in the OECD, University of Oslo Department of Economics Memorandum No. 10/2005, 2005.

appears in line with what would a priori be expected. Generous unemployment benefits may hinder the downward adjustment of wages during phases of weak labour demand by increasing the reservation wages and thereby the bargaining power of workers, thus also hampering the adjustment of relative inflation.

The result concerning high minimum wages, which reduce the reaction to cyclical divergences and increase the persistence of inflation differentials, also squares with expectations. Minimum wages do indeed appear to hamper the adjustment of relative inflation, particularly when relative inflation has to adjust downwards (negative relative output gap). The fact that minimum wages are found to raise competitiveness inertia could be linked to the presence of indexation clauses which provide that minimum wage developments should, at least in part, follow the development of past inflation.

Finally, Table 4 shows that wage bargaining centralisation and co-ordination (corporatism) affects the reaction of competitiveness to shocks and raises its inertia, possibly in a non-linear fashion. Highly centralised wage bargaining (high corporatism) significantly reduces the persistence of inflation differences. Decentralised wage bargaining (low corporatism) also has a significant impact on their persistence in periods of negative cyclical differentials and enhances the reaction of inflation to differences to cyclical divergences. Intermediate wage bargaining – which normally corresponds to bargaining at the industry level – is instead associated with a significantly higher level of inertia of price competitiveness. This result seems consistent with the findings by Calmfors and Driffill¹⁴ that unions' inflationary impact on wages would be stronger for intermediate degrees of centralisation because in this case unions tend not to take into account the broader implications of their wage demands.

Concluding remarks

This paper analyses the competitiveness adjustment mechanism in the euro area and its link with labour and product market regulations. Results show that competitiveness in EMU has moved towards easing country-specific cyclical imbalances. Results also indicate that since the establishment of the monetary union, real exchange rate developments in euro area countries have become less reactive to country-specific cyclical imbalances, but also less persistent. Analysing the determi-

nants of inflation differentials (that abstract from changes in nominal exchange rates) as an alternative measure of price competitiveness, it turns out that this measure becomes slightly more reactive to shocks after monetary union and clearly less persistent. All in all, the evidence suggests that although the loss of nominal exchange rate flexibility could have entailed a less effective response to country-specific shocks, the reduced inertia element since EMU suggests that the adjustment mechanism has become less subject to overshooting and better able to deal with a turbulent environment where a key desirable feature is prompt responses of relative prices to short-lived shocks possibly hitting in opposite directions.

Changes in product and labour market regulations are a natural candidate for explaining the changing behaviour of price dynamics in response to shocks and their inertia. Our analysis reveals that tight product market regulation, strict employment protection, a high minimum wage as compared with the average wage and generous unemployment benefits appear – to a different extent and possibly only under certain conditions or in certain periods – to reduce the responsiveness of relative inflation to cyclical divergences, to raise its persistence or to do both. As for the degree of wage bargaining centralisation and coordination (corporatism), there is some confirmation in the data that an intermediate degree of corporatism (e.g. wage bargaining taking place mostly at sectoral level) is associated with a stronger degree of relative inflation inertia, while the opposite is found for high and low corporatist settings. This finding corroborates previous findings indicating that unions' inflationary impact on wages is stronger for intermediate degrees of centralisation.

The evidence on the impact of regulations on the efficiency of the adjustment mechanism is subject to a number of limitations related to the imperfect measurement of regulatory policies and institutions by means of synthetic indicators, limited sample size and possible problems with the empirical implementation (specification errors, the standard weak instruments issue with the use of GMM estimators). Nonetheless, the results exhibit a certain robustness across specifications and estimation methods and deliver messages of possible relevance. The above evidence on the role of regulations seems consistent with the observed falling inertia of price competitiveness dynamics since the establishment of the monetary union, thereby suggesting that the reduced stringency of product and labour market regulations over the past decades could have played a role. Moreover, the findings are broadly supportive of the recommendations on product and labour markets issued by the EU and other international organisations with a view to enhancing the adjustment capacity of euro area countries.

14 L. Calmfors, M. Driffill: Bargaining structure, corporatism and macroeconomic performance, in: *Economic Policy*, Vol. 3, No. 6, 1988, pp. 13-61.