EUROPEAN CENTRAL BANK

EUROSYSTEM

WORKING PAPER SERIES

NO 1512 / FEBRUARY 2013

LEARNING ABOUT WAGE AND PRICE MARK-UPS IN EURO AREA COUNTRIES

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In 2013 all ECB publications feature a motif taken from the €5 banknote.

Acknowledgements
Without implicating them, we would like to thank Michele Ca' Zorzi, Neale Kennedy, Geoff Kenny, Dora Kosma, Frank Smets and an anonymous referee for comments on previous versions of the paper. The views expressed in this paper are those of the authors and they do not necessarily coincide with those of the European Central Bank.

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ISSN	1725-2806 (online)
EU Catalogue No	QB-AR-13-009-EN-N (online)

Abstract: *In this paper we show that higher flexibility, measured by lower wage and price mark-ups leads to reduced inflationary pressures, increase in competitiveness, and higher output. A rational expectation and a learning version of the ECB's New Multi-Country Model are used to understand plausible dynamics of labour cost and price adjustments. In the rational expectation version of the model gains are quicker but more short-lived than in a learning environment. We argue that a rational expectation model appears appropriate to describe the abrupt wage adjustment which took place in the Baltic States. By contrast, a learning model appears better suited to capture the gradual wage adjustment of Germany during the 2000s and the one that started in Spain and Italy after the 2008-09 crisis. In fact, in view of implementation lags and the need to change institutions, in the above countries the adjustment should be expected to deliver output gains less quickly than in the Baltic States. In this paper we use the linked version of the model to evaluate the aggregate impact of the imposed shocks as well as possible spillover effects within the euro area. All in all, spillover effects are relatively small.*

Key words: unit labour costs, competitiveness, price and wage mark-ups, nominal adjustment in a Monetary Union, rational and learning expectations.

JEL Classification: E24, E27, E30, E37, J30

"...competitiveness is not about becoming richer at the expense of others – the infamous beggar-thy-neighbour doctrine. Competitiveness is about individual and collective health, with the two of them being mutually reinforcing" ***Jean-Claude Trichet****, lecture at the University of Liège, 23 February 2011.*[1]

Non-technical summary

There are many dimensions of competitiveness, related to price and non price factors. The focus of this paper is on a narrow, but equally useful, measure of competitiveness which refers to unit labour costs. Nominal ULCs are a frequently used measure of cost competitiveness of a country, they measure the nominal cost of labour per unit of output, in doing so they weight the labour cost born by the firm by a measure of efficiency, which is average productivity. For a given period, developments in nominal ULCs provide an indication of the extent an economy can effectively compete in terms of labour costs with other countries that have the same currency.

Euro area countries have witnessed growing labour cost differentials since the inception of EMU. Between 1999 and 2007 a clear dichotomy between countries with very low and very high labour cost growth emerged, with Germany, Austria and Finland belonging to the first group and Ireland, Greece, Spain, Portugal and Italy belonging to the second group. The accumulation of relative losses in competitiveness had different causes and in the catching-up countries this might have been explained by Balassa-Samuelson effects. However, by mid 2000s it started to become clear that strong inflationary domestic demand growth was not sustained by adequate supply-side improvements and a correction has become inevitable. Correcting competitiveness losses within a monetary union can be achieved through lower unit labour cost (ULC) increases relative to the average of the Union. However, the lack of flexible wages and prices might hinder a smooth and speedy adjustment and lead to a protracted and painful adjustment in output and employment. The 2008-09 recession has triggered a downward adjustment of relative ULC in the countries which overshot the euro area, the adjustment has been so far relatively modest compared to the previously accumulated competitiveness loss and at the same time very painful, in terms of employment losses.

This paper reviews developments in ULC with a particular focus on the countries that overshot the euro area average by a large amount in the period preceding the 2008-09 crisis. It shows that the correction has been partial so far, very different across countries and that a significant "competitiveness gap" still needs to be filled. To make the downward adjustment of ULC and the improvement in competitiveness persistent, a large number of policy papers suggest that reforms should be targeted at increasing wage and price flexibility, reducing protection and rent seeking behaviour, increasing competition in sheltered sectors, and dismantling red tapes. While there is no doubt that this list of reforms will be growth enhancing in the medium to long term, structural reforms take a lot of time to show up in the data and there is no clear cut analysis on their short-term

[1] http://www.ecb.europa.eu/press/key/date/2011/html/sp110223.en.html

impact. An important issue related to the presence of delays in the adjustment process is related to the implementation phase and its lags. To better capture this problem, and understand plausible dynamics of competitiveness adjustments, we use the ECB's New Multi-Country Model (NMCM) under rational and learning expectations to simulate different scenarios.

The NMCM is one of the main models used at the ECB in the context of the Eurosystem macroeconomic projections for forecasting and policy analysis. The model can be run under rational or learning expectations. Under rational expectation any shock is fully anticipated by agents, which react immediately. By contrast under learning expectations agents adapt gradually to changing conditions over time.

We argue that a rational expectation model appears appropriate to describe the abrupt wage adjustment which took place in the Baltic States. By contrast, a learning model appears better suited to capture the gradual wage adjustment of Germany during the 2000s and the one that started in Spain and Italy between 2008 and 2012. In fact, in view of implementation lags and the need to change institutions, in the latter two countries the adjustment in wages should not be expected to come abruptly and to deliver output gains as quick as observed in the Baltic States.

In more detail, a gradual and sustained adjustment of the wage mark-up which mimics that of Germany is simulated with the Spanish and Italian country blocks of the NMCM. The results show that there are gains in exports, employment and GDP and that they are higher in Spain than in Italy mainly because the former country is characterised by higher labour demand elasticity to a change in wages than the second country as well as a higher openness.

Given implementation lags needed to change institutions and habits, in Spain and Italy an abrupt wage adjustment in the private sector is not likely to occur. Instead an abrupt wage adjustment could take place by a cut in public wages. To understand the implications of this latter scenario the learning environment continues to be more appropriate in these two countries, given the fact that spillovers from the public sector to the rest of the economy take time to materialise. The simulations suggest that an abrupt adjustment of wages brought about by e.g. a cut in public wages could bring about more benefit in terms of GDP and employment over a five period horizon than a gradual adjustment.

A second set of simulations show that a gradual reduction in the price mark-up has very similar effects to a gradual reduction of the wage mark-up. Like in the adjustment of the wage mark-up, Spain benefits more than Italy from a downward adjustment of prices in view of the larger openness of the former economy.

The model also allows us to evaluate the aggregate impact of the imposed shocks as well as possible spillover effects within the euro area. Spillovers are generally very small and the aggregate impact of the competitiveness adjustment is positive in the sense that it triggers a reduction of the competitiveness and current account divergences across euro area countries.

1. Introduction

While there are many dimensions of competitiveness, related to price and non price factors, the focus of this paper is on a narrow, but equally useful, measure of competitiveness which refers to unit labour costs. Nominal ULCs are a frequently used measure of cost competitiveness of a country, they measure the nominal cost of labour per unit of output. In doing so, they weight the labour cost born by the firm by a measure of efficiency: average productivity. For a given period, developments in nominal ULCs provide an indication of the extent an economy can effectively compete in terms of labour costs with other countries that have the same currency. For countries not sharing the same currency, or not linked with a fixed exchange rate, competitiveness is also affected by changes in the nominal exchange rate.

Euro area countries have witnessed growing labour cost differentials since the inception of EMU. Between 1999 and 2008 a clear dichotomy between countries with very low and very high labour cost growth emerged, with Germany, Austria and Finland belonging to the first group and Ireland, Greece, Spain, Portugal and Italy belonging to the second group. The accumulation of relative losses in competitiveness and the build-up of domestic imbalances need at some point to be corrected. In the absence of exchange rate policies, the correction within a monetary union - when controlling for growth convergence in catching-up countries - can be achieved through lower unit labour cost increases relative to the average of the Union. The existing literature shows that in an environment of flexible wages and prices, this adjustment could proceed smoothly without significant losses in output and employment. However, if the economy concerned suffers from structural rigidities in product and labour markets, a more protracted and painful adjustment in output and especially employment might take place (European Commission, 2008).

This paper reviews developments in ULCs with a particular focus on countries that overshot the euro area average by a significant amount in the period preceding the 2009 crisis. It shows that the correction has been partial so far and very different across countries. To make the downward adjustment of ULC and the improvement in competitiveness persistent, there is a large number of policy papers suggesting that reforms should be targeted at increasing wage and price flexibility, reducing protection and rent seeking behaviour, increasing competition in sheltered sectors, and dismantling red tapes (European Commission, 2008, 2009). While there is no doubt that this list of reforms will be growth enhancing in the medium to long term, structural reforms take a lot of time to show up in the data (Barnes et al., 2011). The problem of having delays in the observed macroeconomic impact is due to the presence of lags in the implementation phase.

When modelling the impact of reforms it is important that implementation lags and habit formation are taken into account to properly capture the most likely outcome. The model used in this paper – the New Multi-Country Model (NMCM) (see Dieppe et al, 2011 and 2012) – allows to distinguish between different environments in which a mark-up shock could take place and to take into consideration the issue of implementation lags.

A few features of this paper represent a novelty with respect to the still scarce existing literature on competitiveness adjustment within a Monetary Union.

On the modelling side the NMCM appears particularly suited to analyse the effects of competitiveness adjustments as it links all major euro area countries via a single monetary policy; it has been estimated and not calibrated and can be used under rational or learning expectations and therefore capture changes in agents' behaviour which can occur immediately or take time to materialise.

On the specific simulations carried out, the paper assesses: (i) the plausibility of the impact of a mark-up shock in a learning environment versus a rational expectation environment; (ii) the effects of an abrupt versus gradual adjustment of mark-ups; (iii) the externalities emanating via a contemporaneous reduction in mark-ups in Italy and Spain vis-à-vis the rest of the euro area.

The remainder of the paper is structured as follows. Section 2 provides an overview of the existing literature on competitiveness adjustment in a monetary union and the role of adjusting price and wage mark-ups. Section 3 reviews ULC and mark-up developments across euro area countries. Section 4 describes the key features of the NMCM. Section 5 shows the results of wage and price mark-up simulations. Section 6 shows the spillover effects to other countries. Section 7 reports on the sources of uncertainties surrounding the results and Section 8 concludes.

2. Overview of the literature

Adjusting competitiveness inside a monetary union has been a largely covered topic before and immediately after the creation of EMU. In the expansionary period that led to the 2008-09 crisis the question has been somewhat less popular perhaps as a reflection of the fact that the so called "great moderation period" was hiding the accumulation of imbalances in a number of countries. More recently, with the 2008-09 crisis, there has been a renewed interest in the issue of competitiveness adjustment (see for example European Commission, 2010, Jaumotte and Sodsriwiboon, 2010, Ruscher and Wolff 2009, Dieppe et al. 2012).

The topic of competitiveness adjustment is intrinsically related to the literature of adjustment within a currency union which finds its starting point back in the 1950s. Friedman in 1953 argued that countries giving up flexible exchange rates would find it difficult to adjust to country-specific shocks in the absence of high price and wage flexibility. Following up on this analysis, Mundell (1961) added that members of a monetary union could still adjust to country-specific shocks without relying on price and wage flexibility if inside the union the degree of capital and labour mobility is high. Later in the 1960s fiscal policy was brought into the picture and McKinnon (1963) and Kenen (1969) showed that fiscal stabilisers could help to cushion the impact of country-specific shocks.

These early works were taken up in the 1990s in the discussion about the ex-ante optimality of EMU and the predominant view was that labour mobility was too low and

prices and wages too rigid to allow for a sufficient degree of adjustment to country-specific shocks within EMU (Eichengreen, 1993, Decressin and Fatas, 1995).

The corresponding discussion in the 1990s was on the ex-post optimality of EMU. In particular, while it proved to be very difficult to oppose arguments against sceptical views on the ex-ante optimality of EMU, the focus started to be on how different mechanisms could work to enhance the optimality of the union once the single currency was a reality. Two of these mechanisms were: (1) to foster intra-area trade (Frankel and Rose, 1997); and (2) to increase political national responsibility by stepping up the pace of structural reforms in response to the irrevocable fixing of the exchange rate (Pissarides, 1997; Buti and Sapir, 1998). As to the latter mechanism, the 2009 crisis has found many countries totally unprepared to adjust both to the world trade shock and to imbalances, because they were still locked into rigid structures and the accumulated imbalances were hidden by a long period of buoyant growth.

After the creation of EMU, empirical and theoretical papers that focused on the accumulation of imbalances have been rather scarce prior to the 2009 crisis. Important contributions were those of Blanchard (2007(a), (b)), showing that the adjustment of competitiveness, when prices and wages are rigid, is very costly in terms of the unemployment rate; and that of the European Commission (2008) showing that price and wage flexibility are key for efficient intra-euro area adjustment in the absence of internal exchange rates. Recent empirical partial-equilibrium work has also shown that more flexibility can help substantially the re-equilibration of the existing imbalances (Zemanek, 2010).

This paper contributes to the debate on competitiveness adjustment by showing the results of simulations on nominal unit labour costs adjustments carried out with the NMCM. In particular, the NMCM features some key characteristics of New Keynesian DSGE models which makes it well suited to analyse changes in the degree of firm's competition or in the degree of labour market frictions (Dieppe et al., 2011, 2012). In fact, given the monopolistic competition framework, the model set-up is such that there is room for increasing or decreasing competition, expressed as a price or wage mark-up.

This paper addresses also the issues of speed of adjustment and of spillovers from one country to the rest of the euro area within a consistent theoretical framework. The paper takes an "asymmetric" perspective, in the sense that only a downward reduction of mark-up is considered. However, the issue of how the adjustment should take place is the object of significant debate in the euro area (see Landemann, 2010). The rational for such an asymmetric approach is that independently of the need to adjust for past competitiveness losses, reducing high mark-ups, i.e. increasing the flexibility of the labour and product market is *per se* a good outcome. In fact, available micro and sector-specific evidence shows that euro area countries are indeed generally characterized by high mark-ups in prices and wages (Christopoulou and Vermeulen, 2008, Wage Dynamics Network, 2009).

3. Cross-country developments of unit labour costs and domestic prices

Euro area countries have witnessed growing nominal ULC differentials since the inception of EMU. In those countries with initial lower per capita income than the euro area average, dynamic ULC developments have been related in the initial years of EMU to catching-up and convergence processes (Blanchard and Giavazzi, 2003). Only in late 2000s the accumulation of macroeconomic imbalances (European Commission, 2008) had started to be identified as key reasons for competitiveness losses in the countries that were in the process of catching up. In more mature euro area economies, dynamic nominal ULC developments have instead been related to persistent weaknesses in productivity and trend GDP growth (Italy) but also to possibly equilibrating adjustments from past over competitive developments (the Netherlands).

Chart 1 shows that the overshooting of ULC growth with respect to the euro area in 1999-07 was mainly driven by very dynamic wage growth, above 4% per annum in Ireland, Greece and Portugal.

Productivity growth was particularly disappointing in Spain and Italy compared to the wage dynamics of these two countries. The persistent dismal labour productivity performance of Spain and Italy is essentially related to key structural weaknesses and to the high labour content of production (Estrada et al., 2009, and Rossi, 2009).

Chart 1: Nominal ULC, wages and productivity (average growth rates) **in selected euro area countries**

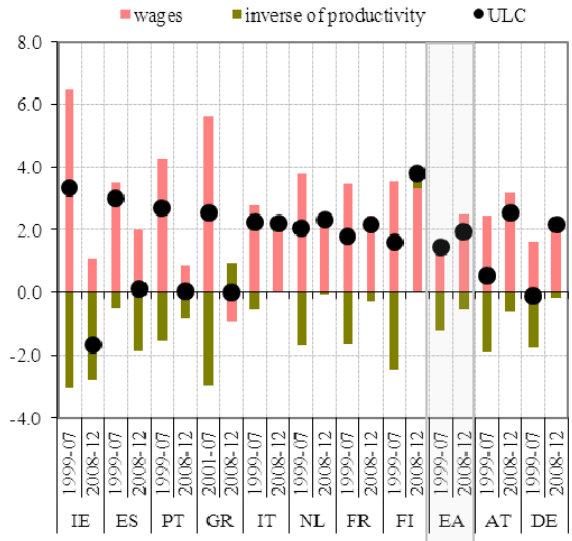
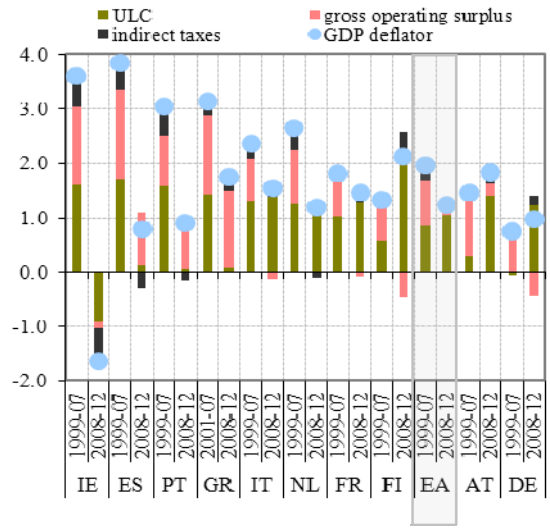


Chart 2: GDP deflator (average growth rates), **nominal ULC, gross operating surplus and indirect taxes** (percentage points) **in selected euro area countries**



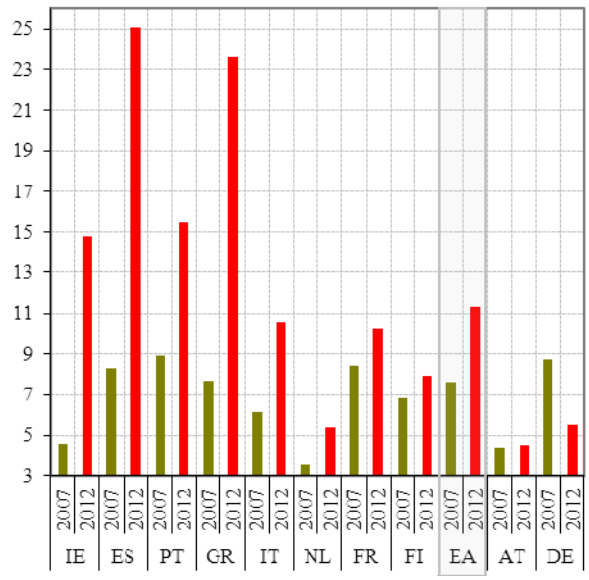
Source: Own computation on European Commission (Autumn 2012). Countries ordered according to average ULC growth in 1999-07.

While nominal ULCs are a key determinant of domestic inflationary pressures, Chart 2 shows that profits (measured by gross operating surplus) have also significantly contributed in the period 1999-07 to stoke inflation in the high labour costs countries. This is particularly the case of Ireland, Spain and Greece where the contribution of gross operating surplus to GDP inflation was even higher than that of nominal ULC.

To sum up, the data clearly point to excesses in labour costs and profit developments with respect to the euro area average in explaining the large differential in domestic inflation observed in the period 1999-2007.

Since 2008, some of the high cost countries have started an adjustment process, which, as Charts 1 and 2 show, has been so far relatively limited with respect to the imbalances accumulated in the previous period. On the cost side, Chart 1 shows that the adjustment in 2008-12 is almost negligible in Italy, where nominal ULCs have continued to be above (although by a very small margin) the euro area average. The adjustment has been instead stronger in Ireland and Spain, however, so far, it has been achieved mainly at the expense of significant labour shedding. Chart 3 shows that the unemployment rate in the countries which had started to adjust from previously high imbalances has increased strongly.

Chart 3: Unemployment rate (in percentage of the labour force) **in selected euro area countries**



Source: European Commission (Autumn 2012)

It is also interesting to note that between 2008 and 2012 the major downward impact on domestic inflation has been driven by labour costs, while the contribution of profits has remained relatively resilient in Spain, Greece and Portugal. By contrast a significant downward correction of profits has taken place in Ireland and Italy (Chart 2).

4. Key features of the NMCM

In this section we briefly outline the key features of the NMCM; for a full description of the model see Dieppe, González Pandiella, and Willman (2012) and Dieppe, González Pandiella, Hall and Willman (2011). The NMCM is one of the key models used at the ECB (in the context of the Eurosystem macroeconomic projections and for scenario analysis) and it covers the five largest euro area countries (Germany, France, Italy, Spain and The Netherlands) and an additional block for the smaller countries. It is estimated and can be used either on a single country basis or as a linked euro area multi-country

model capturing cross-country interactions and it can be used under rational or learning expectations.

The model has theoretical foundations and can be characterised as a structural New Keynesian model. All key behavioural relations are based on the optimisation behaviour of three private sector decision making units (i.e. households, labour unions and firms), along with the reaction functions of the government sector and the common central bank. It is an open economy model with one exportable domestic good and one imported good.

An important feature of the estimated model is that it captures the empirical fact that the GDP shares of capital, labour and total factor income are non-stationary in the medium term. Accordingly, the estimated medium run developments, towards which the short-run dynamics converge, deviate from the balanced growth path. These deviations are allowed to fade away in the long run.

The modelling approach has been, within the constraints of the common theoretical setting, to allow the data to determine estimated parameter values, with only a limited amount of restrictions. Therefore cross-country differences reflect estimated country heterogeneity. Key factors driving cross-country differences include: the degree of openness of the economies, the size of the public sector, the different frequencies of price and wage setting (for example it is found to be less often in Germany than in other countries) and the degree of rigidities and forward-lookingness of agents.

The model's formulation for prices and wages fall within the New Keynesian literature. On the firm side, the profit maximisation leads to a "semi"-conventional hybrid New Keynesian Phillips Curve (NKPC) as in Gali and Gertler (1999), and McAdam and William, (2010). On the labour market side, the NMCM includes a large number of monopoly unions which determine real wages of their members under a right to manage structure. In renewing wage contracts each union sets the wage rate knowing its effect on employment determined by firms. Wages are set as a mark-up on prices. Labour is indivisible and contracts are binding until they are renegotiated. In this way the model entails stickiness in wage formation. These characteristics can be used to adjust the wage and price mark-ups in a gradual or an abrupt manner as described in the simulations later on.

Expectation formation is treated explicitly and it is assumed that optimising agents have only limited-information. This approach is theoretically consistent in the sense that agents' local optimising decisions and future expectations are based on the same information set. Agents in the learning version of the model form expectations via learning, whereby they update their estimates in response to new information. The estimates of the speed of adjustment to "news" suggest that firms respond quicker by updating their estimates than households whose responsiveness is slower. One key advantage of the learning approach is it is able to cope with structural change or large shocks to the economy given the feature that parameters, and hence the model will adjust to new economic regimes. In the rational expectations version of the model it is assumed that agents are endowed with full information and therefore households and firms can anticipate the effects of the shocks and immediately adjust their behaviour.

In the linked version of the model, cross-country linkages occur via the trade channel (both prices and volumes), via common monetary policy and exchange rates as well as

via financial inter-linkages. The latter are captured via the presence of stock prices which affect wealth.

4.1 New Keynesian Wage and Price Phillips Curves

In considering the role of the wage and price mark-ups the two relevant equations are those that characterize wage and price setting behaviour.

As to the wage setting, the NMCM follows a three-valued Calvo-signal in such a way that part of unions keeps wages fixed, another part changes wages following a backward-looking rule and the rest set wages optimally. The wage setting equation (1) includes terms for expected wages, lagged wages and optimal (frictionless) wages:

$$(1) \qquad \left\{\theta_w + w_w\left[1-\theta_w(1-\beta)\right]\right\}\Delta w_t - w_w\Delta w_{t-1} - \beta\theta_w E_t w_{t+1} - (1-w_w)(1-\theta_w)(1-\beta\theta_w)\left(w_t^* - w_t\right) = 0$$

where w is the log of compensation per employee; w^* is the optimal frictionless wage rate and β is the discount factor assumed to be a four per cent annual discount rate, which in quarterly data implies β = 0.99. The parameter θ_w is the probability that wages remain fixed and the parameter w_w is the probability that wages are changed following a backward-looking rule.

For the optimal frictionless wage, w^*, it is assumed that unions are non-utilitarian, so that they target the unemployment rate via real wage demand – as represented below in equation (2). This implicitly suggests a constant long-run natural rate of unemployment:

$$(2) \qquad w_t^* = p_t + log\left(\frac{F_N^{CES}}{1+\mu_w}\right) + \chi log\left(\frac{F_N^{CES-1}(K_t, Y_t)}{\bar{\omega}\cdot N_t^F}\right)$$

Where, F^{CES} is a CES production function (desired number of workers); $F^{CES\text{-}1}$ is the inverse of the production function, N^F is the labour force, and μ_w is the gap between optimal labour demand and supply which measures the wage mark-up effect. This wage mark-up effect is the term that will be shocked in the wage mark-up simulations in section 5.

For price setting, the model also follows the three-valued Calvo-signal based on the New Keynesian Phillips curve, where part of the firms keep prices fixed, part follow a backward looking rule and part set them optimally. This is represented with equation (3):

$$(3) \qquad \left\{\theta_p + w_p\left[1-\theta_p(1-\beta)\right]\right\}\Delta p_t - w_p\Delta p_{t-1} - \beta\theta_p\Delta p_{t+1} - (1-w_p)(1-\theta_p)(1-\beta\theta_p)\left(p_t^* - p_t\right) = 0$$

Where, p_t is the log of the GDP deflator at factor cost at time t; p_t^* is the log of the frictionless equilibrium price level; θ_p the probability that firms do not adjust prices; w_p is the probability prices are changed following a backward-looking rule. As with the wage equation, θ_p and w_p are the estimated parameters and β is assumed to be 0.99. The frictionless equilibrium price level is defined as a mark-up to the marginal product of labour along with an overtime premium such that:

(4) $$p_t^* = w_t - mpn_t + a_h(n_t^* - n_t) + \mu_{pt}$$

where w_t is the log of compensation per employee at time t; *mpn* is the log of the marginal product of labour (from production function); n^* is the optimal number of workers expressed in logs, *n* is actual employment in logs; a_h is the overtime premium parameter and the aggregate mark-up μ_{pt} is determined by the supply system. This parameter will be the term shocked in the price-mark up simulations.

These wage and price Phillips curves are estimated via GMM to account for the forward-looking aspects of the equations (1) and (3).

The key estimated parameters of these equations are the probabilities (θ_p, w_p for prices and θ_w, w_w for wages) that in any given period determine whether prices and wages adjust either following a backward looking rule or are set optimally. These estimated parameters for Germany, Spain and Italy are reported in Table 1 below. One relevant statistic that can be derived from the Phillips curve is the average duration of price or wage changes, which is also reported in the table. The estimated durations are between 3 and 5 quarters which is broadly comparable to micro-evidence (Álvarez et al (2006), Altissimo, Ehrmann and Smets (2006), Eichenbaum, Jaimovich and Rebelo (2008) and the Wage Dynamic Network (2009)). There are however some differences across countries, which will reflect institutional differences, degree of wage bargaining, or degree of competition on product markets. In particular, the average duration of price and wage changes are more than 4 quarters in Germany, whereas Italy and Spain are estimated to change wage and prices more frequently. These estimated differences will lead to different responses to shocks.

Table 1 – Key estimated parameters of the price and wage Phillips curves

Block	Parameter	Country		
		DE	ES	IT
Price Phillips curve	θ_p, Probability that firms do not adjust prices	0.76	0.67	0.72
	w_p, Probability prices are changed following a backward-looking rule	0.38	0.25	0.32
	Average duration of price changes (quarters)	4.25	3.03	3.64
Wage Phillips curve	θ_w, Probability that wages remain fixed	0.80	0.75	0.73
	w_w, Probability wages are changed following a backward-looking rule	0.44	0.36	0.33
	Average duration of wage changes (quarters)	4.95	3.95	3.71

5. NMCM simulations: learning about wage mark-up shocks

In this section we start by considering the German experience of institutional reforms and we analyse it by simulating a cut in wages using the NMCM both under rational and learning expectations. We then apply the same kind of shock to Spain and Italy.

5.1 A gradual adjustment: the German experience in the 2000s

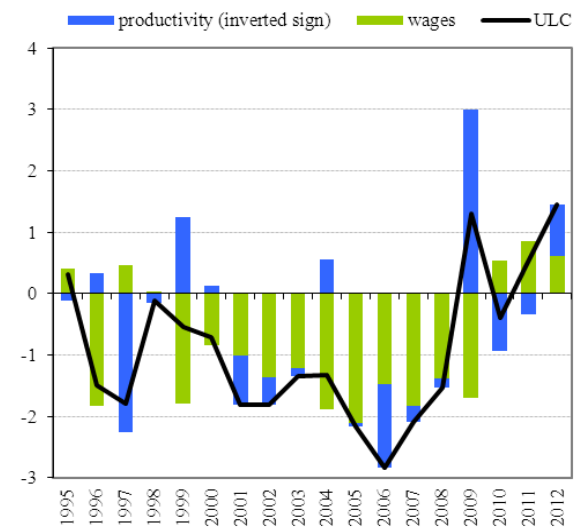
Since 1996 industrial relations in Germany refocused their attention on employment and competitiveness. Moreover, in late 1990s a significant reduction of product market regulations was achieved both via lower public ownership and lower market entry barriers. This had a dampening effect on wages. Subsequently, employment rigidities started also to be reduced in the period 2004-2005.

As a result of the reform effort, Germany witnessed significant competitiveness gains between 1999 and 2009. In this period, Germany has been able to accumulate a positive competitiveness gap (measured by ULC) of about 15 percentage points with respect to the rest of the euro area.

Lower ULC developments than the rest of the area have been the result of significant wage moderation, with wage growth lower than the euro area average by about 1.5 percentage points on average (Chart 4).

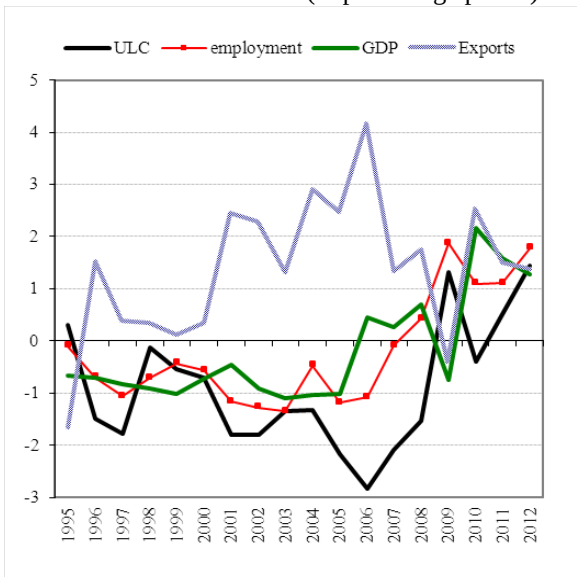
Chart 5 shows that the competitiveness gains were able to bring about a significant and persistent improvement of exports in the past decade. However, the chart also shows that output gains and employment with respect to the rest of the euro area started to be visible only from 2006 onwards, i.e. about 10 years after the

Chart 4: Germany – ULC decomposition: deviation from the euro area (in percentage points)



Source: European Commission (Autumn 2012).

Chart 5: Germany – deviation of key macroeconomic variables from the euro area (in percentage points)



Source: European Commission (Autumn 2012).

start of the adjustment towards a more competitive business model. Moreover, all domestic demand components, in particular investment, have been lagging behind euro area developments during the previous decade.

To sum up, while the competitiveness gains appear to have had a positive impact on exports; this did not translate into immediately higher domestic demand and thus GDP but instead took time to materialise.

5.2 Gradual adjustment: learning versus rational expectations

With the objective of replicating with the NMCM the German experience, a scenario of a gradual reduction of the wage mark-up, μ_w, is considered. The shock to wage mark-ups lasts for 10 years and has been scaled so that it delivers on average a reduction in wages of 1% over a ten-year horizon. This shock can be interpreted as a gradual increase in wage competitiveness, which could, for example, be due to the introduction of a more flexible wage setting mechanism.

In the NMCM, the wage rate (see equation (1) above) is a key determinant of firms' costs. As firms set their prices as a mark-up of their production costs, an anticipated sustained reduction in wage growth causes both firms' intermediate prices (GDP deflator) and consumer prices to fall. Furthermore, when firms start to reduce their prices in response to lower labour costs, the price and cost competitiveness of the domestic goods relative to those produced elsewhere improves. This boosts exports and at the same time, enables households to switch demand from foreign to domestic goods and services, given the reduction in domestic price pressures. The lowering in labour costs rises demand for labour. The combined effect is an increase in GDP which provides a further boost to employment.

The wage mark-up shock is carried out by using both the rational expectation and the learning versions of the model. In the rational expectations framework, all agents (firms, households, government and central banks) anticipate future gains and react immediately to changes triggered by the wage mark-up shock. Firms quickly reduce their prices and increase labour demand. The supply of goods and services increases. This along with the lowering of prices, leads to an immediate boost in exports and hence in GDP.

In the learning version of the model, households and firms are only endowed by a partial set of information, which increases over time, so agents slowly learn about the adjustment process and the gains from competitiveness adjustment.

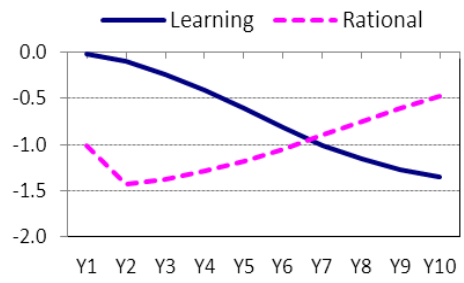
Chart 6 shows the results for both the learning and the rational expectation formation mechanisms. The competitiveness and export channels in the NMCM are the key channels at work in propagating lower wages into higher employment. Chart 6 shows that these work with a lagged effect in the learning version compared to the rational expectations version.

In a country not in a monetary union, the national downward pressures on inflation would have triggered an easing of monetary policy – i.e. a decrease in the nominal interest rate which would counter-act the decline of domestic inflationary pressures. By contrast, within a monetary union a country specific wage shock does not give rise to a direct response from monetary policy, which instead gradually adjusts in an attempt to counteract the disinflationary pressures for the euro area as a whole. Given this lag in the

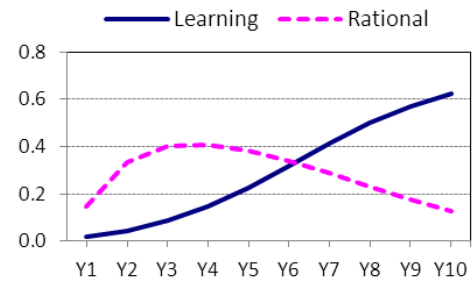
reaction function of the monetary authorities, the initial response of the real interest rate is therefore positive, leading to a higher real cost of capital. This leads, in the learning version of the model, to a slight decrease in investment. By contrast, in the rational expectations version, the anticipation effects on interest rates dominate the short-term impact of higher cost of capital leading firms to immediately increase their investment spending.

Chart 6: Germany - simulated 1% wage mark-up shock for 10 years under rational and learning expectations (deviations from baseline levels)

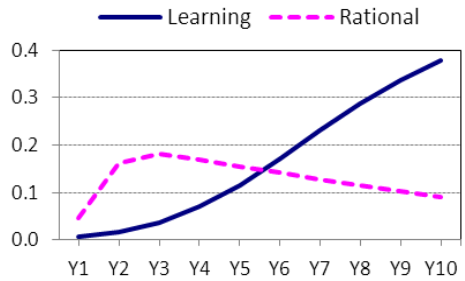
(a) ULC



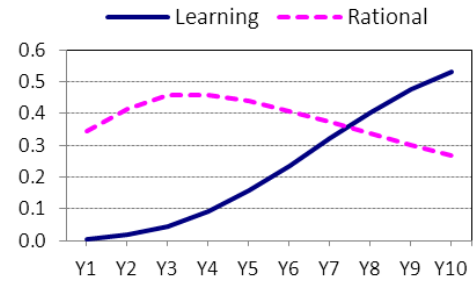
(b) Exports



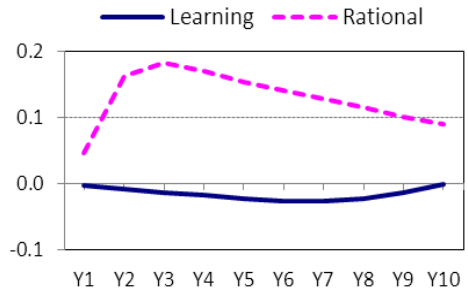
(c) GDP



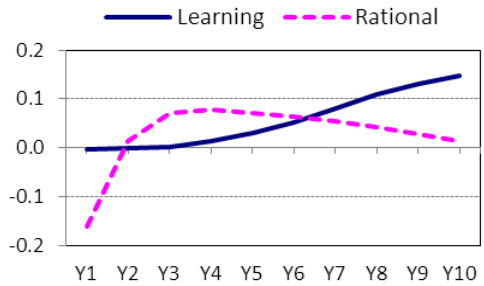
(d) Total employment



(c) Investment



(d) CA % of GDP



The impact of the wage shock on consumer behaviour also differs between the learning and the rational expectation versions of the model. Households' consumption choice is mostly driven by developments in permanent income. In the rational expectations framework, as in the case of firms, households anticipate future gains in their income, and immediately adjust their spending behavior accordingly. However, under learning any change in household behaviour is muted until significant improvements in the economy start to occur. In the medium-term, the boost of demand (via exports) and the

lower real wage translates into an increase in employment, which raises labour income and only afterword consumers start to increase their spending.

Summing up, in the learning version, the slow domestic and external propagation mechanisms lead to a limited increase in output in the first few years as the competitiveness effects take time to have an impact. Two years after the initial shock, the gains start to consolidate with the full effects being felt after 10 years.

The key difference between the dynamics of the macroeconomic variables in the rational and learning cases is related to the different speed of reaction to the wage mark-up shock.

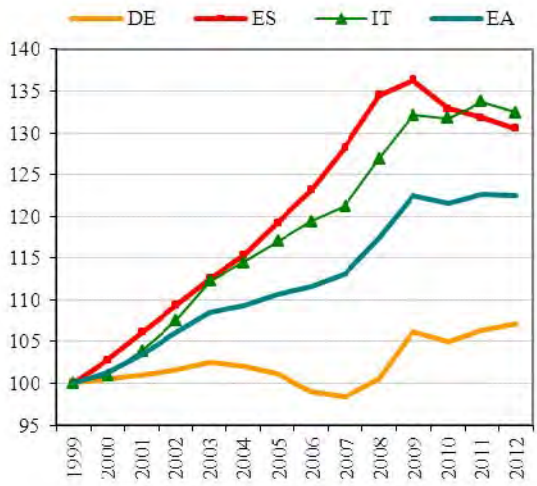
In the rational expectation environment any shock is fully anticipated by agents, which therefore react immediately by boosting labour demand, employment and GDP. The simulation results shown above are qualitatively similar to those conducted with different macro models, in particular the Euro Area and Global Economy model (see Gomes et al. 2011) which is a multi-country DSGE with rational expectations, and which delivers stronger and more immediate gains following a wage mark-up shock compared to the NMCM rational expectations version (see Dieppe et al (2012) for a comparison of a temporary wage mark-up shock between EAGLE and the NMCM).

The results shown in Chart 6 illustrate that the learning version of the model can track the slow impact on domestic demand and GDP from the competitiveness adjustment witnessed by Germany in the 2000s. As in the learning environment agents adapt gradually to changing conditions in such a way that the competitiveness gains are cumulated over time and output and employment increases are gradual and the correction is long lasting.

5.3 A gradual reduction of mark-ups in Italy and Spain

In the previous exercise the experience of Germany in the 2000s has been matched by simulating a gradual wage shock in the presence of learning agents. The same type of competitiveness adjustment is now replicated with the country model blocks for Spain and Italy. Chart 7 shows that the competitiveness differentials - as measured by ULC developments - between Spain and Italy, on the one hand, and Germany, on the other, has been increasing over time. Only in the case of Spain this differential has started to be reverted since 2010. This notwithstanding the cumulated ULC differential was still very large at the end of 2011.

Chart 7: Italy and Spain: a large ULC differential vis-à-vis Germany *(1999=100)*



Source: European Commission (Autumn 2012) and own computations.

The objective of this section is to quantify the impact of a gradual reduction of ULC in Italy and Spain, similar to what happened in Germany in the 2000s using the NMCM.

Table 2 shows the results of the model simulation under learning expectations of a gradual reduction in the wage mark-up such that wages are on average lower by 1% over 10 years.

The table shows that only the second year after the shock is introduced the competitiveness channel starts to work. This is consistent with the reaction reported in Chart 6 for Germany.

While the basic adjustment mechanisms from a reduction in the wage mark-up will hold for both Spain and Italy, the different structures of the two economies, as captured by the NMCM estimated parameters (see Table 1 above), imply that responses to the wage mark-up shock differ between them.

Table 2 – Comparing a gradual wage mark-up shock in Spain and Italy under learning expectations (1% wage reduction over 10 years)
(% deviations from baseline levels)

	HICP		ULC		Export deflator	
Wage mark-up	ES	IT	ES	IT	ES	IT
1 year after the shock	0.0	0.0	0.0	0.0	0.0	0.0
2 years after the shock	-0.1	-0.1	-0.2	-0.1	-0.1	0.0
5 years after the shock	-0.8	-0.4	-1.0	-0.5	-0.5	-0.3
10 years after the shock	-1.6	-1.0	-1.8	-1.1	-1.0	-0.6

	Consumption		Investment		Real GDP	
Wage mark-up	ES	IT	ES	IT	ES	IT
1 year after the shock	0.0	0.0	0.0	0.0	0.0	0.0
2 years after the shock	0.0	0.0	-0.1	-0.1	0.0	0.0
5 years after the shock	0.0	0.0	-0.5	-0.2	0.2	0.1
10 years after the shock	0.2	0.0	-0.1	-0.2	0.6	0.3

	Trade Balance		Exports		Employment	
Wage mark-up	ES	IT	ES	IT	ES	IT
1 year after the shock	0.0	0.0	0.0	0.0	0.0	0.0
2 years after the shock	0.1	0.1	0.1	0.1	0.0	0.0
5 years after the shock	0.6	0.4	0.5	0.2	0.2	0.1
10 years after the shock	1.1	0.8	1.1	0.6	0.8	0.4

Table 2 shows that the pass-through of wages into consumer prices is lower in Italy than in Spain. One of the reasons for this is because firms are estimated to change prices more often in Spain (which could reflect the higher inflation experienced over the estimated period). The two countries are not only characterized by a different speed of adjustment of HICP inflation, but also by a different long run impact. After 10 years a 1% drop in nominal wages leads in Spain to an amplified impact on inflation, while in Italy a one-to-one relationship between a fall in wages and inflation exists.

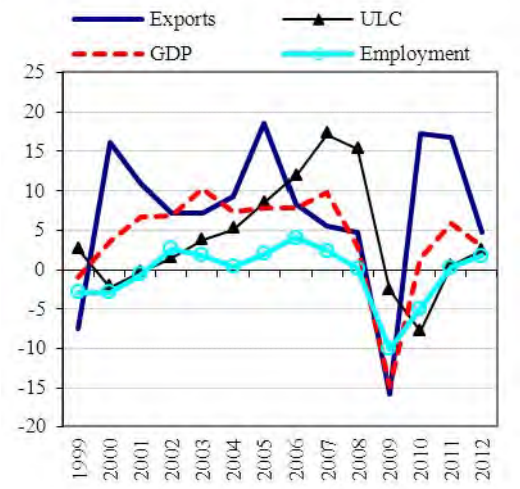
The higher openness of the Spanish economy with respect to Italy favors a higher impact from the competitiveness gains to real GDP and employment, both in the medium term

and by the end of the simulation horizon. Moreover, the higher response of labour demand to a reduction in the wage mark-up amplifies the positive impact from the competitiveness gains. Real GDP is higher than in the baseline scenario by cumulatively 0.6% at the end of the 10-year horizon in Spain and by cumulatively 0.3% in Italy. Total employment is cumulatively 0.8% higher in Spain and 0.4% in Italy after 10 years. However, like in the case of Germany, the positive effects on consumption take a very long time to materialize and investment remains subdued in both countries even after 10 years according to the simulations.

5.4 How to implement an abrupt adjustment? Rational versus learning

While the adjustment of competitiveness in Germany in 2000s was gradual, the adjustment of competitiveness in the Baltic States during the 2008-09 crisis occurred in an abrupt way.

Chart 8: Adjustment in the Baltic states
(% changes)



Source: European Commission. Note: average growth rates of Latvia, Estonia and Lithuania

Despite being outside the euro area (Estonia joined in 2011), the Baltic States constitute a relevant comparison for the euro area countries because since the early 2000s they have maintained a fixed exchange rate policy vis-à-vis the euro. Notwithstanding their fixed exchange rate these countries have been able to adjust their labour costs very rapidly between 2009 and 2010. This adjustment was possible thanks to the flexibility of their labour and product markets. In contrast to most euro area countries, the Baltic States are much more flexible, with wage setting mechanisms that allow a renegotiation of contracts in case of changing economic and labour market conditions. The Baltic States are also significantly more open than the euro area countries.

Chart 8 shows that the drop in ULC in the Baltic States in 2009 and 2010 - driven to a large part by a significant drop in wages - led to an immediate recovery in exports, which was particularly noticeable in the context of a globally weak demand environment. This experience seems at odds with the learning environment where it takes time for competitiveness gains to materialize, but seems closer to the rational expectations environment where gains are immediate.

Indeed, if the shock is abrupt and credible, then from the moment of the change agents can anticipate the implications for the economy, and hence the rational expectations framework might be the most appropriate. An abrupt adjustment in a rational expectation environment seems to capture well what had happened in the Baltic States during the 2009 crisis.

If, however, there are doubts as to the sustainability of the shock, or if the shock could partially be unwound, or if institutional reforms are also needed, then a learning framework might be the most representative.

In the case of an economy where a change in the wage mark-up can only take place by implementing institutional and or legislative changes, perhaps due to a sequence of labour or product market reform shocks, then a learning framework would be an appropriate representation, as the extent of future shocks is unlikely to be fully anticipated. This seems to be particularly the case in Spain and Italy. A clear distinction should be made between the swift approval of new laws, which is what in fact happened during the past year in both countries, and the effective implementation of the new laws via changes in institutions, habits and behaviour. The latter changes take time and can be reflected in a gradual reduction of price and wage mark-ups.

While both Italy and Spain have been undergoing important labour market reforms in a short period of time, it is most likely that a time lag is needed before institutions, preferences and behavior of agents are changed. This change in institutional setting was not needed in the case of the Baltic States, given that they are already endowed by very flexible institutions.

Given the low likelihood of introducing an abrupt mark-up shock in the private sector in Spain and Italy, an immediate reduction of the wage mark-up could instead result from a significant cut in public sector wages.[2]. However, given the fact that spillovers from the public sector to the rest of the economy would likely be limited and with delayed macroeconomic effects, in these two countries a learning environment continues to appear more appropriate even in the case of an abrupt wage shock (e.g. via a public wage cut).[3]

In what follows, we perform an abrupt wage mark-up shock in a rational expectation and in a learning expectations environment.

Chart 9 shows the results for Spain. While the quantitative impact for the Baltic States and for Italy will certainly be different than the one shown for Spain, the main message of the exercise would still hold. Chart 9 shows that in a rational expectation environment, the abrupt impact of a change in mark-up is visible immediately right after the shock. One year after the shock, the adjustment leads to strong employment, exports and GDP gains. Ten years after the adjustment ULC growth is reverted but the domestic demand boost still has a negative impact on the current account.

Under learning agents initially take time to adapt to the new environment because they initially expect that changes in wages will be only temporary or limited in scope (e.g. in the case of a public wage cut), so the adjustment by firms and households is correspondingly limited. Chart 9 shows that in the first year after the shock, the impact of a 1 percent wage adjustment is slightly negative on nominal variables and domestic demand. In the second year after the shock the abrupt change in mark-up starts to have visible effects on competitiveness and exports but not yet on domestic demand and GDP.

[2] In the case of Spain, an abrupt adjustment could also occur via a cut in minimum wages.

[3] In order to properly assess the implications from a cut in public wages a separate modelling of the public sector would necessary. In the context of the NMCM we can only shock the whole economy wages.

Only after 5 years real GDP and employment are positively affected and gains are endured from then onwards.

While the NMCM is only available for the largest euro area countries, the above results suggest that an abrupt adjustment under rational expectations could be used to understand the competitiveness adjustment that took place in the Baltic States. However, in the cases of Spain and Italy a learning environment seems more appropriate even when an abrupt cut in public wages is brought about, given the time lag needed for private sector wages to adapt to a more flexible wage setting environment.

Chart 9: Spain – Abrupt simulated 1% wage mark-up shock which takes place in the first year under rational and learning expectations (deviations from baseline levels)

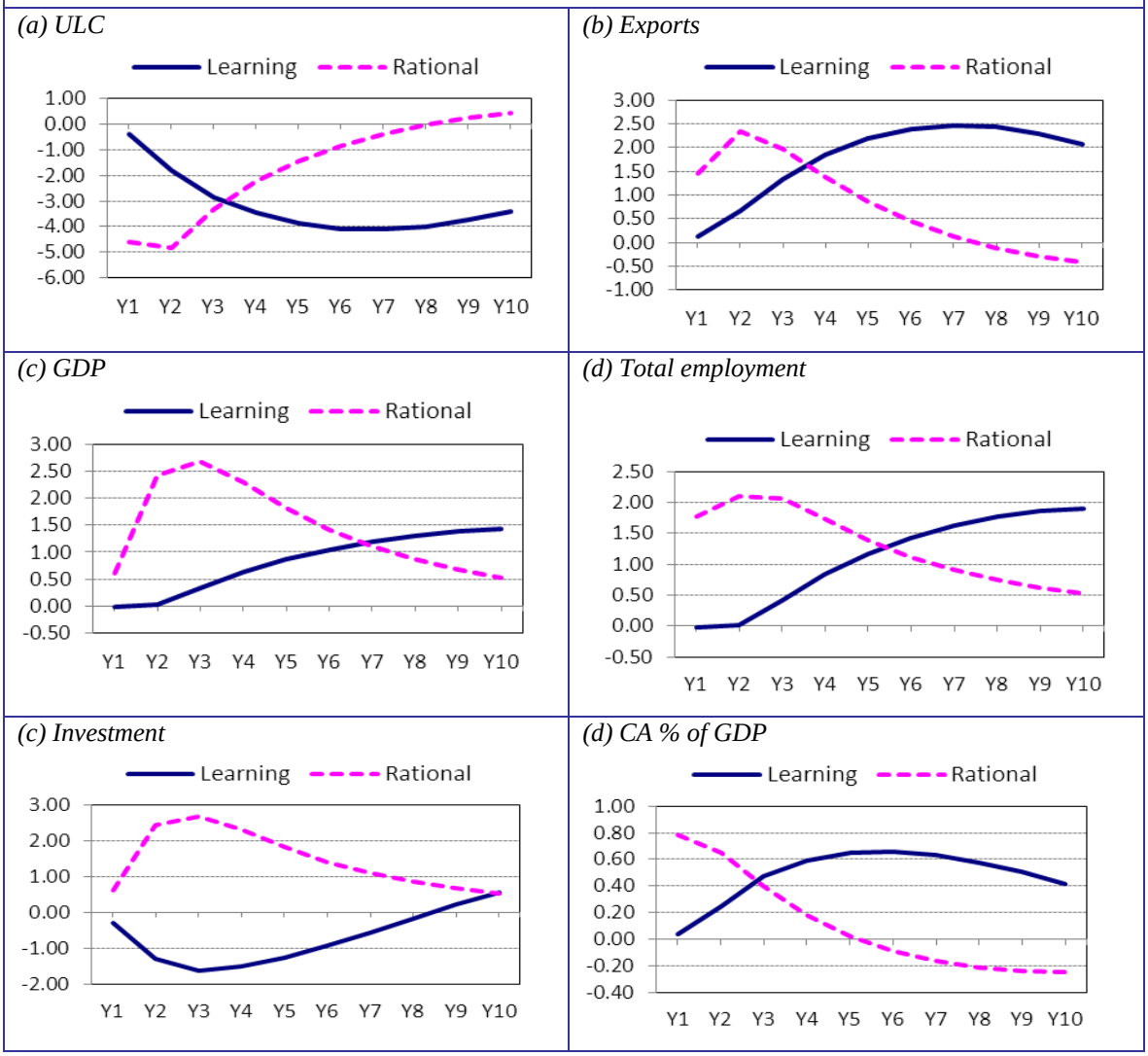


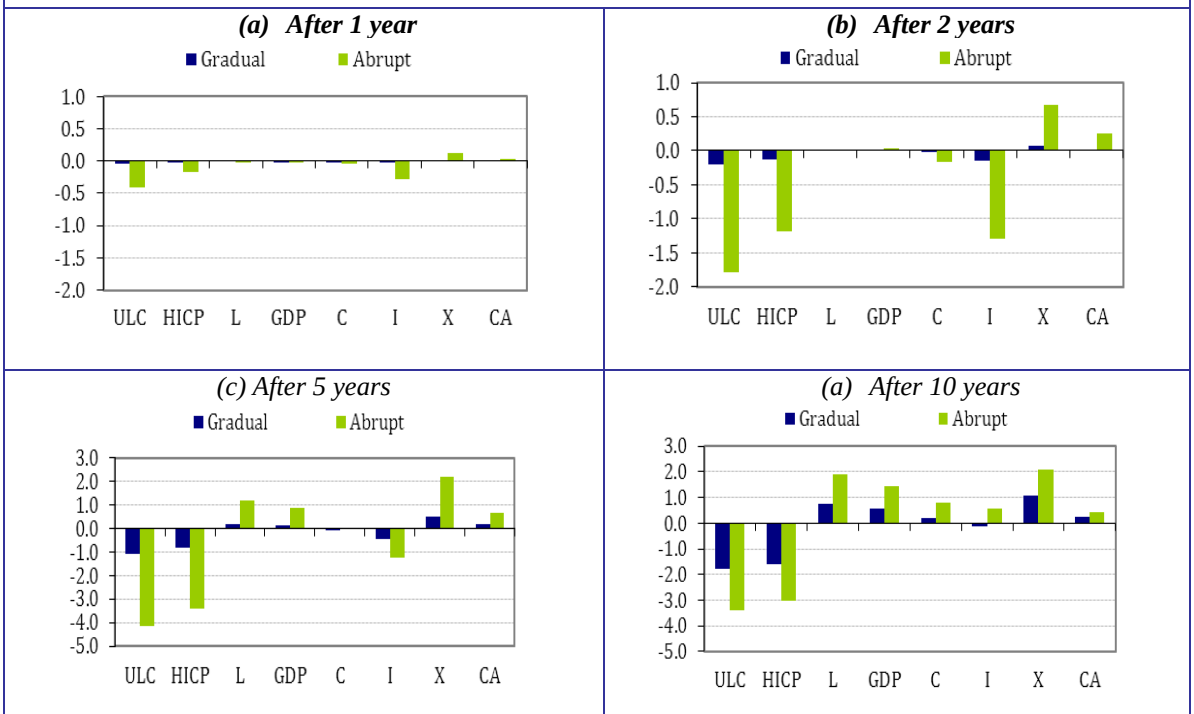
Table 3 below exemplifies the outcome in terms of matching between actual and or expected developments of a change in the wage mark-up and the assumptions of learning versus rational expectations.

Table 3 – Summary outcome of the plausibility of simulation results in term of speed of adjustment and agents' behaviour		
	Gradual	*Abrupt*
Rational expectations		Baltic States
Learning	Germany, Italy, Spain	Italy, Spain (e.g. public sector wage reduction)

5.5 Comparing the abrupt versus the gradual in a learning environment

It is useful to directly compare the results of an abrupt versus a gradual shock, we do this under the learning environment. Chart 10 shows that when comparing the abrupt with the gradual adjustment scenario, competitiveness gains are quicker in the former case, resulting in higher exports and GDP 5 years after the shock. In the gradual scenario, real GDP takes about 10 years to start improving on a visible scale (as in the German experience). Ceteris paribus, it appears that, even if agents are learning, i.e. take time to adapt to a new institutional framework; the implementation of an abrupt strategy, via a cut in public sector wages (or in minimum wages), could deliver gains in a shorter period of time than waiting for the private sector to adapt slowly to a more flexible environment. The results are robust to a rational expectation environment.

Chart 10: Spain - gradual versus abrupt 1% wage adjustment under learning expectations
(deviation from baseline levels, in percentage)



Note: ULC= nominal unit labour cost, HICP= harmonised index of consumer prices, L = employment, C= consumption, I= investment, X= exports, CA = current account

6. A reduction in price mark-up in Spain and Italy

The objective of achieving a competitiveness adjustment does not need to occur necessarily by shocking wages but it could also be the result of a reduction in price mark-ups, which afterwards trigger a reduction in labour costs. Indeed, Felipe and Kumar (2011) conjecture that loss of competitiveness in some Euro area countries is not just a question of nominal wages increasing faster than labour productivity but also that nominal profit rates decreased at a slower pace than capital productivity. Therefore, looking at both wage and price mark-up reduction appears justified by both analytical and policy considerations.

A price mark-up scenario is now considered, which entails a lowering of the output price set by firms and thereby reducing profits of the firm. Such a scenario could be triggered by introducing higher competition in the economy via structural reforms which would lead to a reduction of the less competitive firms' mark-ups over costs. In the NMCM framework, the mark-up shock is introduced by shocking the term μ_{pt} in the price equation (see equation (4) above).

The design of the scenario is such that output prices are on average lower by 1% over a 10–year period, i.e. the size of the shock is the same as the one introduced for the wage mark-up when the adjustment is taking place in a gradual way.[4]

Table 4: Comparing a price mark-up shock in Spain and Italy under learning expectations (1% price mark-up reduction over 10 years)
(% deviations from baseline levels)

	HICP		ULC		Export deflator	
Price Mark-up	ES	IT	ES	IT	ES	IT
1 year after the shock	0.0	0.0	0.0	0.0	0.0	0.0
2 years after the shock	-0.2	-0.1	-0.2	-0.1	-0.1	0.0
5 years after the shock	-1.1	-0.4	-1.3	-0.5	-0.7	-0.2
10 years after the shock	-1.8	-0.9	-2.0	-1.1	-1.1	-0.7

	Consumption		Investment		Real GDP	
Price Mark-up	ES	IT	ES	IT	ES	IT
1 year after the shock	0.0	0.0	-0.1	-0.3	0.0	0.0
2 years after the shock	0.0	0.0	-0.3	-0.3	0.0	0.0
5 years after the shock	-0.1	0.0	-0.7	-0.3	0.2	0.1
10 years after the shock	0.2	0.0	0.0	-0.2	0.7	0.3

	Trade Balance		Exports		Employment	
Price Mark-up	ES	IT	ES	IT	ES	IT
1 year after the shock	0.1	0.0	0.0	0.0	0.0	0.0
2 years after the shock	0.2	0.1	0.1	0.0	0.0	0.0
5 years after the shock	0.9	0.4	0.7	0.2	0.3	0.1
10 years after the shock	1.2	0.8	1.2	0.6	0.9	0.4

[4] The gradual versus abrupt comparison is not shown as it delivers the same results as in case of a wage mark-up shock.

Table 4 shows that a reduction in the price mark-up triggers with some lags a downward adjustment of wages and eventually resembles very much the wage mark-up scenario and entails qualitatively similar results across Spain and Italy. In particular, in the short-term (first two years after the shock) the impact of the price mark-up shock does not lead to sizeable competitiveness gains. In the long term (10 years after the adjustment) HICP inflation falls cumulatively between 1% and 2%; real GDP increases between 0.3% and 0.7% and employment between 0.4% and 0.9%. One can notice that compared with the adjustment via nominal wage reduction, the increase in GDP and employment is slightly higher in both countries. This is explained by the fact that the transmission channel between the GDP deflator, consumer and export prices is quicker and stronger than the transmission channel from wages to consumer / export prices. In this respect a fast reduction of price mark-ups appears even more desirable than that of wage mark-ups.

7. Spillovers to the euro area from a wage and price mark-up reduction in Spain and Italy

This section considers a scenario where Italy and Spain are adjusting competitiveness simultaneously and studies the potential spillovers to the rest of the euro area. The presence of spillovers depends on a number of factors and in the literature there is a lot of uncertainty associated with their impact. A positive demand boost in Spain and Italy would be expected to increase demand for foreign goods, but it would also lead to increased inflation, triggering a monetary policy reaction and losses in Spanish and Italian competitiveness. As an illustration, we consider the effects of a wage or price mark-up reductions which are the same as performed in the previous sections but done simultaneously for both Spain and Italy.

Charts 11 and 12 show that the induced increase in real exports (due to gain in competitiveness) in Spain and Italy more than compensates for the fall in exports in the rest of the countries, leading to a small increase in real GDP for the euro area as a whole. For the rest of the euro area countries the reduction in GDP with respect to the baseline level is relatively marginal, this is induced by a more unfavorable net trade contribution to GDP. It should be noted that in the NMCM the rest of the euro area is composed by Germany, France and the Netherlands, i.e. countries which have been persistently running current account surpluses (or have not been running deficit). This implies that the competitiveness adjustment in Spain and Italy triggers a rebalancing of relative current account developments, albeit very limited, across euro area countries.

The absence of large spillovers is common to other models (see Gomes et al., 2010) and could be related to the limited cross-country financial linkages in this version of the NMCM.

Chart 11: Impact of a simultaneous wage mark-up reduction in Italy and Spain on the rest of the euro area (i.e. excluding Spain and Italy) (% deviations from baseline levels)

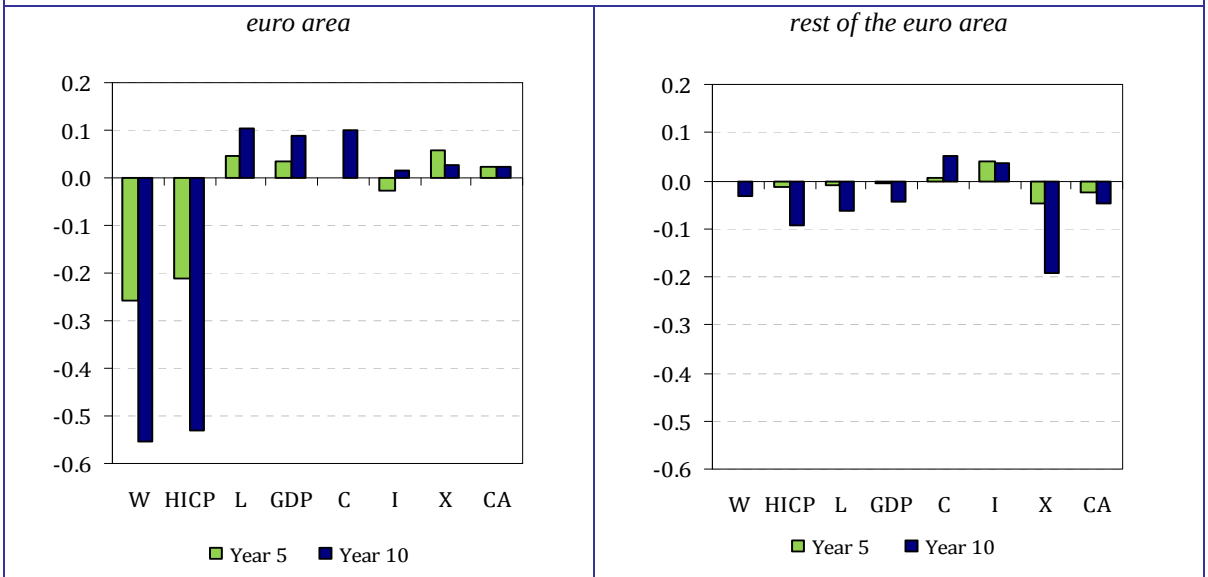
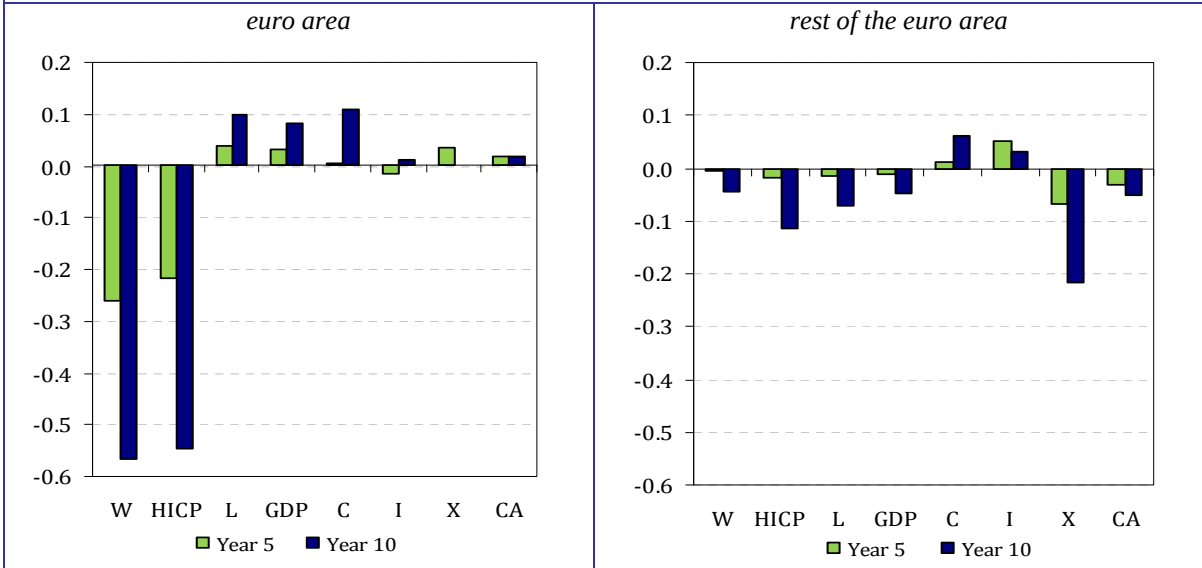


Chart 12: Impact of a simultaneous price mark-up reduction in Italy and Spain on the rest of the euro area (i.e. excluding Spain and Italy) (% deviations from baseline levels)



Note: ULC= nominal unit labour cost, HICP= harmonised index of consumer prices, L = employment, C= consumption, I= investment, X= exports, CA = current account

8. Sources of uncertainty surrounding the results

The NMCM is estimated to match historical relationships in the data. However, the simulations are sensitive to a number of factors and assumptions, including the speed of adjustment and extent of rigidities.

Since the competitiveness channel is a key channel it is important to acknowledge the large uncertainty in the literature on trade elasticities. The uncertainty tends to depend on the sample and the methodology used to estimate these elasticities. Table 5 presents the NMCM estimates along with some alternative estimates. The table shows that the NMCM elasticities are within the plausible range found in the literature between macro and micro estimates.

Another key factor affecting the results is the extent to which product and labour markets are able to adjust to changes in the economy or if this adjustment is hampered by structural rigidities. The NMCM has been estimated to capture the different degrees of rigidities across the countries, which tend to reflect structural characteristics of each economy (such as wage indexation or collective wage agreements), but there might be very different responses at a sectoral level, reflecting the different productive structure of the countries, for example differences between high-tech and low-tech sectors and their responses would depend on whether the shock is a traded or non-traded productivity shock. Therefore, an analysis at a more disaggregated level could be desirable.

Finally, any macro analysis of unit labour costs should account for possible measurement issues related to aggregation problems as shown in the case of Spain by Rodriguez et al. (2012), stressing the relevance of micro-data (see also Altomonte et al., 2012).

Table 5: Estimates of export trade elasticities

	NMCM (2011)	**Imbs & Méjean (2010) constrained estimates**
Germany	-1.1	-1.6
France	-1.0	-1.7
Italy	-1.2	-1.7
Spain	-1.3	-1.9
Netherlands	-1.4	-
Portugal	-	-2.1
Greece	-	-2.0
	NAWM (2008)	**QUEST III (2009)**
Euro area - DSGE	-1.0	-1.2
Time variation (Di Mauro et al. 2010)	**2000 to 2007**	**prior to 2000**
	-0.6	-1.1

Note: See bibliography. NAWM refers to New Area Wide Model: see Christoffel, Coenen, Warne (2008), QUEST III : see Ratto M, W. Roeger, J. in 't Veld (2009)

9. Conclusions

This paper addresses the issue of competitiveness adjustment in the euro area. It focuses on a narrow definition of competitiveness as measured by relative unit labour costs. A rational expectation and a learning version of the ECB's New Multi-Country Model are used to understand plausible dynamics of competitiveness adjustments in the euro area countries.

In the rational expectation version of the model gains are quicker but more short-lived than in a learning environment. We argue that a rational expectation model appears appropriate to describe the abrupt wage adjustment which took place in the Baltic States. By contrast, a learning model appears better suited to capture the gradual wage adjustment of Germany during the 2000s and the one that started in Spain and Italy between 2008 and 2012. In fact, in view of implementation lags and the need to change institutions, in the latter two countries the adjustment should not be expected to deliver output gains as quick as those observed in the Baltic States.

Within a learning environment, the competitiveness adjustment in Germany is taken as an example of a sustained and gradual adjustment. In Spain and Italy, the same gradual and sustained adjustment brings about delayed gains in exports, employment and GDP, as seen in Germany. These gains are higher in Spain than in Italy mainly because the former country is characterised by higher labour demand elasticity to a change in wages than the second country as well as a higher openness.

While implementation lags following the reforms undertaken in Spain and Italy would limit the speed of adjustment that could be carried out in Spain and Italy, given the inertia in the private sector, even a large cut in public wages would most likely be better captured by a learning environment and not a rational expectation environment as in the Baltics.

Ceteris paribus, when comparing the speed of adjustment in a learning environment, the simulations suggest that an abrupt adjustment of wages brings about quicker benefits than a more gradual adjustment.

The paper shows that a gradual reduction in the price mark-up has the same effect of a gradual reduction of a wage mark-up. Like in the previous case, Spain benefits more than Italy from a downward adjustment of prices in view of the larger openness of the former economy.

Finally the paper shows that spillovers from a mark-up shock are generally very small and the aggregate impact of the competitiveness adjustment is positive in the sense that it triggers a reduction of the competitiveness and current account divergences across euro area countries.

The analysis shown in this paper is subject to a number of caveats, which are mainly related to the fact that the working of the competitiveness channel depends largely on the trade elasticities where there is uncertainty about their magnitudes. However the estimated trade elasticities used in the NMCM are in the middle of from a variety of estimates from the literature.

The simulation results shown in this paper are qualitatively similar to those conducted with different models, in particular the Euro Area and Global Economy model (see Gomes et al. 2011) which is a multi-country DSGE with rational expectations, and which delivers stronger and more immediate gains following a wage mark-up shock compared to the NMCM rational expectations version (see Dieppe et al (2012) for a comparison of a temporary wage mark-up shock between EAGLE and the NMCM). In this respect, the simulations carried out with the NMCM learning version complement those of the other models and can be considered to be able to add more realism to the expected impact of structural reforms.

References

Altissimo, F., M. Ehrmann, and F. Smets, (2006), *Inflation persistence and price-setting behaviour in the euro area, a summary of the IPN evidence*. Occasional Paper Series 46, European Central Bank.

Altomonte C., F. di Mauro and C. Osbat (2012) "*Going beyond labour costs: How and why "structural" and micro-based factors can help explaining export performance*? CompNet policy brief no.1, (June).

Álvarez, L. J., E. Dhyne, M. Hoeberichts, C. Kwapil, H. Le Bihan, P. Lünnemann, F. Martins, R. Sabbatini, H. Stahl, P. Vermeulen, and Jouko Vilmunen, (2006), *Sticky Prices in the Euro Area: A Summary of New Micro-Evidence*, Journal of the European Economic Association, vol. 4(2-3), pages 575-584, 04-05.

Barnes, S. R. Bouis, P. Briard, S. Dougherty, M. Eris (2011), *The GDP Impact of Reform: A Simple Simulation Framework*, OECD Working Papers, No. 834.

Blanchard O., F. Giavazzi, (2003), *Macroeconomic effect of regulation and deregulation in goods and labour markets*, Quarterly Journal of Economics, Vol. 118(3) pages 879-907.

Blanchard O. (2007a), *Current account deficits in rich countries*, NBER working paper no. 12925

Blanchard O. (2007b), *Adjustment within the euro. The difficult case of Portugal*, PEJ vol 6, pages 1-21.

Buti M., A. Sapir (1998), eds., *Economic policy in EMU: A Study by the European Commission Services*, Oxford: Clarendon Press.

Christoffel K., G. Coenen, A. Warne (2008), *The New Area-Wide Model of the euro area: a micro-founded open-economy model for forecasting and policy analysis*, ECB Working paper No. 944.

Christopoulou, R., P. Vermeulen (2008), *Mark-ups in the euro area and the US over the period 1981-2004. A comparison of 50 sectors*, ECB working paper no. 856.

Decressin J., A. Fatas (1995), *Regional labour market dynamics in Europe*, European Economic Review, no. 198, January.

di Mauro F., K. Forster, A. Lima, (2010), "*The global downturn and its impact on euro area exports and competitiveness*", ECB Occasional Paper No. 119.

Dieppe A., V. Ajevskis, Z. Bragoudakis, M. Brzoza-Brzezina, J-C. Bricongne, S. Dees, G. Gaulier, S. Gomes, P. Jacquinot, A. Jochem, T. Karlsson, J. Krekó, B. Micallef, C. Osbat, S. Özyurt, N. Papadopoulou, M. Pisani, D. Sideris, P. Tello, I. Vetlov, M. Vyskrabka, (2012), *Competitiveness and External Imbalances within the Euro Area*, ECB Occasional Paper No. 139.

Dieppe, A., A. González Pandiella, A. Willman, (2012). *The ECB's New Multi-Country Model for the euro area: NMCM - simulated with rational expectations*, Economic Modelling Volume 29, Issue 6, Pages 2597–2614

Dieppe A., A. González Pandiella, S. Hall A. Willman, (2011), *The ECB's New Multi-Country Model for the euro area: NMCM - with boundedly rational learning expectations*, ECB Working paper no. 1315

Eichenbaum, M., Nir Jaimovich and S. Rebelo (2008), *Reference Prices and Nominal Rigidities*,.NBER Working Papers 13829, National Bureau of Economic Research, Inc.

Eichengreen (1993), *Labour markets and European monetary unification*, in P. Masson and M. Taylor eds., Policy issues in the operation of currency unions, Cambridge, Cambridge University Press.

Estrada A., J.F. Jimeno, J.L. Malo de Molina (2009), *The Spanish economy in EMU: the first 10 years*, Banco de España, Documentos Ocasionales no. 0901.

European Commission (2008), *Emu@10 - Successes and challenges after ten years of Economic and Monetary Union*, European Economy 2/2008

(2009), *Focus: Competitiveness developments within the euro area*, Quarterly Report on the Euro Area – Vol. 8, no.1, pages 20-51.

(2010), *Surveillance of Intra-Euro-Area Competitiveness and Imbalances*, European Economy no 1.

Felipe, J. and Kumar, U. (2011), *Unit Labor Costs in the Eurozone: The Competitiveness Debate Again*, Asian Development Bank WP No. 651.

Frankel J., A. Rose (1997), *Is EMU more justifiable ex post than ex ante*, European Economic Review, vol. 41, no.3-5, pp. 753-760.

Friedman M. (1953), *The case for flexible exchange rates*, in M. Friedman, Essays in positive economics, Chicago: University of Chicago press, pp. 157-203.

Gali, J., M. Gertler (1999), *Inflation Dynamics: A Structural Econometric Analysis*, Journal of Monetary Economics, 44, 1999.

Gomes, S. P. Jacquinot, M. Mohr, M. Pisani (2011), *Structural reforms and macroeconomic performance in the euro area countries: a model-based assessment*, ECB Working Paper no. 1566.

Gomes, S. P. Jacquinot, M. Pisani, (2010), *The EAGLE. A model for policy analysis of macroeconomic interdependence in the euro area*, ECB working paper no. 1195.

Imbs, J., I. Méjean (2010), Trade Elasticities: a final report for the *European Commission*, Economic Papers 432, European Economy.

Jaumotte, F. and P. Sodsriwiboon (2010), *Current Account Imbalances in the Southern EuroArea*, IMF Working Paper 10/139.

Kenen P. (1969), *The theory of optimal currency area: an eclectic view*, in R. Mundell and AK. Swoboda, eds., Monetary Problems of the International Economy, Chicago: University of Chicago press, pp. 41-60

McAdam P., A. William (2010), *State-Dependency and Firm-Level Optimization: A contribution to Calvo Price Staggering*, Manchester School, 78, 556-581.

McKinnon R. I. (1963), *Optimum currency areas*, American Economic Review, vol. 53, no. 4, pp. 717-725.

Mundell R.A. (1961), *A theory of optimum currency areas*, American Economic Review, vol. 51, no. 4, pp. 657-665.

Pissarides C. A. (1997), *The Need for Labor-Market Flexibility in a European Economic and Monetary Union*, Swedish Economic Policy Review, Vol.4, pp. 513-546.

Ratto M, W. Roeger, J. in 't Veld (2009), *QUEST III: An Estimated Open-Economy DSGE Model of the Euro Area with Fiscal and Monetary Policy*, Economic Modelling, 26, pp. 222-233.

Rodríguez A., G. Pérez-Quirós and R. Segura Cayuela (2012), *Competitiveness indicators: the importance of an efficient allocation of resources*, Banco de Espana, Economic Bulletin, (January)

Rossi (2008), Rapporto sulle tendenze del sistema produttivo italiano, Banca d'Italia.

Ruscher, E., G. Wolff (2009), *External Rebalancing is not just an Exporters' Story: Real Exchange Rates, the Non-Tradable Sector and the Euro*, European Economy Economic Paper 375.

Wage Dynamic Network (2009), *Wage Dynamics In Europe*, Final report, ECB http://www.ecb.int/home/html/researcher_wdn.en.html.

Zemanek H. (2010), *Competitiveness within the euro area: the problem that still needs to be solved*, IEA Economic Affairs, October 2010, pp. 42-47