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Are wages and productivity converging simultaneously in Euro-area countries?

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A convergence analysis is applied to wages and productivity for Euro-area countries in the period from 1981 to 2001. The results show a reduction in the dispersion of wages and unit labour costs, but not in productivity. Different patterns are found for real and nominal wages: higher levels of inflation in countries with higher growth rates of unit labour costs have caused nominal wages to move towards equalization. Moreover, disparities in all the variables have remained more or less the same since 1997, suggesting that the establishment of a single currency area has not accelerated the process of wage equalization.

I. Introduction

The establishment of monetary union would be expected to reduce wage differentials between the countries involved. However, if this reduction is not accompanied by an evolution in productivity, some countries may find that their competitiveness is adversely affected; as they are no longer able to use the exchange rate to restore their competitiveness, a bottleneck may be created. In order to maintain territorial equilibrium in terms of economic activity and employment, the relationship between wages and productivity is a decisive factor. As a consequence, it is expected that market competition and the introduction of the euro will reduce wage differentials between European countries whether or not there are productivity differentials. This means that unit labour costs will converge.

Reports on the convergence of labour costs are contradictory. Erickson and Kuruvilla (1994) find

no evidence of convergence during the eighties in European countries. However, using a more recent (and more extensive) data set, Jung and Doroodian (2001) found convergence in manufacturing labour costs between Belgium, Denmark, France, Germany, Italy, the Netherlands and the UK between 1960 and 1991, due to the behaviour of wages. Forces such as free trade and migration seem to have contributed to this process. Focusing on manufacturing wages, Andersen *et al.* (2000) reported convergence in growth rates of nominal wages for the period 1970–1998 in Euro-area countries (excluding Portugal and Luxembourg) plus Sweden and the UK.

There are three possible reasons for the fall in wage differentials in the Euro-area countries recorded since the establishment of European Monetary Union (EMU): migration, the Balassa–Samuelson effect, and the role of trade unions. With regard to the first of these factors, if workers from low wage

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economies move to those with high wages, the process of wage equalization is likely to be enhanced. The evidence shown by Flanagan (1993), however, indicates that in the thirty years after the Rome Treaty wage differences remained quite stable although the rates of intra-EU migration during this period were relatively high. The second possible explanation of the reduction in wage differentials is the existence of the Balassa–Samuelson (B–S) effect.¹ However, Alberola and Tyrväinen (1998) found evidence of this effect in only three EU economies (Germany, Spain and Belgium): hardly suggestive, at first glance at least, of a major influence on the evolution of differences in whole economy wages. Third, Demertzis and Hughes Hallet (1995) and Jackman (1997) predict that EMU may reduce wage differentials across countries due to a ‘demonstration’ or ‘fair wage’ effect (see European Commission, 1997). They suggest that the possibility of comparing wages in the same currency in different European countries may cause wages to converge. However, as long as productivity rates remain lower in poorer economies, wages may be influenced by factors at the national level, such as wage bargaining between unions and employers (for an analysis of regional economies, see Faini, 1999).² Nonetheless, the experience of the Doorn initiative (the collective bargaining cooperation promoted by the trade union federations of Belgium, Germany, Netherlands and Luxembourg) shows that coordination is complex, especially in the current context of wage moderation due to the European Central Bank’s objective of attaining price stability.

Therefore, EMU provides the basis for a link between productivity and wages performance. Gains in productivity should lead to a corresponding rise in real wages, thereby maintaining the share of wages in national wealth. But if productivity does not follow the performance of real wages, economic

activity will locate in zones with high levels of productivity and slightly higher real wages (due to wage homogenization). As a consequence, there will be growing pressure on countries with lower levels of productivity, which are losing economic activity and whose unemployment levels will inevitably rise. This effect, together with the low level of inter-European migration (due in the main to cultural differences) will have an adverse effect on the poorest countries.

The present paper aims to determine whether unit labour costs, wages and productivity have indeed converged in Euro-area countries. Our main aim is to examine if there was convergence in productivity and unit labour costs between 1981 and 2001. In the next section, we propose a set of criteria for doing so. In Section III, we apply these econometric techniques to unit labour costs, wages and productivity for the Euro-zone economies. The final section concludes and stresses some policy measures that could help to improve the link between unit labour costs and productivity.

II. Methodology for Detecting Convergence

The economic growth literature proposes multiple ways to analyse convergence processes. In this section we apply some of them³ to unit labour costs, wages (considering both nominal and real wages) and productivity for eleven European countries.⁴ These analyses can be divided into cross-section tests on the average growth rates of the variable considered across a sample of countries (β -convergence),⁵ time series tests of the stationarity of differences in the variable levels over time (mainly, unit root and cointegration tests) and measures of the dispersion of the variable analysed across countries over time (σ -convergence).

¹ This effect considers that countries with fast growing labour productivity in the tradable sector face higher inflation in their non-tradable sector than their trade partners. As a result, even if they have a fully fixed exchange rate, a currency board or indeed a common currency with their trade partners, they will experience higher overall inflation and consequently higher wages. If in low-wage countries, the non-tradable sector is more important than in high-wage countries, there may be a process towards wage equalization. However, since the considered effect is more a rise in the relative price of non-tradables than a general increase in the price level, the inflation differential due to the B–S effect would have no implications for the competitiveness of the country’s tradable goods sector.

² The experience of the USA shows that unions initially tried to reduce geographical wage differentials; only the pressure of external competitors changed this trend towards higher wage differentiation. In the case of the reunification of Germany, the trend was similar (Reder and Ulman, 1993). However, the European case may be different: historical, cultural and institutional differences and the pressure of external competitors may act in an opposite direction.

³ Other convergence approaches consider additional aspects such as intradistribution mobility (Quah, 1993). Kernel density functions have not been estimated due to the small size of samples in our analysis.

⁴ Austria, Belgium, France, Finland, Germany, Greece, Ireland, Italy, Netherlands, Portugal and Spain.

⁵ Implementing β -convergence means that some important restrictions on the model must be imposed (see Barro and Sala-i-Martin, 1995).

While the first two criteria examine whether convergence towards a mean value has occurred, σ -convergence considers the evolution of overall disparities. However, there are some assumptions behind the two first approaches that differentiate between them. For Bernard and Durlauf (1996), cross-section tests assume economies to be in transition towards a unique steady state (absolute convergence), and initial differences should tend to shrink over time. The coefficient of the initial level in growth regressions will be negative, reflecting the faster growth of economies with lower initial levels. Different steady states can also be considered (conditional convergence) by introducing other explanatory variables (Barro and Sala-i-Martin, 1995) or by using panel data with fixed effects (Marcet, 1994). However, time series analysis assumes economies to be near steady-state equilibrium, the basic idea being that deviations in the relative levels of the variables considered should be transitory over time. In this case, if the null hypothesis of a unit root is rejected, we can assume that a convergence process has taken place.

III. Empirical Evidence on the Convergence of Wages and Productivity for Euro-Area Countries (1981–2001)

To analyse convergence between the eleven Euro-area countries we used data from National Accounts and OECD Economic Outlook to define unit labour costs, nominal wages, real wages and productivity. Data used are taken from OECD National Accounts for the period 1981–2000 while information for 2001 comes from OECD Quarterly National Accounts, except for Greece, Ireland and Portugal. In these last three countries, adjusted data from OECD Economic Outlook 71 (June 2002) has been used. Wage data used are compensations per employee.

The unit labour cost was defined as the ratio between nominal wages per employee (expressed in \$ exchange rate) and productivity (gross domestic product per worker expressed in terms of PPP), as shown by the following expression:

$$\text{Unit Labour Cost}_{i,t} = \frac{(\text{Wages}_{i,t}/\text{Employment}_{i,t}) \cdot (1/\text{Exchange rate } \$_{i,t})}{(\text{Gross Domestic Product PPP}_{i,t}/\text{Employment}_{i,t})} \quad (1)$$

Table 1 shows β -convergence results for Euro-area countries in the period 1981–2001. The table suggests that there is β -convergence only in terms of nominal

Table 1. β -convergence: cross-section and panel-data results

β -convergence EU-11	Cross- section	Panel data (pool)	Panel data (Country fixed effects)
Unit labour costs			
β	1.82%	5.82%*	10.84%*
R^2	0.668		
Nominal wages			
β	1.34%*	4%*	8.30%*
R^2	0.607		
Real wages			
β	0.17%*	0.18%*	−0.27%*
R^2	0.389		
Labour productivity			
β	1.63%	0.73%	1.74%
R^2	0.17		

Notes: EU-11: Austria, Belgium, France, Finland, Germany, Greece, Ireland, Italy, Netherlands, Portugal and Spain.

*5% significance level.

wages and unit labour costs. For labour productivity the speed of convergence is not statistically significant, whereas for real wages its speed is not relevant.

As stressed in the literature, the use of panel data increases the speed of convergence considerably. For instance, in the case of unit labour costs, it rises from 1.82% (cross-section) to 5.82% (pool). Additionally, if we estimate the speed of convergence allowing different steady states (countries fixed effects) the speed doubles, both for unit labour costs and nominal wages: for instance, in the former case, β -convergence increases from 5.82% to 10.84%. Note, however, that the results obtained by estimating panel data with fixed effects show values for the speed of convergence that are upward biased (Shioji, 1997).

Summing up, we found convergence for unit labour costs and nominal wages but not for real wages or labour productivity. The main implication of these results is that convergence in labour costs is related only with the process of convergence in nominal wages. So, productivity does not follow the same pattern as unit labour costs, though this would be desirable for a healthy economy. High growth rates of unit labour costs are the consequence of high levels of inflation. So, as unit labour costs converge, we would expect investment to choose locations in areas with high productivity levels. This problem can be aggravated for European countries with low levels of productivity if we take into account the lower unit labour costs in non-member states. Nevertheless, β -convergence results reflect the behaviour of a representative economy; for Quah (1993), these findings may be unreliable.

Table 2. β -convergence: pooled time series unit root

	Nominal wages		Real wages		Unit labour costs		Productivity	
	ADF (1)	Long-run relatives (2)	ADF (1)	Long-run relatives (2)	ADF (1)	Long-run relatives (2)	ADF (1)	Long-run relatives (2)
Austria	-2.687*** (0.016)	1.14	-2.603 (0.019)	0.688	-2.793*** (0.013)	1.319	-4.571** (0.000)	0.196
Belgium	-0.317 (0.755)	1.137	-1.812 (0.087)	2.293	-1.166 (0.259)	1.268	-0.418 (0.681)	0.233
Finland	-0.032 (0.975)	0.236	-1.209 (0.247)	0.172	-2.842*** (0.012)	1.386	-1.024 (0.319)	0.209
France	-2.043 (0.058)	0.39	-1.117 (0.280)	2.037	-1.833 (0.086)	0.542	-2.046 (0.056)	0.163
Germany	-1.153 (0.266)	1	-1.85 (0.083)	1	-1.827 (0.093)	1	-0.172 (0.865)	1
Greece	-1.562 (0.136)	1.044	-2.503 (0.024)	5.118	-1.508 (0.149)	0.96	-1.831 (0.086)	0.248
Ireland	-1.264 (0.230)	0.439	-0.218 (0.830)	0.018	-0.589 (0.566)	0.855	-1.347 (0.199)	0.14
Italy	-1.632 (0.122)	0.843	1.791 (0.095)	516.083	-1.84 (0.084)	0.909	-2.301 (0.035)	0.21
Netherlands	-2.176 (0.047)	1.285	-2.508 (0.025)	0.193	-3.094** (0.007)	1.264	-0.725 (0.485)	0.168
Portugal	-2.646 (0.019)	1.369	-0.332 (0.746)	3.146	-1.5 (0.165)	1.197	-3.276** (0.007)	0.26
Spain	-2.288 (0.036)	1.219	-1.727 (0.104)	18.364	-1.588 (0.132)	1.382	0.305 (0.765)	0.12
p_λ		48.162*		49.004*		57.423*		52.195*

Notes: (1) The optimal lag length chosen taking into account the AIC criterion.

(2) Normalized to Germany.

*, **, *** Significant at 1%, 5% and at 10% (standard p -values between parentheses). Significance based on McKinnon critical values.

Another way of analysing convergence is to determine whether deviations from the mean value of the sample have increased or decreased over time. The results obtained applying these time series techniques⁶ show that the null hypothesis of no convergence is rejected for all variables (see Table 2). Analysing bilateral convergence, Austria is the only country that converges towards the sample mean for nominal wages, and in the case of real wages there is no convergence. Likewise, only Austria, Finland and The Netherlands converge towards the mean for unit labour costs, and only Austria and Portugal converge towards the mean for productivity. So most countries do not present convergence, although, overall, Maddala and Wu's (1999) test confirms the presence of convergence for the whole sample.

As regards long-run differentials between countries, the results have to be interpreted with care because they have been calculated under the alternative hypothesis of convergence. This is because, under the null hypothesis, the long-run shocks have unknown distributions. Focusing on nominal wages, only Austria converges towards the German economy in the long run, by 114%. For unit labour costs, taking Germany as the base country, the long-run differential for Austria is around 132%, for Finland 139% and for The Netherlands 126%. Lastly, for productivity, the convergence long-run relatives are: Austria (19.6%) and Portugal (26%).

In general, there is no evidence for the presence of bilateral convergence for all the variables considered and the majority of the countries analysed.

⁶ Applying standard Augmented Dickey–Fuller tests for every individual country, bilateral convergence with the average behaviour of the considered countries can be assessed. Under the null hypothesis, the long-run differential between the countries and the sample average group will grow and shocks in levels will be permanent. By contrast, under the alternative, the shocks will be temporary. In this case, there are two alternatives; convergence is to equal levels – absolute convergence – or convergence is to equal growth rates – relative convergence (Evans, 1998). We also test the convergence of the pool of countries to the mean value applying the Maddala and Wu test (1999).

This contrast between the results using time series and those using β -convergence reinforces the point made by Bernard and Durlauf (1996) that the choice of the appropriate technique depends on the steady state characteristics of the data. Our results for β -convergence for the variables analysed between 1981 and 2001 suggest that European economies are in transition towards a steady state position. This argument is reinforced by the very strong long-run relations that we have obtained.

In our case, β -convergence detects a catching up process towards the mean value that is not supported by the evidence of time series results. The main reason for these contradictory results is the fact that we are assuming that the economies analysed are converging towards a single representative economy. So we are obliged to test convergence using a method that does not have these restrictions. One such is the σ -convergence method, which analyses whether a convergence process has taken place if there has been a reduction of disparities in the variable.

Figure 1 shows the time evolution of the standard deviation of the growth rates of the unit labour costs, wages (nominal and real) and productivity for EU-11 from 1981 to 2001. Variables are normalized with respect to their initial values, as it is important to observe the evolution of the index values rather than the values by themselves. For each variable, the dispersion is always lower in the later years than during the initial period. However, there are differences between the evolution of productivity

and real wages and the performance of the other two variables. For instance, disparities in productivity rose until 1984, and then began to decrease slightly.

On the other hand, unit labour costs and nominal wages increased until 1987, and then decreased steadily, to around 70% of the initial value by the last year. Real wages fell slightly between 1991 and 1998, and stagnated during the final years. In general, disparities for all variables have remained more or less the same since 1997, suggesting that the most recent policy measures and the establishment of the single currency area have not have a great influence on the evolution of differences. Additionally, the slow reduction in disparities during the second half of the 1990s coincides with a substantial wage moderation in the European Union, as Gros and Hefeker (1999) point out. However, those authors show that the evolution is not the same for labour costs, because wages plus labour taxes have remained more or less constant as a percentage of GDP over recent decades. Therefore, an increase in labour taxes has produced small benefits in building up employment rates.

There are four main conclusions that can be drawn from this analysis. First, inflation has influenced nominal wages, and thus unit labour costs, but it has not affected productivity. Second, since the entry of economies with low levels of development (Greece, Portugal and Spain), the disparities have become smaller, especially for unit labour costs and nominal wages. Therefore, economies with lower

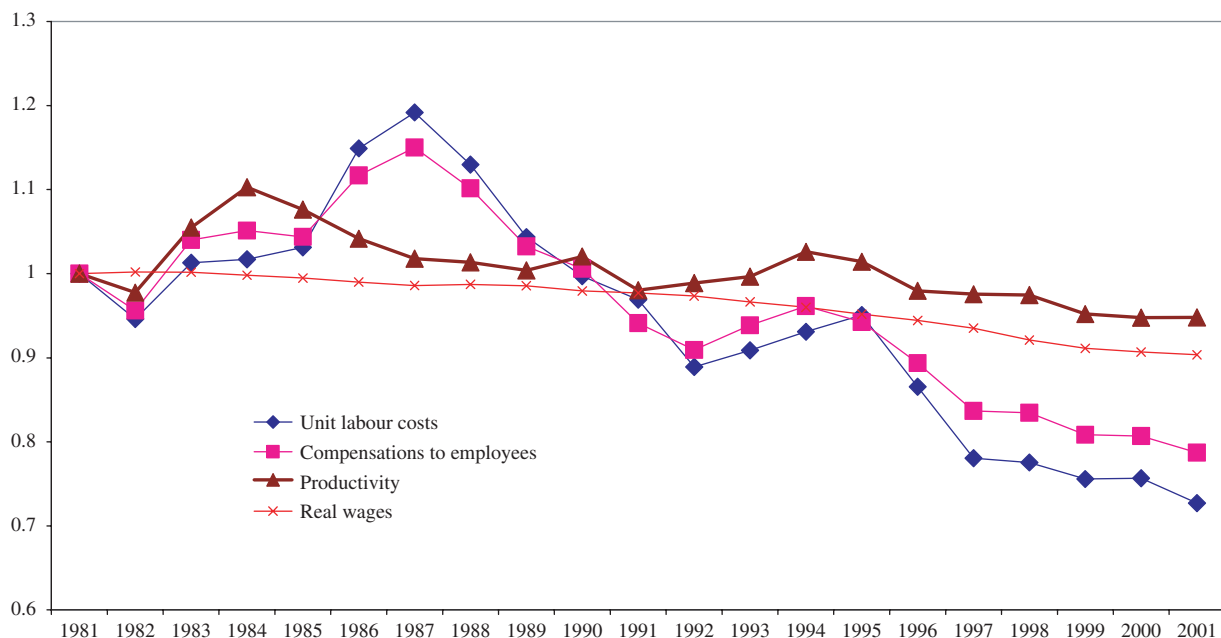


Fig. 1. σ -convergence of unit labour costs, wages and productivity

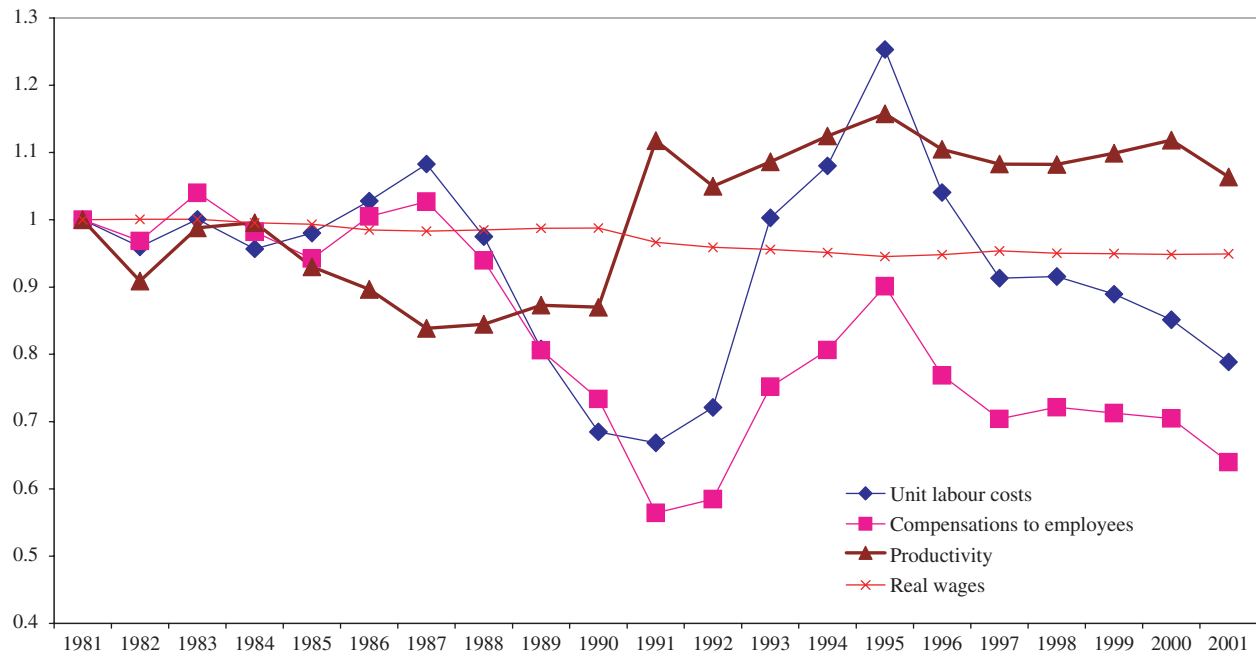


Fig. 2. Evolution of polarization index: unit labour costs, wages (nominal and real) and productivity, normalized to initial values

values for these variables have moved towards equalization, even though productivity levels have not risen at the same time. Third, the relative stagnation during the second half of the last decade has been conditioned by the presence of increases in labour taxes. Fourth, as far as the effects of inflation are concerned, disparities in wages have tended to stagnate.

An additional issue to take into account is the fact that σ -convergence may not detect a polarization process (Esteban, 1994). Figure 2 plots the evolution of the polarization index of all variables normalized with respect to their initial values. If there is an increase in the values of the polarization index, the economies should be considered in different groups, not altogether. In Fig. 2, nominal wages and unit labour costs show the same pattern (i.e. real wages stagnated throughout the period), while productivity presented higher values of polarization from 1991 onwards. For wages and unit labour costs, the final values are lower than the initial ones, although evolution is not stable in either case. Another point should be made concerning the evolution during the period 1991–1995. In this short period, the increase in polarization coincides with a slight rise in disparities measured by means of σ -convergence (1991–1994 for wages and 1991–1995 for unit labour costs). So, this short-term difference in the reduction of disparities appears to be due to a non-homogeneous behaviour in the sample of economies as a whole.

So, once again, productivity does not behave in the same way as the other two variables. The polarization index shows an increase since 1990 – another indication of the lack of convergence in productivity. Moreover, it shows an increase in disparities between two different poles, which can be confirmed by the histograms of the last year (twin-peaked distribution, to use Quah's terminology). So, this result is related to the analysis of detection of convergence clubs in productivity, which cannot be detected by means of β -convergence or time series analysis.

Some other results in the literature reinforce this point of view. In a regional context, López-Bazo *et al.* (1999) shows that, when density functions are estimated, there is an important mass of probability for regions with low levels of productivity. As these lower values are concentrated in two countries (Portugal and Greece), a country-level analysis shows, as in our case, that there is no convergence for this variable. It should also be noticed that productivity at country level in Europe may have undergone a process of polarization. Therefore, Euro-area economies should not be considered as homogeneous productivity groups leading economies with lower levels to non-desirable scenarios in which productivity tends to be far away from nominal wages performance (due to convergence in the latter variable).

Summarizing, the analysis of convergence in this section has shown that during the last twenty years there has been a reduction in the disparities between Euro-area countries in terms of nominal wages and unit labour costs but not in terms of productivity or real wages.

IV. Concluding Remarks

After the introduction of the euro, wage differentials would be expected to shrink due, among other things, to a 'demonstration' or 'fair wage' effect. If this reduction is not in line with the evolution of productivity, in some countries competitiveness will be adversely affected and the exchange rate can no longer be used to restore it. One way to measure competitiveness is by means of unit labour costs. Focusing on the evolution of this variable in the last twenty years, most countries that have used exchange rates to improve their relative position with respect to the other members of the Euro-area. For this reason, increases in wages must be accompanied by productivity improvements if competitiveness is to be maintained.

But are wages, productivity and unit labour costs converging? Looking at the time evolution of these variables for Euro-area countries from 1981 to 2001, we see a reduction in the dispersion of nominal wages and unit labour costs, but not for productivity or for real wages. Real wages and nominal wages present different patterns. We have detected that, the higher inflation in poorer economies influences the convergence process of unit labour costs.

Additionally, the stagnation of σ -convergence since 1997 suggests that introduction of the euro does not seem to have accelerated the process of wage equalization. So neither recent policy measures nor the establishment of a single currency area have had a great influence on the evolution of disparities.

Therefore, if productivity and real wages are to follow the same pattern, in order to improve the territorial equilibrium in economic activity, Europe has to implement labour reforms in areas such as bargaining coordination and tax and security charges in order to control unit labour costs in countries with lower levels of productivity. In addition, political measures designed in order to raise these productivity levels must take into account the polarization process that we have detected. These measures should involve the promotion of technology transfer and human capital development in

these countries. However, it must be borne in mind that the economic structures vary across the Euro-area, and the effects of these possible reforms may well be asymmetrical.

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