Price Convergence in the European Union countries

PAWEL GAJEWSKI

JAKUB KOWALSKI[*]

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Abstract

The aim of the paper is an attempt to analyze the price convergence process in the EU countries covering the period of 1970-2002.

As economic integration proceeds, it is interesting to investigate the dynamics of price relations between countries. The catching-up process may result in stronger inflationary processes in some countries, while in those with lower levels of prices economic is bound to cause higher inflation levels as long as price convergence occurs.

The convergence of per capita GDP and labour productivity levels, have been undertaken in many studies (see, e.g.: Barro, Sala-i-Martin, 1995, Martin, Velasquez, Funck, 2001, De la Fuente, 2002, Tokarski, Gajewski, 2003). In recent years some other aspects of international convergence have been researched, price convergence being one of them.

The theoretical starting point of our analysis is a traditional wage-price mechanism (see Tobin, 1972, Welfe, 2000) and a price convergence concept similar to the one presented by Sosvilla-Rivero and Gil-Pareja (2002). We combine the two approaches to check for price convergence and still be in line

[*] Both authors are Research Assistants and PhD candidates at the Institute of Economics, University of Lodz, Poland.

with the well-documented wage-price mechanism. The methodology of our research is a model pooling cross-section and time-series data with fixed-effect (see Pindyck, Rubinfeld, 1991). We also follow the Levin and Lin (1992) paper regarding panel data estimation.

Keywords: Price level, inflation, convergence, integration, wages

JEL Codes: E24, E31, F02, F41

1. Introduction

As states undergo the path-of-no-return or, stated in other words, globalization process, the convergence issue is being concerned more commonly.

De La Fuente (2002) emphasizes that the growth theory explaining the convergence subject, has taken the place of business cycle theory as one of the most important problems, which needs to be solved.

Economy defines convergence as leveling of the formerly diversified values of crucial economic variables, both nominal and real. That approach constitutes nominal and real convergence.

Barro and Sala-i-Martin (1995) distinguish two concepts of convergence, namely σ- and β-convergence. The former one, seeming to be more intuitive, assumes that the spatial diversification do decrease in the means of certain statistical measures, such as variation or standard deviation.

β-convergence, on the other hand, ties growth rate of the variable with its recent (or starting) value. In order for the convergence process to occur, lower starting value of a variable should translate into its higher growth rate. In this paper we examine the, so-called, β-conditional convergence of prices and wage rates, since we check for other variables' impact on growth rates as well. In particular, as it will become apparent later on, we include wage rates to explain the growth rate of relative prices whereas labour productivity and prices are explanatory variables for relative wages growth rate.

Price convergence considered, the ready-to-use economic law describing the mechanism was introduced by Gustav Cassel in early 1920's, although many claim that the origins can be traced back to the writings of the Salamanca's School members (see e.g. Dornbusch, 1987). The law of one price, hereafter also referred to as LOP, for almost a hundred years has been the central theory for numerous studies.

A very suggestive introduction to the LOP theory is given by Isard (1977): *Students exposed to the pure theory of international trade have been seduced by visions of an imaginary world with few goods, each typically produced by*

several countries but nevertheless homogeneous. In the assumed absence of transport costs and trade restrictions, perfect commodity arbitrage insures that each good is uniformly priced (in common currency units) throughout the world.

The usual definition cited is the one proposed by Sarno and Taylor (2002) *the same good should have the same price across countries if prices are expressed in terms of the same currency of denomination.*

Nevertheless, in the real world several obstacles might be of great importance for prevailing the LOP, just to mention few (detailed description of possible problems can be found in Dornbusch, 1987, Rogoff, 1996 or Sarno and Taylor, 2002):

- the existence of trade barriers, quotas or other trade impediments,

- the impact of capital flows,

- differences in profit margins among regions (countries),

- various national standards,

- the tradable – non-tradable division of goods taken under the consideration,

- not perfect substitutability of goods,

- producers' behavior remaining in accordance with the pricing to market theorem.

The remainder of the paper is structured as follows. In section 2 we look at the recent developments in the field of price convergence issues and we shed some light on outcomes of other researches. Section 3 describes the methodology employed in our analysis. In section 4 empirical results are presented. Section 5 sums up and draws some major conclusions.

2. Survey of Literature

Several studies attempted to verify the predictions of the theory as well as its assumptions (compare the literature on purchasing power parity). The main reason for that might have been the establishment of the European Monetary Union. Trying to foresee the possible implications of introducing the common currency (strictly connected with the EMU) more and more attention has been paid to the price convergence problems.

Not only was it a matter of concern for academics, but also numerous policy makers were involved in the discussion. Willem F. Duisenberg, the President of the European Central Bank, in his speech given on September 6, 2000, emphasized several important issues regarding differences in inflation rates across countries or even regions within a single currency area. He mentioned both short and long term determinants of inflation variations. Among others he indicated government policies, diversified patterns of consumption, the completion of internal market as well as "one-size-fits-all" ECB policy.

Examining inflation and price level convergence constitute two main approaches used in empirical studies.

A good example of inflation convergence analysis can be found in Holmes (1998). He uses time varying parameters, time trends and weak exogeneity over the disaggregated price series to find evidence for inflation in certain sectors (e.g. manufacturing) to adjust faster to common rates. Kocenda and Pappell (1997) give support to inflation convergence in the European Union using aggregate panel data covering the period 1959-1994. Cecchetti, Mark and Sonora (2002) arrive at similar conclusions for United States cities, although they are disappointed with low pace of the convergence.

As for the price level convergence approach, Nenna (2001) obtains convergence prediction among Italian cities using a model with implemented Balassa-Samuelson theorem. She gets half-life raging 11 to 24 years. Lower half-lives of about 2.5 to 5 years come from the experience of German reunification as in Maier and Cavelaars (2003). The authors, on the base of these results, draw conclusions for possible scenarios regarding price

convergence for EU acceding countries. Generally speaking, the most commonly obtained estimates of half-lives range from 2 to 11.5 years (for extensive comparison of these results see: Lan, 2001).

3. Methodology

Originating from the core idea introduced in section 1, we additionally implement the Levin and Lin (1992) approach to the panel data in the same manner as various preceding studies did (compare section 2 summarizing literature findings).

The methodology commonly employed in researches can be described in the formal way by equation (1) (see Sosvilla-Rivero and Gil-Pareja, 2002 or Cecchetti, Mark and Sonora, 2002).

$$\Delta p_{i,t} = \alpha_i + \beta p_{i,t-1} + \sum_{j=1}^{m} \gamma_j \Delta p_{i,t-j} + \xi_{i,t} \qquad (1)$$

Where:

small caps denote natural logarithms of the variable and Δ stands for the first difference;

$p_{i,t}$ − log-difference in the price index in country i in year t relative to the benchmark country.

Equation (1) is applied to panel unit root hypothesis verification, thus equation (1) is also known as Augmented Dickey Fuller (ADF) regression. The value of β is the key parameter to the analysis as it allows distinguishing between the divergence and convergence, for $\beta>0$ and $\beta<0$, respectively.

Moreover, it informs about the expected half-life (equal to T calculated from the formula given in equation (2)) of a $p_{i,t}$ shock, i.e. the time needed for half of a difference in value of the variable from its long-run path to diminish.

$$T = -\frac{\ln(2)}{\ln(1-\beta)} \qquad (2)$$

On the other hand, our model bases on the well-known price-wage mechanism as presented in Welfe (2000), see equation (3).

$$\Delta w_t = \alpha_0 + \alpha_1 \Delta p_t + \alpha_2 \Delta z_t + \alpha_3 U_t + \xi_{wt}$$
$$\Delta p_t = \alpha_4 + \alpha_5 w_t + \alpha_6 \Delta z_t + \alpha_7 \Delta m_t + \xi_{pt} \qquad (3)$$

where:

p – price index;

w – average wages;

z – labour productivity;

m – import price index;

U – unemployment rate.

For the purpose of price and wage convergence examination in the EU countries we take a simplified form of equation set (3) enhancing it with the common framework of the price catching-up analysis (equation (1)). Furthermore, as in Pindyck and Rubinfeld (1991) or Cecchetti, Mark and Sonora (2002) we apply the fixed effect method. Thus we estimate parameters of the following equations (4) and (5).

$$\Delta p_{i,t} = \alpha_0 + \alpha_1 \Delta w_{i,t} + \alpha_2 p_{i,t-1} + \sum_{m=1}^{M} \gamma_{i,j} \Delta p_{i,t-j} + \sum_{n=2}^{N} \phi_n d_n + \xi_{i,t} \qquad (4)$$

$$\Delta w_{i,t} = \alpha_3 + \alpha_4 w_{i-1,t} + \alpha_5 \Delta p_{i,t} + \alpha_6 \Delta z_{i,t} + \sum_{h=1}^{H} \varphi_{i,j} \Delta w_{i,t-j} + \sum_{n=2}^{N} \mu_n d_n + \xi_{i,t} \qquad (5)$$

where:

$p_{i,t}$ – log of consumer price level in country i relative to consumer price level in the benchmark country in year t;

$w_{i,t}$ – log of wage rate in country i relative to wage rate in the benchmark country in year t;

$z_{i,t}$ – log of labour productivity in country i relative to labour productivity in the benchmark country in year t;

d_n – dummy variable for a non-base country n.

Equations (1), (4) and (5) make use of the Campbell and Perron's top-down approach to determine the accurate number of the dependent variables' lags. We start by setting the initial value of m and h equal to 5, estimate the parameters in the next step, and finally leave the statistically significant number of lags.

The fixed effects in equations (4) and (5) allow us to control for possible heterogeneity, which might arise e.g. from differences in fiscal policy or other country specific features that can entail variation of price levels across countries. As a result intercepts (α_0 and α_3) refer only to the base-country, while for any other country n they are augmented by ϕ_n or μ_n, respectively.

4. Empirical Results

The research is based on annual data from the OECD Statistical Compendium Database. As the study concerns the European Union countries, the states included in the panel are: Austria, Belgium, Denmark, Finland, France, Germany[1], Greece, Ireland, Italy, Netherlands, Spain, Sweden, United Kingdom. For certain problems with data we had to exclude Luxembourg and Portugal.

The choice of Germany, as a benchmark country, was determined by the central role it plays in the European economy, see e.g. Holmes (1998).

The estimated values of variable parameters in equations (4) and (5) are presented in Table 1 and Table 2, respectively.

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[1] For the period 1970-1991: West Germany.

Variable	Coefficient (Std. Error)
Constant	0.003 (2.52)
Greece	0.011 (2.24)
$p_{i,t-1}$	-0.029 (-9.68)
$\Delta w_{i,t}$	0.042 (2.90)
Lags of $\Delta p_{i,t}$	Yes (1)

Table 1 Estimation output for equation (4); Dependant variable $\Delta p_{i,t}$

Source: Authors calculations

All coefficients in equation (4) turned out to be statistically significant and of expected signs. The only important country specific variable is the one related to Greece, giving the yearly average growth rate of relative consumer price level by ca. 1 per cent higher than in other countries. Insignificance of other country dummy variables indicates that the relation described by equation (4) is not distinctively diversified across the analyzed countries.

For the period being considered it was necessary to include binary variables for the years 1991 and 1997. The former was introduced to compensate the German reunification. The latter's significance can be justified by the word-wide financial crisis originated in East Asia, which had an influence for European economies as well.

Moving on to the most crucial parameters, the following conclusions can be drawn from the obtained results. Firstly, we found confirmation for the price convergence pressure to exist. The convergence parameter value of –0.029 seems however to be fairly low, as it implies a half-life of 23.5 years. The relative wage growth rate reveals a positive but feeble impact on the growth rate of relative price level.

Variable	Coefficient (Std. Error)
Constant	-0.006 (-1.16)
Greece	-0.060 (-2.10)
Italy	-0.037 (-2.65)
Spain	-0.045 (-2.63)
$w_{i,t-1}$	-0.050 (-2.30)
$\Delta p_{i,t}$	0.305 (2.69)
$\Delta z_{i,t}$	0.760 (8.87)
Lags of $\Delta w_{i,t}$	Yes (2)

Table 2 Estimation output for equation (5); Dependant variable $\Delta w_{i,t}$

Source: Authors calculations

As it can be seen from Table 2, the relative wage growth rate is determined by its level in the prior period, the relative consumer price level growth rate and, above all, by the relative real productivity growth rate. There seem to have been a tendency in the analyzed period towards slower wage rate growth in the South European countries: Greece, Italy and Spain.

The wage convergence parameter, estimated at a value of –0.050, translates into a half-life period of 13.5 years, which means that wages converge emphatically faster than prices. On the other hand, a much stronger impact of relative consumer prices growth rate is observed on $\Delta w_{i,t}$, than inversely. As it was mentioned above, the most significant variable, which influences $\Delta w_{i,t}$, is real relative labour productivity growth rate. If it would rise by 1 p.p., we could expect a 0.8 p.p. increase of the relative consumer price level growth rate.

5. Concluding Remarks

In this paper we examined the conditional convergence process of prices and wage rates among thirteen member states of the European Union in the period of 1970-2002. The results confirm the existence of convergence, yet the speed appears to be slower than it is suggested in most of studies, which do not account for other variables' influence on growth rates of relative prices.

Making use of simplified relations constituting the wage-price mechanism, we find that the speed of convergence is higher in case of wages than for consumer prices. Moreover, the speed of price convergence in Greece is lower than elsewhere, while wages converge significantly slower in Greece, Italy and Spain in comparison to other member states of the EU.

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