Price Level Convergence in Europe: Did the Introduction of the Euro Matter?[1]

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Several theoretical arguments suggest that price level divergence across EU countries has diminished in the course of the European integration process as a result of both product market integration and the introduction of the common currency. In this paper, we empirically assess this hypothesis for the euro area countries and a group of control countries since 1990, using price level data on over 160 products and services in 27 European cities. Our conclusions confirm that price convergence took place at the beginning of the 1990s. There is, however, not much evidence that the introduction of the single currency has led to a further narrowing of price differentials. In fact, price dispersion has remained remarkably stable in recent years, whereas it has increased slightly since 2003 in the control group.

1 Economic Integration Fosters Price Level Convergence

Several processes, such as globalization, trade liberalization or stronger product standardization, imply that price level convergence is a global phenomenon. Within Europe, price level convergence is likely to have been speeded up additionally by the process of European integration, including product market integration and the introduction of the common currency in 1999/2002.[5] A number of arguments would support this proposition:

First, removing trade barriers facilitates access to products across national borders, and enhances arbitrage that helps eliminate price differences.[6] A number of European countries agreed to abolish internal tariff barriers already in 1968.[7] Further barriers to trade were removed with the adoption of the Single European Act in 1986 and the Single Market Programme in 1992, which among other things led to a partial harmonization of sales taxes within the European Union (EU). But it is only with the physical introduction of the euro in 2002 that price differences became clearly visible, enhancing both competition and goods arbitrage.

Second, the harmonization of regulation and taxation has gradually reduced the cost of doing business in other EU member countries. The common European currency further contributes to lowering such costs by eliminating exchange rate uncertainty

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[5] *As a matter of fact, Engel and Rogers (2004) actually interpret the level of price convergence as an indicator of market integration.*

[6] *Arbitrage is when consumers or retailers buy products at the cheapest price and sell them in other locations at a higher price.*

[7] *According to the factor price equalization theorem, free trade helps achieve price equalization of homogeneous goods, leading to factor price equalization which, in turn, brings even greater price equalization.*

and related risk premiums as well as currency conversion costs. Clearly, this enhances goods arbitrage.

Third, flexible nominal exchange rates can generate or reduce price differences if local currency prices are sticky in the short run. If goods and services are priced in each country's national currency (local currency pricing), a nominal depreciation in the country with the lower price implies widening price differences. In turn, an appreciation leads to convergence of prices expressed in the same currency unit. Within the euro area, the impact of the nominal exchange rate on price differences across countries was eliminated when the exchange rates of the euro's legacy currencies were irrevocably fixed in 1999.

Finally, firms outside the euro area may increasingly tend to set common prices for the entire euro area, so that monetary unification itself eliminates pricing-to-market practices across different member states (Devereux et al., 2003).

Moreover, as Engel and Rogers (2004) suggest, the effects of the common currency on European integration could go beyond those direct effects. The commitment to a common currency may signal even broader integration on issues such as nontariff trade barriers, labor policy or property rights. This may increase producers' and retailers' willingness to assume the fixed costs of opening foreign sales offices or training foreign representatives.

All these arguments would imply an initial wave of price level convergence after the creation of the Single Market and potentially a second wave when the common currency was implemented and reinforced the path towards integrated markets.

On the empirical side, the question of whether prices equalize across countries over time – defined in the literature as the question of whether purchasing power parity (PPP) holds – has long been haunting the economic profession and has generated one of the most hotly debated areas in international economics. Since Rogoff drew attention to the puzzlingly slow reduction in differences in price levels (Rogoff, 1996), much research has been done, without, however, offering a universally accepted view for the causes of this puzzle. For instance, Engel (2000) shows that the correction of the relative price level occurs more quickly for items such as fruits, fuel and energy than for other types of goods in a number of European economies. Imbs et al. (2005), who use very disaggregated price categories, find an average half-life of price differentials of close to one year. This so-called aggregation bias has drawn strong objections from e.g. Chen and Engel (2004). Others, like Taylor and Taylor (2004), argue that price differences may persist because of transportation costs and that price differences beyond transportation costs narrow quickly.

One of the major weaknesses of the conventional PPP literature is that it does not use price level data but cumulated inflation rates. While this allows researchers to investigate whether the price level of goods and services move in sync in different countries, it does not permit them to assess whether or not the prices of goods equalize across countries. The first researchers who tried to tackle this problem were looking at the absolute price of small sets of well-identified goods. For instance, Gosh and Wolf (1994) analyzed the price of the "The Economist" magazine and found

that the absolute version of PPP[8] is violated. Crucini and Shintani (2002) enlarged the coverage of goods and services, using the absolute price level data provided by the CityData database of the Economist Intelligence Unit (EIU). They detected very large differences in the prices of individual goods and found evidence of very quick mean reversion to these large deviations. Hence, differences in prices are large in absolute terms and stay stable over time. The authors also show that it does not matter whether data for single goods or aggregated data are used. This casts doubt on the aggregation bias hypothesis put forth by Imbs et al. (2005). Goldberg and Verboven (2005) and Lutz (2000) could not find much evidence in favor of absolute PPP for car prices, either.

The EIU CityData database has been extensively used to study the extent to which price levels have converged in the euro area over time. Indeed, the implementation of the Single Market and the introduction of the euro are both expected to stimulate price level convergence. The general finding of the literature seems to support the effect of the first factor, but not of the second one. Most of the price level convergence occurred during the early 1990s mainly due to convergence in tradable price levels as a result of tax harmonization and a decline in income dispersion (Rogers, 2001, 2007). The introduction of the euro, however, failed to produce the much expected further price convergence-enhancing effect (Engel and Rogers, 2004; Lutz, 2002; European Commission, 2004). This is not sur-

prising, as price discrimination is still an important feature of price setting in the euro area (Fabiani et al., 2006).[9] Baye et al. (2002) point out that price dispersion even increased after 1999 for goods sold on the Internet. Still, the dispersion of price levels today is found not to be much larger than in the U.S.A., which could be viewed as a natural benchmark (Rogers, 2007). Allington et al. (2005), who show the positive impact of the euro on price level dispersion using disaggregated price data obtained from Eurostat, are an exception.

Now, five years after the introduction of the euro as a cash currency, we revisit the question of price convergence, using EIU CityData price level data from 1990 to 2006 for the euro area countries (excluding Slovenia). We also use a set of developed European countries that are not members of the euro area as a control group. It is not absolutely clear whether enhanced price level convergence related to monetary integration would be triggered by the introduction of the euro as an accounting unit in 1999 or only by the use of the euro as cash currency three years later. In our benchmark investigation we assume that the euro cash changeover was more relevant, but also perform robustness checks based on the year 1999. We investigate this question for a large number of goods and services sold in conventional shops and hypermarkets in the capital cities of the countries under study. Our results broadly confirm the findings of earlier studies, suggesting that most of

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[8] *Absolute PPP means that the price of the same good sold in two countries is the same if expressed in the same currency unit. Relative PPP indicates that the domestic-to-foreign price ratio remains stable over time.*

[9] *For instance, a large majority of Dutch companies operating abroad report that their pricing policies have not changed since the start of the Economic and Monetary Union (Hoeberichts and Stokman, 2006).*

price level convergence took place in the early 1990s. There is not much evidence, however, that the introduction of the single currency has systematically led to a further narrowing of price differentials.[10] Price convergence took place only for a limited number of goods and services.

The outline of the paper is as follows: Section 2 describes the dataset and the methodology of the paper. Section 3 sketches out some stylized facts emerging from eyeball econometrics and presents the results of the convergence analysis. Section 4 concludes.

2 EIU CityData – A Unique Database

We use data obtained from the EIU CityData database. This is a remarkable database that contains observations for the price levels of over 160 products and services in 140 cities in 91 countries worldwide from 1990 to 2006. Table 1 provides insight into the range of goods and services covered. The original purpose of the data collection was not to provide data for research but rather to calculate a cost-of-living index for multinational corporations that move employees around the world.

We use data for euro area members (excluding Slovenia) and a control group including developed non-euro area countries from Western Europe: Denmark, the United Kingdom, Iceland, Norway, Sweden and Switzerland. While the dataset reports data for more than one city for some of the countries,[11] we focus our empirical study on the capital cities only. As a robustness check, we alternatively use the average of the available cities for the country. For the non-euro area countries, the price data are converted from national currency units to euro using the dollar/ euro and the dollar/national currency unit exchange rates drawn from City-Data.

The data provided by the EIU is collected by EIU correspondents operating in the cities considered. The price data refer to prices in supermarkets and medium-priced retail outlets. While efforts are made to gather price data for goods and services of internationally comparable quality, full comparability is not always warranted due to differences in quality and the range of the goods available. Furthermore, items such as residential properties for monthly rent or clothing are hard to compare across countries, given differences in preferences, local taste and the wide variety of choice.

We evaluate the existence and degree of price convergence in the euro area by studying the changes in price dispersion across euro area countries for the individual items in our dataset. A reduction in price level dispersion (measured in terms of the variation coefficient of the price of a given product across cities) indicates price convergence, while an increase indicates price divergence. This concept of convergence has been labeled "sigma convergence" in the literature

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[10] Parsley and Wei (2001) and Faber and Stokman (2004) show that a stabilization of the exchange rate reflected in diminishing exchange rate risk promotes goods market integration and price level convergence. A decrease in foreign exchange rate risk is indeed a prominent feature of the run-up to the euro and could partly explain why the benefits of the euro were "cashed in" before the introduction of the euro.

[11] The EIU CityData contains data for five cities in Germany and for two cities in Spain, France, Italy, Switzerland and the U.K.

Table 1

Goods and Services Included in the Dataset

Goods	**Clothing:** dress, business shirt, business suit, women's sweater, raincoat and shoes, men's raincoat and shoes, girl's dress, boy's jacket and trousers, child's jeans and shoes, socks, tights
	Cars: compact, deluxe, family, low price
	Other durable goods: electric toaster, frying pan, CD, color TV, PC, Kodak film, batteries
	Semidurable goods: Toilet tissue, toothpaste, shampoo, soap, razor blade, light bulb, hand lotion, laundry detergent, dishwashing liquid, lipstick, insect repellent, facial tissues, Aspirin
	Tobacco products: local cigarettes, Marlboro cigarettes, pipe tobacco
Food	**Fruits:** apples, bananas, lemons, oranges
	Vegetables: carrots, lettuce, mushrooms, onions, potatoes, tomatoes
	Canned fruits and vegetables: peas, peaches, pineapples, tomatoes
	Meat: beef, lamb, veal and pork (various types), fresh and frozen chicken and fish, ham, bacon
	Dairy products and eggs: milk, butter, margarine, natural yogurt, imported cheese, eggs
	Semidurable food: bread, cornflakes, corn oil, olive oil, flour, rice, spaghetti, sugar
	Nonalcoholic beverages: chocolate milk, cocoa, Coca-Cola, mineral water, tonic water, orange juice
	Coffee and tea: ground coffee, instant coffee, tea bags
	Beer and wine: local and top quality beer, wine of superior, fine and table quality
	Hard liquor: cognac, gin, cointreau, scotch, vermouth
Services	**Household-related services:** babysitter, domestic cleaning help, dry cleaning, laundry, man's and woman's haircut, telephone and line, telephone charge
	Car and transport-related services: car repair, car insurance, taxi charges, road tax
	Recreation services: cinema and theater seats, drink in a bar, Hilton-type hotel, moderate hotel, development of a film, local or foreign newspaper, weekly magazine, paperback book, three-course dinner, different quality lunches
	Household energy: water, electricity, heating oil, gasoline, gas
	Rents: car rental, office and industrial space rent, rents for a range of furnished and unfurnished apartments and houses

Source: EIU-CityData.

on economic growth (see for example Barro and Sala-i-Martin, 1992).

Following this approach, we investigate whether the prices for individual items in our sample show convergence or divergence trends throughout the whole sample. We then also explicitly investigate these trends in the pre- and post-euro period. In our benchmark exercise we assume that the cash changeover was the relevant event enhancing price level convergence. It was only with the euro as a cash currency that price differences became clearly visible to consumers, enhancing both competition and goods arbitrage. We therefore compute for all products the change in dispersion in the period preceding the euro cash changeover (1990 until 2002) and afterwards (2002 to 2006). As we cannot exclude that the bulk of the effect – if any – happened already with the irrevocable fixing of the exchange rates and the introduction of the euro as an accounting unit, we also generate alternative subperiods by splitting the sample in 1999, as a check for robustness. To distinguish the potential effects of monetary unification from general Europe-wide trends, we also perform the exercise for the set of European control countries.

3 Little Empirical Evidence for Euro Effects, but Large Differences at a Disaggregate Level

A preliminary look at the data provides a rough idea of the extent of possible price convergence effects of the euro. Chart 1 depicts the evolution over time of the cross-country dispersion of the overall price level for the euro area and the group of

Chart 1

Overall Price Dispersion

Variation coefficient

All items, euro area   All items, control group
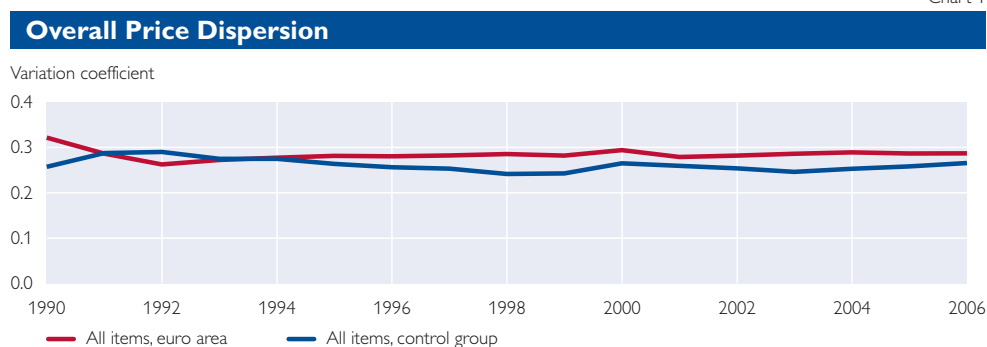
Source: Authors` calculation using EIU CityData prices.

control countries, measured in terms of the variation coefficient. These figures for the overall price level are only very rough measures, calculated simply as the unweighted average of the dispersion measures for each good and service item. To calculate the variation coefficient of a proper price index would require the weights for each item in the consumer basket for each city/country, information that EIU CityData does not provide.

According to the plotted series from 1990 to 2006, price dispersion decreased mostly during the early 1990s and remained flat afterward. This result is in line with the earlier literature that allocates the major convergence wave to the first half of the 1990s. Around 2000, we observe a pickup in price dispersion that appears to be unrelated to the euro, given that the same peak shows up also in the data for the control group. While price dispersion in the euro area is persistently at a higher level in the euro area than in the group of control countries, it remained flat in recent years, whereas the variation coefficient showed a slight increase since 2003 in the control group.

Overall, notwithstanding progress in price level convergence, prices still show substantial differences across cities going beyond levels ex-

plained by factors such as taxation. For instance, in 2006, one kilogram of apples cost EUR 2.68 in a supermarket in the German city of Mannheim but only EUR 0.85 in Vienna.

Looking at more disaggregated data grouped according to the classification given in table 1, the overall picture becomes much more heterogeneous. The series plotted on charts 2 to 5 reveal that in several cases, the level of price dispersion is substantially higher in the euro area than in the control group. Moreover, in some cases it showed an increasing trend over recent years, particularly for vegetables, nonalcoholic beverages and for dairy products and eggs. For other items, it is difficult to discern tangible and systematic differences in price dispersion between the euro area and the control group. For instance, meat and durable goods show similarities both in levels and in evolution. Furthermore, we can observe initial price convergence for clothing, followed by a rise in price dispersion both for the euro area and the control group. This could indicate that some international factors, such as globalization or product standardization, are at play.

We also note that – in line with international trade theory – the price

dispersion of goods that are easily tradable, such as canned fruits and vegetables, durable household goods and cars, tend to be below the levels shown for other items. The lower and/or decreasing dispersion of prices for alcohol and tobacco in the euro area may be related both to the harmonization efforts at the EU level (i.e. minimum taxation on alcoholic beverages or cigarettes) and the low price elasticity of these items, which makes them a first-rate candidate for tax revenue-raising attempts in budgetary consolidation periods, especially in countries with initially low tax rates. Overall, there are only few items (cars, hard liquor, tobacco products) where dispersion has declined markedly in the euro area since the cash changeover with no corresponding decline in the control group.

Finally, it appears that there has been some convergence in service prices and that service price dispersion is lower in the euro area than in the control group, especially toward the end of the sample and except for household-related services. One way of interpreting this is that economic convergence within the euro area causes inputs for services, mostly wages, to converge across countries. But convergence in services prices can come not only via convergence in costs, but also through an increase in market competition in services, fueled by privatization and market liberalization. Examples in our data sample are car insurance, telephone charges or the costs for electricity.[12]

Overall, in line with the existing literature, there are indications of price level convergence for some items during the first half of the 1990s. Evidence of a further surge in convergence related to the introduction of the euro can, however, hardly be inferred from charts 1 through 5.

To confirm the preliminary conclusion of the purely visual inspection of price dispersions, table 2 indicates for the euro area and the group of control countries whether there are overall convergence or divergence trends within each of the item subgroups.[13] For instance, the category beer and wine refers to the overall picture for local and top quality beer and wine of superior, fine and table quality, each in small outlets and in big stores. For the euro area we show the results for the entire sample as well as for the subperiods 1990 to 2002 and 2002 to 2006.

The analysis of table 2 sheds light on a number of interesting aspects of the price level convergence process in the euro area and in Europe more generally.

A first general observation is that convergence mostly took place before the cash changeover in 2002. A similar conclusion can be drawn when splitting the sample in 1999 (not shown in table 2). There are only few instances in which the introduction of the euro can be associated with price level convergence. Examples are cigarettes and tobacco products, as well as several food items.

Second, tradable and branded goods prices do not seem to have con-
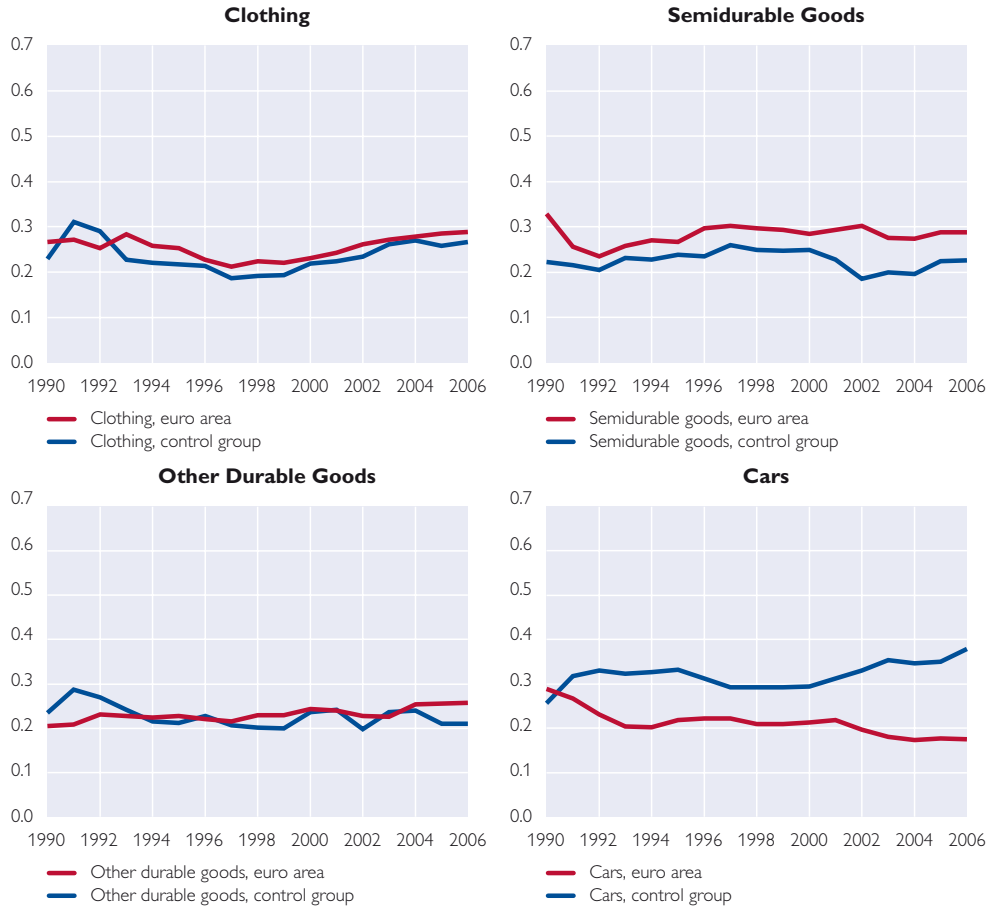
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[12] The temporary steep increase in rent prices dispersion in the group of control countries can be entirely attributed to housing market developments in the city of London.

[13] "Overall convergence" is defined as convergence in at least two-thirds of the subitems. A corresponding definition holds for "overall divergence"; all other cases are labeled as "mixed."

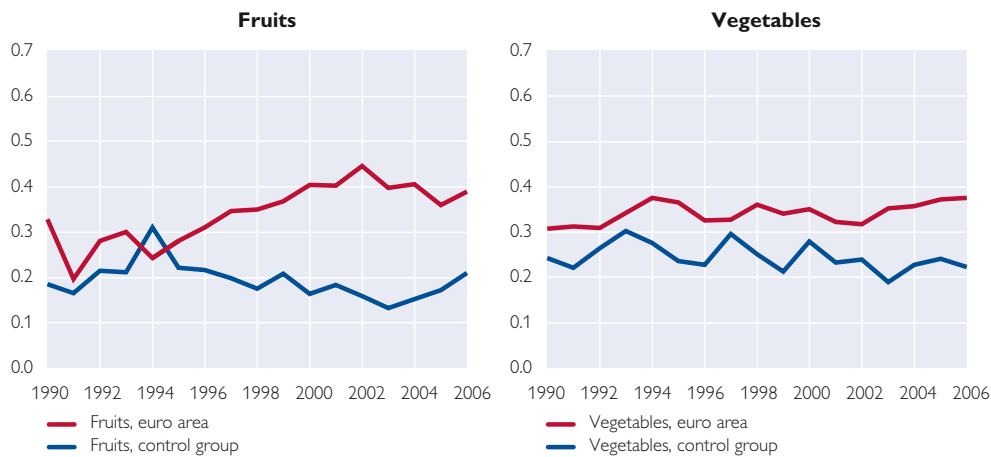Chart 2

Price Dispersion of Goods

Variationskoeffizient

Clothing

Clothing, euro area
Clothing, control group

Semidurable Goods

Semidurable goods, euro area
Semidurable goods, control group

Other Durable Goods

Other durable goods, euro area
Other durable goods, control group

Cars

Cars, euro area
Cars, control group

Source: Authors` calculation using EIU CityData prices.

Chart 3

Price Dispersion of Foods

Variation coefficient

Fruits

Fruits, euro area
Fruits, control group

Vegetables

Vegetables, euro area
Vegetables, control group

Price Dispersion of Foods – Part 2

Variation coefficient

Canned Fruits and Vegetables

- Canned fruits and vegetables, euro area
- Canned fruits and vegetables, control group

Meat

- Meat, euro area
- Meat, control group

Dairy Products and Eggs

- Dairy products and eggs, euro area
- Dairy products and eggs, control group

Nonalcoholic Beverages

- Nonalcoholic beverages, euro area
- Nonalcoholic beverages, control group
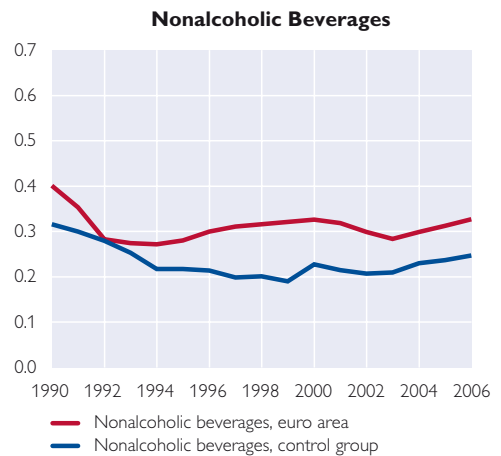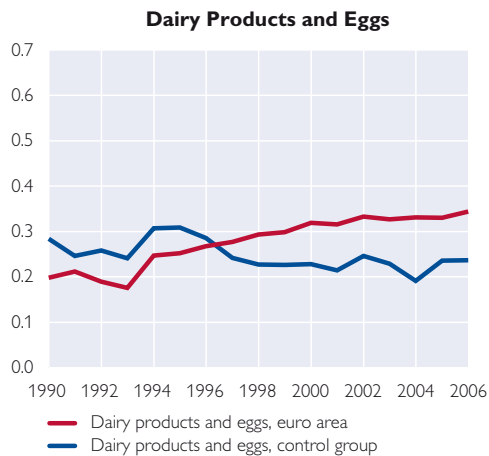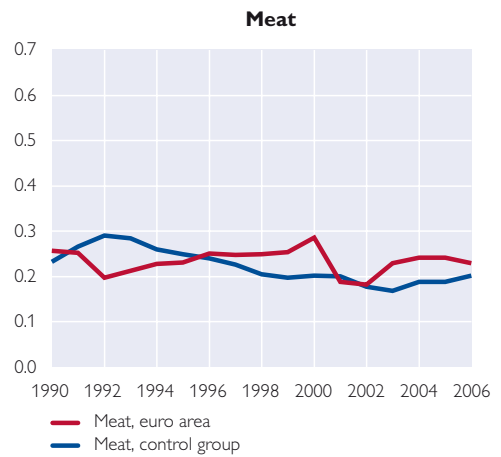
Source: Authors' calculation using EIU CityData prices.

Chart 4

Price Dispersion of Services

Variation coefficient

Household-Related Services

- Household-related services, euro area
- Household-related services, control group

Recreation Services

- Recreation services, euro area
- Recreation services, control group

Chart 4

Price Dispersion of Services − Part 2

Variation coefficient

Car and Transport-Related Services

Rents

Car- and transport-related services, euro area
Car- and transport-related services, control group

Rents, euro area
Rents, control group

Source: Authors' calculation using EIU CityData prices.
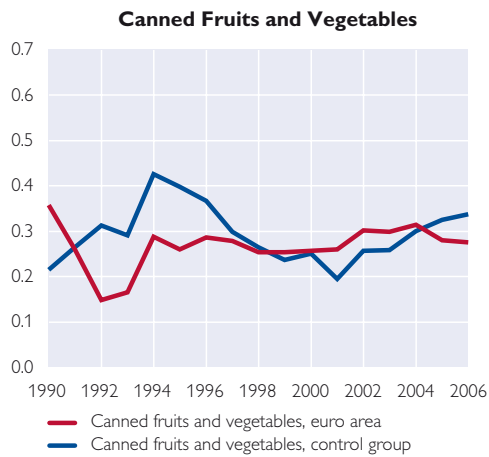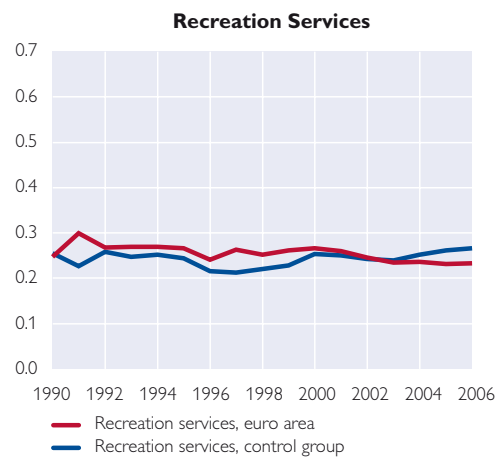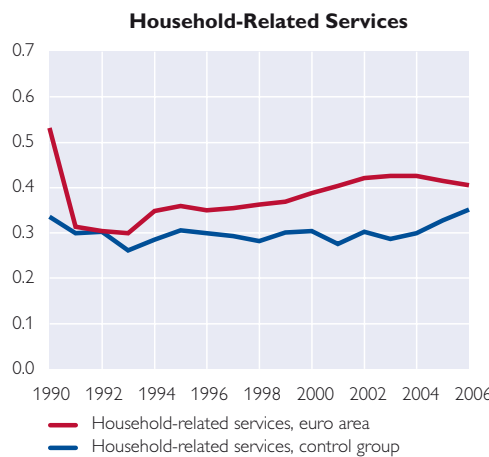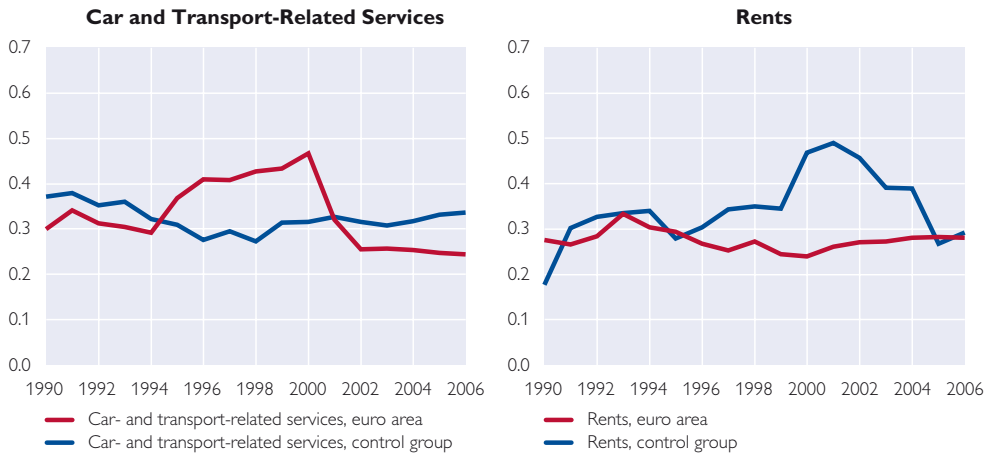
Chart 5

Price Dispersion of Alcohol and Tobacco Products

Variation coefficient

Beer and Wine

Hard Liquor

Beer and wine, euro area
Beer and wine, control group

Hard liquor, euro area
Hard liquor, control group

Tobacco Products

Tobacco products, euro area
Tobacco products, control group
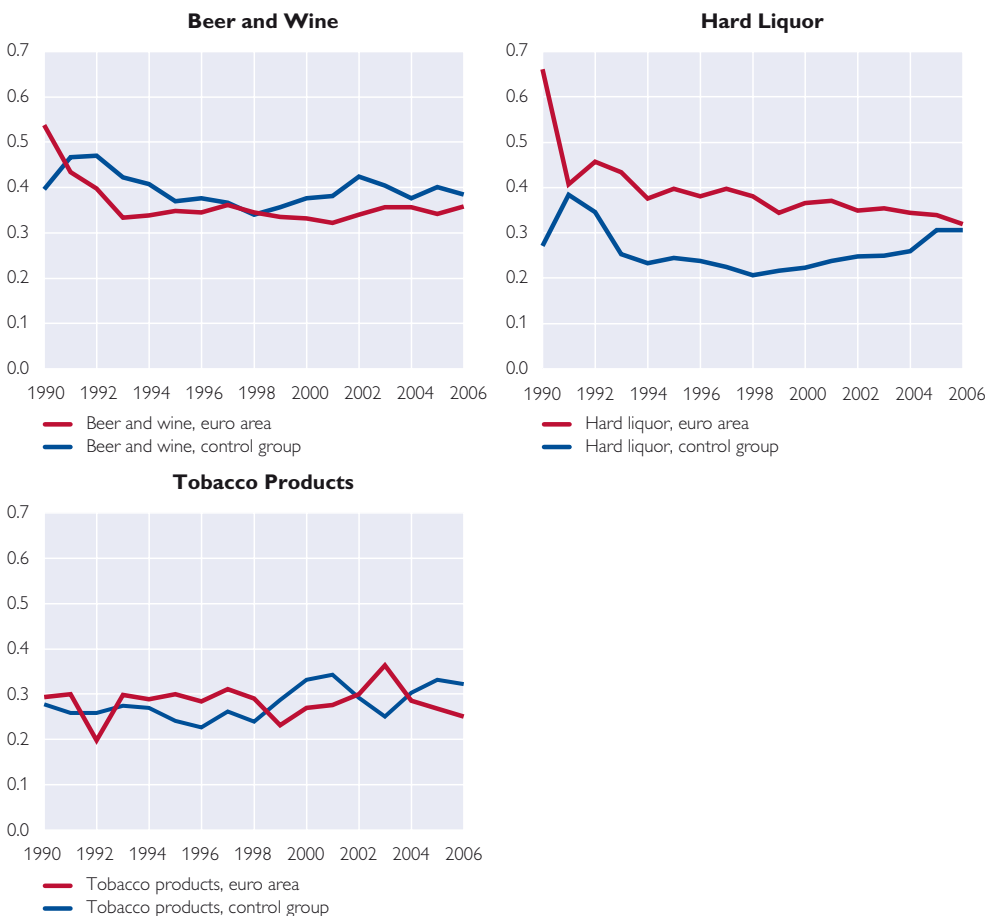
Source: Authors' calculation using EIU CityData prices.

Table 2

Price Convergence and Divergence before and after the Euro Cash Changeover

	Euro area			Control countries	
	1990 to 2006	pre-euro	post-euro	pre-euro	post-euro
Goods					
Clothing	C	C	D	M	M
Cars	C	C	C	M	D
Other durable goods	C	M	D	M	M
Semidurable goods	C	C	M	C	D
Tobacco products	M	D	C	D	C
Food					
Fruits	D	D	C	M	D
Vegetables	C	C	M	C	M
Canned fruits and vegetables	C	C	M	C	D
Meat	C	M	C	M	M
Dairy products and eggs	D	M	M	C	C
Semidurable food	C	M	C	M	M
Nonalcoholic beverages	C	C	D	C	D
Coffee and tea	D	D	M	C	M
Beer and wine	C	C	M	C	M
Hard liquor	C	C	C	C	D
Services					
Household-related services	M	M	M	M	M
Car- and transport-related services	M	C	M	M	C
Recreation services	C	C	M	M	D
Household energy	M	M	M	C	M
Rents	C	C	M	M	D

Source: EIU CityData.
*Note: Pre-euro: 1990 to 2001, post-euro: 2002 to 2006. **C** represents convergence, **D** divergence and **M** mixed evidence.*

verged more than service prices. As mentioned above, this may be interpreted as a sign of wage convergence and of stepped-up market competition triggered by privatization and market liberalization. Also, the type of outlet, i.e. hypermarkets/supermarkets versus normal-sized shops, does not substantially influence price level convergence and divergence.

Third, the control group's price level convergence and divergence behavior is different, with some exceptions, such as beverages or cigarettes and tobacco. Price dispersion tends to be lower in the euro area countries, especially at the end of the sample. This may relate to the lack of exchange rate variability.

Carree and Klomp (1997) provide a method for testing for the statistical significance of changes in price dispersion. The T2 test statistic is given by

$$T_{2i} = (N - 2,5)\ln\left[1 + \frac{1}{4}\left(\frac{\hat{\sigma}_{it}^2 - \hat{\sigma}_{iT}^2}{\hat{\sigma}_{it}^2\hat{\sigma}_{iT}^2 - \hat{\sigma}_{itT}^2}\right)\right]$$

where $\hat{\sigma}_{it}^2$ is the variance of the price of product i across the cities in the sample evaluated at period t, $\hat{\sigma}_{itT}^2$ is the squared covariance between the price data at period t and period T, and N is the number of cities in the sample. Under the null hypothesis of no change in dispersion, the T_2 test statistic is χ^2 distributed with one degree of freedom.

Carree and Klomp's test statistic is defined for the standard deviation as a measure of dispersion. However, our investigation is based on the variation coefficient, defined as the standard deviation divided by the mean.

This measure accounts for the fact that dispersion may rise when the average price level increases. In contrast to the standard deviation, this measure is comparable across items and country groups and thus more appropriate for our purpose. As an additional check, we nevertheless perform Carree and Klomp's test for the standard deviation of all individual items. The results are not overwhelming, given that the tests are very often not statistically significant, especially for the subperiods. We should thus interpret the cases of convergence and divergence in table 2 with some caution.

As a check of robustness, we perform the same exercise using not just the capital city for those countries where more than one city is covered by the data set (Germany, France, Italy and Spain), but the average of the cities. The results show some differences, indicating some intracountry heterogeneity. Furthermore, we repeat the exercise using the year 1999 as the threshold between the two subperiods. The results are broadly in line with the baseline scenario.

4 Other Factors May Outweigh Possible Euro Effects

In this study, we assessed the degree of price convergence in the euro area using the widest set of products for which price level data are available. We specifically investigated the question whether the introduction of the euro was a driving force of price level convergence. Our conclusions broadly confirm the findings of earlier studies, suggesting that the bulk of price convergence took place in the early 1990s and that there is not much evidence that the introduction of the single currency as an accounting unit and later as cash currency has led to a further narrowing of price differentials.[14]

The evolution of price dispersion in the euro area since the introduction of the euro differs, however, from that in a group of comparable European countries which we use as a control group. Overall, price dispersion in the euro area exceeds that of the control group, but has remained remarkably stable after the introduction of the euro, while the control group has experienced an increase in dispersion since 2003. For some tradable goods, there is price convergence (e.g. cars), but surprisingly, there is also price convergence for some services. This could be explained by an increase in competition in services and perhaps also by the convergence that took place for local factors such as wages and per capita income.

Several reasons can be put forward to explain this lack of further convergence after euro introduction. One explanation is that most product market integration took place in the early 1990s, so that no second convergence wave was to be expected. By 1999/2002, the consumer goods markets had already become highly integrated, with some notable exceptions, such as cigarettes and tobacco products. Also, convergence of monetary and fiscal policies was already a precondition for monetary unification. Engel and Rogers (2004) claim

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[14] *While earlier studies (Rogers, 2001 and 2007; Engel and Rogers, 2004) were written soon after monetary unification and often claimed that it may have been too early to detect significant effects, this argument applies much less to our study. Depending on whether one judges the introduction of the euro as an accounting unit or as cash currency as the relevant event, the euro has now been reality for eight or five years, so that potential effects should be visible in the price data.*

that it was not the adoption of the euro per se that effected market integration, but rather the commitment toward harmonizing monetary policy. Along this argument, it would not be surprising that the final step of this integration process, the introduction of the common currency, had no overwhelming visible effect.

Another argument is that the euro may have had small convergence effects after all, but that other factors continue to hamper market integration and dominate the euro effects. Sales taxes are only fractionally harmonized at the EU level, where only minimum standards are required. Other local factors, such as price regulation, transport or distribution costs, market segmentation or local consumer preferences, may play a role. Some goods and services contain a large nontradable component or are not tradable at all. The Services Directive was decided only recently and allows for several exceptions, so that effects will be limited and visible only in the years to come. Furthermore, factors such as transaction costs or information barriers between local and foreign consumers may severely hamper international competition between producers and distributors. In some cases, finally, structural

policy measures that are expected to induce price level convergence in the longer run may even increase price dispersion in the short to medium run. An example is the liberalization of network industries, which each EU country implemented at its own pace (European Commission, 2001). All these factors may have outweighed the potential positive effects of the introduction of the common currency as an accounting unit and later as a cash currency.

From a monetary policy point of view, the remaining substantial price level differentials matter only insofar as potential future price level convergence may imply future temporary inflation divergence. As low-price countries tend to be those with high inflation rates and high-price countries mostly show low inflation, price level convergence could imply an amplification of these inflation differentials. This does not pose a problem for decision-making itself, as the common monetary policy is geared toward price stability at the euro area average and the overall effect of price convergence on aggregate inflation remains a priori unclear. Widening inflation differentials may, however, pose a challenge for the communication of the common monetary policy.[15]

References

Allington, N. F. B., P. A. Kattuman and F. A. Waldmann. 2005. One Market, One Money, One Price? In: International Journal of Central Banking 1(3). 73–115.

Barro, R. J. and X. Sala-i-Martin. 1992. Convergence. In: Journal of Political Economy 100(2). 223–251.

Baye, M. R., R. Gatti, P. Kattuman and J. Morgan. 2002. Online Pricing and the Euro Changeover: Cross-Country Comparisons. University of California at Berkeley.

Carree, M. and L. Klomp. 1997. Testing the Convergence Hypothesis: A Comment. In: The Review of Economics and Statistics 79(4). 683–686.

[15] *For a related discussion, see also ECB (2003).*

Chen, S.-S. and C. Engel. 2004. Does "Aggregation Bias" Explain the PPP Puzzle? NBER Working Paper 10304.

Crucini, M. J. and M. Shintani. 2002. Persistence in Law of One Price Deviations: Evidence from Micro Data. Vanderbilt University. Mimeo.

Devereux, M., C. Engel and C. Tille. 2003. Exchange-Rate Pass-Through and the Welfare Effects of the Euro. In: International Economic Review 44(1). 223–242.

ECB. 2003. Inflation Differentials in the Euro Area: Potential Causes and Policy Implications. September.

Engel, C. 2000. Local-Currency Pricing and the Choice of Exchange-Rate Regime. In: European Economic Review 44. 1449–1472.

Engel, C. and J. H. Rogers. 2004. European Product Market Integration after the Euro. In: Economic Policy 19(39). 347–384.

European Commission. 2001. Price Levels and Price Dispersion in the EU. In: European Economy 7. Supplement A. July.

European Commission. 2004. Preliminary Analysis of Price Data. Directorate General Internal Market, Economic and Evaluation Unit B3. July.

Faber, R. P. and Ad C. J. Stokman. 2004. Price Convergence in Europe from a Macro Perspective: Trends and Determinants (1960–2003). De Nederlandsche Bank Working Paper 12.

Fabiani, S., M. Druant, I. Hernando, C. Kwapil, B. Landau, C. Loupias, F. Martins, T. Mathä, R. Sabbatini, H. Stahl and Ad C. J. Stokman. 2006. What Firms' Surveys Tell About Price Setting Behavior in the Euro Area. In: International Journal of Central Banking 2(3). 3–47.

Goldberg, P. K. and F. Verboven. 2005. Market Integration and Convergence to the Law of One Price: Evidence from the European Car Market. In: Journal of International Economics 65(1). 49–73.

Gosh, A. R. and H. C. Wolf. 1994. Pricing in International Markets: Lessons from The Economist. NBER Working Paper 4806.

Hoeberichts, M. and Ad C. J. Stokman. 2006. Price Setting Behaviour in the Netherlands: Results of a Survey. ECB Working Paper 607.

Imbs, J., H. Mumtaz, M. O. Ravn and H. Rey. 2005. PPP Strikes Back: Aggregation and the Real Exchange Rate. In: Quarterly Journal of Economics 120(1). 1–43.

Lutz, M. 2000. Pricing in Segmented Markets, Arbitrage and the Law of One Price: Evidence from the European Car Market. CSGR Working Paper 53.

Lutz, M. 2002. Price Convergence under EMU? First Estimates. University of St. Gallen Discussion Paper 2003-08.

Parsley, D. C. and S.-J. Wei. 2001. Limiting Currency Volatility to Stimulate Goods Market Integration: A Price Based Approach. NBER Working Paper 8468.

Rogers, J. H. 2001. Price Level Convergence, Relative Prices and Inflation in Europe. Board of Governors of the Federal Reserve System. International Finance Discussion Papers 699.

Rogers, J. H. 2007. Monetary Union, Price Level Convergence and Inflation: How Close is Europe to the USA? In: Journal of Monetary Economics (forthcoming).

Rogoff, K. 1996. The Purchasing Power Parity Puzzle. In: Journal of Economic Literature 34(2). 647–668.

Taylor, A. P. and M. P. Taylor. 2004. The Purchasing Power Parity Debate. In: Journal of Economic Perspectives 18(4). 135–158.