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# Price Convergence in Euroland. Evidence from micro data without noise

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Evidence from micro data without noise

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## Abstract

Analyzing prices of truly homogenous consumer goods sold in Euroland, we find significant price convergence after the Euro cash changeover in 2002. The deviation of national log prices from the mean log price of the same product is much narrower with the Euro than before. We observe Sigma and Beta convergence, i.e. prices do not differ systematically between countries. Our result is in contrast to some other findings stating divergence rather than convergence but which do not control perfectly for heterogeneity of products. Because of information and transportation costs arbitrage is unlikely to occur in consumer items and reasons for convergence must therefore be sought in competition and advantages on the supplier's side. If suppliers would minimize menu costs, price for the same item should be identical, which we do not observe.

**JEL classification:** D4, E31, F36

**Keywords:** convergence, price setting, law of one price, Euro, homogenous products

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**Price Convergence in Euroland**?
Evidence from micro data without noise

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## 1. Introduction

Aside from political considerations, the economic integration of Europe was claimed to create a market as big or even bigger than that of the US and therefore allows to raise productivity through economies of scale (eos). The common market and finally the introduction of a common currency initially among 11 countries[1] -the Euro- in 1998[2] should create a higher degree of market transparency, lower transaction costs[3], more cross-border exchange, less price discrimination and more competition. Convergence of prices among the Euro-countries (Euroland in the following) was expected according to the law of one price (LOP or PPP)[4] because in a market without trade barriers and a common currency –i.e., no risks related to exchange rate variations- price differentials betweeen countries for identical products should disappear or at least diminish.[5] Especially the Euro cash change over in January 2002 made prices more easily comparable, and may have pushed prices to converge among the EMU member states. However, transport and information costs as well as national taxes, labor and other costs may have prevented to achieve absolute PPP or the strong LOP (i.e. identical prices in Euroland) through arbitrage.[6] If the price-demand functions are (assumed to be) similar across the countries, pricing to the market may not be as relevant as the reduction in transaction costs achieved by setting a standard price.

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[1] Euroland (i.e. EU-countries using the Euro) first (January 1999) comprised: France, Spain, Italy, Austria, The Netherlands, Luxembourg, Belgium, Portugal, Germany, Ireland, and Finland. In 2001 Greece joined Euroland and later several other EU countries followed.

[2] Since January 1999 the Euro is the single currency in Euroland, but national coins and banknotes were used until the cash change over in January 2002.

[3] Some retail chains operating in several Euroland countries reduced transaction costs and started to use price-tags with unique prices for all countries, making the strong LOP obviously to hold despite different costs (labor costs, taxes). However, other price tags display country-specific Euro-prices, i.e. pricing to the market is applied although the consumer can easily identify price discrimination.

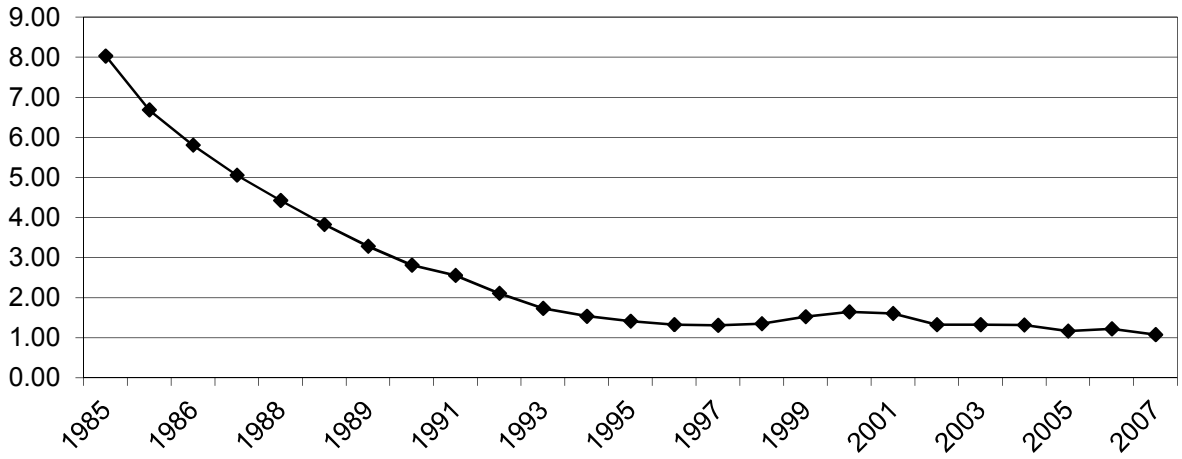
[4] For an overview of the LOP literature, see Dornbusch 1987, Froot/Rogoff 1995, Rogoff 1996).

[5] In a perfect market where absolute PPP holds, exchange variations are determined by the movement of relative prices (Dornbusch 1987). Or one may say, that exchange rates have been driven by price differentials in an integrating market.

[6] Reasons why real exchange rates are not constant include: Barriers to trade (tariffs, transportation costs), different consumption preferences across countries, presence of non-traded goods in CPIs, prices which are sticky in terms of currency in which the good is consumed (see e.g. Krugman/Obstfeld 1991).

The PPPs[7] for private consumption as published by the OECD for the initial Euroland countries reveals strong convergence (see Figure 1). The coefficient of variation declined from 1985 to 2009 by almost two thirds. Most of the convergence (about 90%), however, was achieved by 1999 with the largest contribution (6% points or 75%) occurring before 1992, i.e. before the so-called Maastricht treaty from 1991 could have affected convergence substantially. In other words, by this aggregate metric level-convergence of prices was partly achieved, but mainly in the period before the actual introduction of the Euro and before the so-called convergence criteria (treaty of Maastricht 1992) were established. After 1999 the coefficient of variation of consumer PPPs indicates roughly stability. This finding is very much in line with several studies based on macro data or some aggregation of product to groups (see e.g., Wolszczak-Derlacz 2006 Lein/ Nitsch 2008, Fritsche/ Kuzin 2011, Fritsche/Lein/Weber 2009, Cuaresma/Egert/Silgoner 2007).

**Figure 1: Coefficient of variation, PPPs private consumption**




*Note:* Countries include: Austria, Belgium, Finland, France, Germany, Ireland, Italy, Netherlands, Portugal, Spain.
Source: computations based on OECD's Purchasing Power Parities for private consumption (PPPPRC), Stat OECD.

Paul de Grauwe (2009) emphasized that the Euro cash change over (2002) created a window of opportunity and it seems that prices of frequently bought but low price items -such as bread, meat etc. (de Grauwe 2009: Table 2)- rose substantially although more comprehensive price indices do not show this effect. De Grauwe (2009: 10/11) argues that price convergence

[7] PPPs are the rates of currency conversion that equalize the purchasing power of different countries by eliminating differences in price levels between countries.

in consumer items is unlikely because high transaction costs prevent arbitrage, therefore differences in the national or regional cost structure of the retail sector can persist in a common currency area. Furthermore, regulations, customs, and cultures are still very regional (national). This reasoning is confirmed by the US-Canada comparison of Gopinath et al. (2011) who found that national borders segment markets. I.e., retail prices react to price-setting in neighboring stores within the same country but not across the national border. However, the US and Canada are different currency areas which raises transaction costs and make price comparisons difficult.[8] A study of prices in Scandinavian duty-free shops also argues that the reference price (i.e. the onshore price customers are used to) is most relevant for consumers (see Asplund/Friberg, 2001 and below).

The price convergence shown in Figure 1. may have been caused by changes in national prices and/or by variations of exchange rates. If national currency prices are expressed in a common currency, convergence may result from convergence of national price levels or from exchange rate adjustments.[9] Table 1 displays inflation rates for private consumption as well as exchange rates of the national currencies to the Deutsch-Mark (DM). For Italy, for example, the cumulated inflation differential to Germany was almost 40% in the period 1985 to 2009 but until 1998 the inflation differential was compensated or even overcompensated (1992 to 1990) by a devalutation of the Lira against the DM. After the Euro introduction in 1999 the exchange rates are equal to one and convergence could only be achieved through national price adjustments (relativ to Germany in the example used here).

[8] Engel (1993) found that relative prices within a country are much less volatile than the prices of specific goods in one country to the prices of similar goods in other countries. In a later paper Engel/Rogers (1996) argue that the distance between regions affects the price differences between similar goods.

[9] $P_{com} = P_{nat} * C_{ref}/C_{nat}$
where $P_{com}$ = common price, $P_{nat}$ = price in national currency, $C_{ref}/C_{nat}$ = exchange rate EX
And thus for differences over time:
$\Delta \ln P_{com} = \ln P_{com,t} - \ln P_{com,t-1} = \ln P_{nat,t} - \ln P_{nat,t-1} + \ln EX_t - \ln EX_{t-1} = \Delta \ln(P_{nat}) + \Delta \ln(EX)$

**Table 1: National inflation rates (cumulated) and exchange rates (cumulated)**

| Country | Inflation rate differential to Germany (cumulated logs of annual inflation rates, * 100) | | | | Exchange rate to Germany (cumulated logs of annual differences, * 100) | | | |
|---|---|---|---|---|---|---|---|---|
| | 1985-2009 | 1985-1991 | 1992-1998 | 1999-2009 | 1985-2009 | 1985-1991 | 1992-1998 | 1999-2009 |
| **Italy** | **39.7** | 22.9 | 8.6 | 7.8 | **-46.9** | -19.1 | -27.8 | 0 |
| **Spain** | **50.8** | 26.4 | 8.6 | 15.1 | **-40.7** | -10.3 | -30.4 | 0 |
| **France** | **2.9** | 7.5 | -6.4 | 1.4 | **-8.8** | -10.2 | 1.4 | 0 |
| **Belgium** | **5.1** | 2.9 | -4.5 | 5.7 | **-1.6** | -1.3 | -0.2 | 0 |
| **Portugal** | **79.8** | 53.0 | 14.9 | 11.6 | **-68.8** | -52.6 | -16.2 | 0 |
| **Netherlands** | **1.4** | -4.0 | -1.6 | 6.8 | **0.0** | 0.1 | -0.1 | 0 |
| **Austria** | **6.5** | 3.3 | -1.3 | 3.9 | **-0.6** | -0.1 | 0.0 | 0 |
| **Finland** | **11.5** | 17.7 | -7.9 | 1.7 | **-36.33** | -14.3 | -22.0 | 0 |
| **Germany** | **0** | 0.0 | 0.0 | 0.0 | **0** | 0.0 | 0.0 | 0 |

Source: computations based on IMF data (exchange rates), OECD (inflation rates).

Summarizing the empirical results above and that of other studies using macro or aggregated data one may conclude, that convergence within Euroland was strong, but that it was already achieved before the introduction of the Euro in 1999. Even before the so-called Maastricht criteria was effective substantial price convergence occurred but it was achieved mainly by exchange rate adjustments. Aggregated price level data is based on a basket of goods, which may be not comparable across the countries and heterogeneity may disturb hide similarities but also differences between countries. To overcome heterogeneity problems some studies restrict the analysis to single items (The Economist, BigMac, for example, see below).

In the following we first summarize studies investigating price convergence using micro data. In the third section we present our analysis based on a unique data set using identical products in a unique service environment in 8 initial Euroland countries. We make use of data collected from IKEA catalogues before (1998) and twice after the introduction of the EURO (2001 when national banknotes were still used and after the Euro cash over, 2009). Thus, we analyze price convergence of perfectly homogenous products within Euroland. We find significant price convergence between 1998, 2001 and 2009.

**Table 2: Measures to achieve European economic integration**

2002, January 1st: Euro notes and coins introduced

1999, January 1st: Euro (EMU) established, exchange rates fixed, national currencies were becoming denominations of the Euro (virtual Euro).

1998, May 2nd: Special European Council agreed that 11 member states (France, Belgium, Luxembourg, the Netherlands, Germany, Austria, Italy, Spain, Portugal, Finland, Ireland) joined Euroland (Britain, Denmark, Sweden and Greece (joined in 2002) did not join).

ECB board appointed

1997, June: Stability and Growth Pact (SGP, Amsterdam)

1994, January 1st: European monetary integrations (EMI) set to work to prepare EMU

1993, July/ August: European Exchange rate mechanism (ERM) in critical stage, fluctuation band increased from 2.25% to 15%

1992, November: Treaty on the European Union came into effect

1991, September: British Pound and Italian Lira left the ERM after speculative attacs.

1991, December: Treaty of Maastricht, convergence to start stage 3 (the EMU) was defined in terms of monetary and fiscal stability:

- stable inflation rate (within 1,5% of the three best performing states)
- low government deficit (no more than 3% of GDP) and government debt (below 60% of GDP)
- no devaluation of the currency within the previous 2 years
- stable interest rates (within 2% of the three best performing states)

1989, November: Collapse of the Berlin wall, prospective German unification gave stimulus to EMU negotiations.

1989, April: Delors Report, a blueprint to implement EMU in 3 stages.

June 1988: European Council (Hannover) moving ahead with EMU

1979: European Monetary System (EMS) launched

(for details see: Dyson/Featherstone, 1999)

## 2. Micro data studies of price differentials

The most famous individual item PPP is the McDonald's Big-Mac regularly published in the Economist, but also the Economist itself has been used in several studies (Knetter 1997, Gosh/Wolf 1994). Gosh/Wolf (1994) found that cover prices of 'The Economist' in local currency do not react to exchange rate variation, i.e. that the magazin is 'priced to the market' to long-term considerations (10 European countries and the US using the UK as reference). Knetter (1997) used monthly cover prices of the Economist in 7 European countries and the US in the period between 1966 and 1990. He found price rigidity in local prices, i.e. relative prices expressed in a common currency price rise if the exchange rate appreciates. Engel and Rogers (1999) analyzed price dispersion for similar goods across US cities but concluded that sticky prices cannot explain price divergence within the US because nominal exchange rate shocks cannot occur.

Parsley and Wei (1996) use quarterly prices of 51 final goods and services from 48 cities in the US over the period 1975:1 through 1992:4 to investigate convergence to LOP. They find that tradable goods converge fast to parity (the half-life of the price gap is about 4 to 5 quarters) but that services converge less fast (15 quarters half-life). The higher the price differential the stronger the convergence in the Parsley/Wei data for the US. However, given that the US was an intergrated market already before 1975, one may wonder why convergence did not occur before.

Wolf (2000) uses prices for 42 goods and services within 211 US cities and investigates possible hypotheses for the deviation from LOP. He found that the difference in traded and non-traded goods is only marginal (slightly in favor of tradables) and that differences in prices between city-pairs are consistently changing signs for various goods. Wolf concludes that differences in (roughly constant) city-specific characteristics (such as taxes, median household income, population, city government expenditures etc.) and distance between the locations do not explain divergence from LOP.[10] Differences in mark-ups also seem to be a problematic explanation since price differences are not significantly influenced by proxies for local competition. Average prices of the entire basket also seem to be unrelated to per capita

[10] Measurement error may affect non-branded tradables more than branded tradables but Wolf (2000) actually found on average a higher coefficient of variation for branded (0.127) than for non-branded (0.117) tradables.

income and median household income variables which may serve as proxies for productivity differentials.[11]

Among European countries Goldberg and Verboven (1998) found substantial and persisting differences in quality-adjusted prices for cars in the period 1980 to 1993. Year-to-year volatility in price differentials is strongly (although not completely) related to exchange rate fluctuations (see also section 1 of this paper), i.e. local prices remain relatively stable despite exchange rate variations. They conclude that exchange rates seem to be the main variable driving any price conversion. In a later study Goldberg and Verboven (2001) also analyze the European (5 countries) auto market applying hedonic price regressions to account for the variations of models across countries (physical characteristics, market segments, brands). The data covers the period 1970 to 2000 - a period when the European common market has been developed – and this allows the authors to analyze the impact of dissolving trade barriers on price convergence. They claim that the strength of their data (prices of individual car models and their characteristics) allow them to compare prices of identical products across countries and thus to investigate convergence not only to the relative LOP but also to the absolute LOP. However, even controlling for characteristics, cars remain complex products and the service environment may have a substantial impact on prices. Using similar data on car prices provided by the European Commission for the period 1995 to 2005 Gil-Pareja and Sosvilla-Rivero (2008) interpret their analysis as clear evidence of price convergence after 1999.

Some studies explicitely investigate price convergence on the basis of micro data in Europe and especially in Euroland. Wolszczak-Derlacz (2006)[12] uses data from the Economist Intelligence Unit which includes prices for 173 narrowly defined products (goods and services) for 15 capital cities in the EU (Wolszczak-Derlacz 2006: 23) for the period 1990 to 2005.[13] Market exchange rates have been used to express prices in a common currency. Excluding items for which the comparability has been assumed problematic, the final dataset comprises 107 traded and 41 non-traded items (Wolszczak-Derlacz 2006:23). Tradable goods have been grouped into 8 categories and price dispersion (coefficient of variation) has been

[11] The Harrod-Balassa-Samuelson effect assumes that relative productivity differs between locations in tradables but not in non-tradables (services) and that prices of tradables are equal. Within a location wages equalize and therefore non-tradable production in high-productive (high wage) locations is more costly than in low-productive (low wage) locations. Thus, LOP or PPP holds only for tradables but not for non-tradables which are permanently higher priced in high-productive locations. The price level will be higher in high-productive locations because the CPI is a basket of equally priced tradables and differently priced non-tradables (which are higher priced in the high-productive locations).

[12] Aside from using micro data she also investigates macro indicators (see setion 1 of this paper)

[13] Imputations for missing values have been made using the CPI (Wolszczak-Derlacz 2006:23).

measured within these groups. The highest price difference has been observed for non-tradables (hourly rate of domestic cleaning help) and the lowest for traded goods. Standard deviations (sigma convergence) show a decline from 1990 to 1996 (19%) but some variations after.

Most products (110 of 148) in the Wolszczak-Derlacz data set experienced price convergence between 1990 and 2005. Calculating log price differences for all pairs of cities shows the decline in dispersion between 1990 and 1995 and roughly stability after. Thus, the results based on the less aggreagted micro data from the Economist Intelligence Unit over 15 years confirm the findings made with more aggregated indicators: a decline in price dispersion mainly in the period from 1990 to the mid 1990s and roughly stability after. One has to keep in mind that the Wolszczak-Derlacz study includes not only Euroland countries but also countries keeping their own national currencies. In addition, the convergence in prices before the shift to the Euro in 1999 may be mainly caused by exchange rate adjustments rather than by the movements of prices itself. Also based on data of the Economist Intelligence Unit, Engel and Rogers (2004) find similar results as Wolszczak-Derlacz with a wider dispersion among non-tradables than tradables and clearly lower price dispersion in the period 1998-2003 than in earlier periods. However, in the latter period only prices of one product category (alcoholic beverages) showed a further decline in price dispersion. In other categories it rose slightly although insignificantly in most categories.

Probably the largest dataset (327,583 observations) was used in a Bundesbank analysis (Fischer 2009) of prices of washing machines in 17 European countries for the period 1995 to 2005.[14] Applying a hedonic price regression[15] 'controlling' for specific features of the machines and including firm and country dummies 88% of the net price variation of washing machines is explained. All country and firm dummies are significant (Deutsche Bundesbank 2009: 43). Comparing net prices from September to December 1998 (just before the introduction of the Euro) with prices from September to December 2005, the deviation from the average of the Euroland countries (including Greece, but excluding Ireland and Luxemburg) was higher in 2005 than before the introduction of the Euro. The Bundesbank

[14] The Analysis include also non Euroland countries.
[15] The equation estimated was:
$\ln P_{ikt} = \pi_0 + \pi'_{\varpi}\varpi_k + \pi_f + \pi_{it} + \varepsilon_{ikt}$
where $P_{ikt}$ = price of model k in country i at time t, $\pi_0$ = constant, $\pi'_{\varpi}$ = coefficient of model-specific features, $\varpi_k$ = quality features of model k, $\pi_f$ = coefficient of a firm dummy, $\pi_{it}$ = coefficient of an interaction term of country and time, $\varepsilon_{ikt}$ = error term.

analysis, if generalized, is clearly in contrast to the Wolszczak-Derlacz finding that after the introduction of the Euro price divergence did not occur. However, washing machines are clearly tradable products and are often produced in one or only a few locations and then distributed across Europe, but the comparison is based on a quality adjusted single item. An alternative test could make use of identical products and, of course, more than one product would be preferable.

**Table 3: Deviations of net prices for washing machines within Euroland (%, %-Pts. respectively)**

| Country | Sept. to Dec. 1998 | Sept. to Dec. 2005 | Difference (2-1)* | Convergence (con) Divergence (dev) |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| | | | | |
| **Italy** | 1.5 | 12 | 10.5 | Div |
| **Spain** | -2.0 | 9.5 | 11.5 | Div |
| **France** | 4 | 8 | 4.0 | Div |
| **Belgium** | 4 | 2 | -2.0 | Con |
| **Portugal** | 3 | -3.5 | -6.5 | Div |
| **Netherlands** | -11 | -6 | 5.0 | Con |
| **Austria** | -11 | -2 | 9.0 | Con |
| **Finland** | 0 | -11.5 | -11.5 | Div |
| **Germany** | 1 | -14 | -15.0 | Div |

* the signs do not indicate whether the country converged to the mean or not. Convergence (lower absolute distance from mean) from 1998 to 2005 can only be observed in Belgium, The Netherlands, and Austria (see column 4).
Source: numbers are extracted from Figure on page 44, Deutsche Bundesbank 2009.

To our knowledge two studies used IKEA data before (Haskel/ Wolf 2001, Hassink/Schettkat 2001, 2003). Haskel and Wolf analyzed mainly low-price items in 25 European, American ans Asian countries. [16] Hassink/Schettkat analyze prices of identical items sold by IKEA in 1998 (before the introduction of the EURO) and in 2001 in 8 EU countries. The log price difference of identical products in 1998 has a strong but not perfect (coefficient of 0.53) effect on the log price difference in 2001. They found evidence for pricing to national markets but argue that this pricing strategy is strongly limited by incomplete information of the seller. Effective price discrimination requires knowledge of the price-demand function, but sellers

[16] Haskel and Wolf analyzed prices of 119 IKEA products in the period 1995 to 1998 in 25 countries (in Europe, America, Asia and Australia) using mid-year exchange rates to calculate common currency prices. The product basket Hasel and Wolf used consists of identical but mainly low-price products typically selling at about 2 US$ (Haskel/Wolf 2001: 548). They conclude that LOP is violated with typical deviation of 20 to 50% and only a weak convergence to LOP. However, their study doe not cover the introduction of the Euro.

know at best a few points of the function. If prices cannot be easily adjusted down and up – because buyers resist price rises, e.g. –, the price-demand function is basically unknown to the seller. Most of the inter-country price variation for identical products remains unexplained in the Hassink/Schettkat study.

Absolutely identical products sold in the same place were analyzed by Marcus Asplund and Richard Friberg (2001) in a study of Scandinavian duty-free shops with price tags in two currencies. They offer two hypotheses why the seller uses two currencies on the price tags although prices may deviate for the same product at the same location when expressed in a common currency. First two rigid nominal prices may be convinient for the consumer because this offers her the possbility to compare easily to prices at home and second the seller may discriminate prices according to the onshore price level. However, difference in cost components (labor costs, taxes etc.) cannot be the reason for deviation from the LOP and transportation costs hindering arbitrage are nil. The only costs related to arbitrage for consumers are related to the exchange of currencies. These, however, could be relatively high especially if small amounts are changed as it will typically be the case for low price items sold in Scandivian duty-free shops (such as alcoholics, cosmetics etc.). Thus, even for identical products sold at the same place prices may deviate in a certain range.

## 3. Price convergence in Euroland: evidence from homogenous products

Why may prices converge? Price convergence may occur for several reasons: (1) arbitrage, (2) convergence of the cost structure (VAT harmonization, labor costs, interest rates), (3) declining transaction costs, (4) competition, (5) convergence of price demand functions. Arbitrage by customers shopping in different countries, is unlikely to occur because information and transportation costs will be high for individuals.[17] Therefore, with imperfect competition, sellers may discriminate between national markets. But pricing to the market, i.e. regional price differentiation, requires sufficient knowledge about the national demand functions.[18] The cost structure is influenced by the product itself, which can be assumed to be roughly identical everywhere (transportation costs per item are low) but the domestic cost components may differ most obvious with VAT-rates and other taxes, but also rents, and labor costs.

We analyse price convergence in Euroland based on a three-dimensional dataset of identical products, countries and time covering the period before (1998) and after the introduction of the Euro (2001 and 2009). Therefore, we are able to investigate prices in the currency area when prices were still expressed in national currencies (although fixed to the Euro) countries as well as after the cash change over to actual Euro-banknotes in 2002. The analysis is based on national IKEA catalogues including 112 products[19] priced at a minimum of 5.00 Euros. The sample includes eight of the initially 11 EMU member states: Germany, Austria, Netherland, France, Belgium, Italy, Spain and Finland (i.e., not including Luxemburg, Portugal and Ireland).[20] IKEA sets prices at the national level published in an annual catalogue, the firm famously minimizes distribution costs, involves the customer who has to collect the products in the store, arrange the transport and assemble the products. The stores and catalogues are almost identical everywhere[21], products are labelled identically with Scandinavian names, i.e. IKEA products are thus truly homogeneous not only with respect to the products themselves but also regarding the shopping and service environment. Therefore, our cross-national analysis compares actually homogenous products.

[17] In border regions it may well be the case that arbitrage is used especially in common currency areas, which does not necessarily contradict the Gopinath et al. (2011) finding for the US and Canada (see also above). IKEA stores make in border regions announcements in two languages (Wikipedia).
[18] Helga Einecke (2010) reports that IKEA invested 130 Mill. Euro in lowering product prices (about 5% of the 2,670 Mill Euro turnover), that turnover increased by 11%, which implies a price elasticity of about 2 (assuming that lower prices caused the increase in turneover) in Germany.
[19] With a few exceptions the products are available in all countries.
[20] The first IKEA store in Ireland opened in 2009 (Wikipedia)
[21] All catalogues are centrally designed in Sweden and apply the same production labels. Only prices may differ.

If Euroland were a perfect market, competition and arbitrage would enforce the LOP, prices would be identical independent of national cost components. Actually, arbitrage is unlikely to occur because for consumers information (they simply would not know about price differences) and transportation costs are high for consumers. Competition could enforce unique prices but although IKEA products are in the low price segment they have a distinguished design and quality which may be an advantage over competitors. The IKEA-world is highly standardized allowing IKEA to gain from economies of scale. Catalogues are centrally designed and identical, suggesting that consumers are assumed to be similar with respect to features like culture and tastes. Although catalogues are centrally designed, 'pricing to the market' may still be attractive if price-demand functions and/or cost components differ sufficiently. If IKEA applies a strict full cost principle and mark-up pricing, domestic cost components will affect national prices, i.e. a higher VAT will translate into higher consumer prices if costs are otherwise identical. This should be reflected in country-specific effects. If, on the other hand, price-demand functions are sufficiently different between countries (and IKEA knows about it) profit maximization may lead to price differentiation (pricing to the market)[22] IKEA clearly differentiates prices between countries but –at least for the outside observer- in an unsystematic way (Hassink/Schettkat 2001, 2003).

**Table 4: Two-sample Kolmogorov-Smirnov test for equality of distribution functions (log price deviations)**

| | Test-Statistic D | P-Value |
|---|---|---|
| **1998 against 2001** | 0.0322 | 0.733 |
| **1998 against 2009** | 0.1417 | 0.000 |
| **2001 against 2009** | 0.1275 | 0.000 |

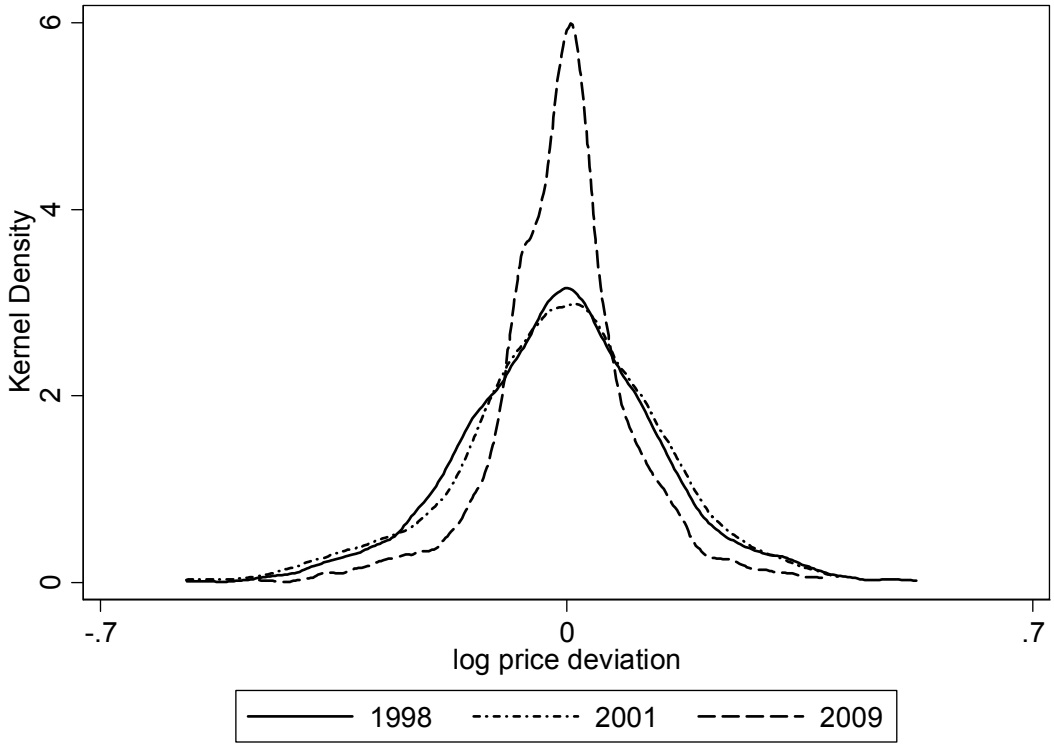
Source: IKEA-Prices collected by Hassink/Schettkat (cf. Hassink/Schettkat 2001), the authors.

We use beta and sigma convergence to investigate whether prices of homogenous products differ and whether they converged after the introduction of the EURO. As Figure 3.1 clearly shows, The distribution of the log-price deviations (difference of country specific prices in logs of each product [$\ln(p_{i,c})$] from the mean price of the product in logs [$\ln(p_{i,.})$], [$\ln(p_{i,c})$-

[22] For price discrimination see Varian (1989).

$\ln(p_{i,.})$]) are much smaller and much more concentrated in 2009 than in the earlier 1998 or 2001 samples. Actually we cannot detect a difference between the 1998 and 2001 distributions but both are significantly different from the 2009 distribution as indicated by a Kolmogorov-Smirnov two-sample test on the similarity of the distributions (see table 4). Sigma convergence clearly occurred after the cash change over to the Euro. However, sigma convergence is not the same as identical country-specific prices which may still differ systematically between countries.

**Figure 2: Distribution of prices differences (logs), 1998, 2001 and 2009.**




Source: IKEA-Prices collected by Hassink/Schettkat (cf. Hassink/Schettkat 2001), the authors.

To investigate country-specific effects, we apply 3 models: first we assume absolute PPP, identical prices in all countries, i.e. we apply an unrestricted model but include a vector of country-dummies. The country-coefficients should be insignificant if the absolute PPP holds. Absolute PPP is based on strong assumptions and we investigate therefore the weak PPP version, allowing for national cost components such as VAT rates and labor costs. For labor costs we use hourly wages instead of unit labor costs. The latter is strongly influenced by

aggregate productivity, but here we compare IKEA prices and since IKEA is organized similarly everywhere it will have similar productivity but hourly labor costs may differ.

Model 1: country dummies

(1) $$\ln(p_{i,c}) - \ln(p_{i,.}) = \beta_0 + \beta_{1,c} C + \varepsilon_{i,c}$$

where i = product, c = country, $\beta_0$ = constant, $\beta_1$ = coefficient for country, ε= error term.

Model 2: country dummies plus VAT

(2) $$\ln(p_{i,c}) - \ln(p_{i,.}) = \beta_0 + \beta_{1,c} C + \beta_2 VAT + \varepsilon_{i,c}$$

where $\beta_2$= coefficient for Value Added Tax (VAT)

Model 3: country dummies plus VAT, plus hourly labor costs

(3) $$\ln(p_{i,c}) - \ln(p_{i,.}) = \beta_0 + \beta_{1,c} C + \beta_2 VAT + \beta_3 HLC + \varepsilon_{i,c}$$

where $\beta_3$= coefficient for hourly labor costs (HLC)

If the price deviations between EMU countries could be ascribed to different labor costs or VAT alone, the coefficients for all country-dummies in model (2) or (3) should become zero whereas the coefficients of the cost variables should differ significantly from zero. If price deviations between countries still exist after controlling for these country-specific cost components, other unobserved variables may determine prices. If price-demand functions are sufficiently different between the countries (and IKEA knows about it) pricing to the market may be applied.[23]

All models are significant although the $R^2$ are very low indicating a minor role or no role for systematic country-specific effects on prices (Table 5). Actually, the coefficients for labor costs and VAT[24] have a significantly negative sign in 1998 but are both insignificant in 2009 (in 2001 the coefficient of the labor cost variable is significantly negative, but VAT is positive). Thus, we cannot detect systematic effects of the variables proxying cost component. In 2009 all country-coefficients (except for The Netherlands) are insiginificant, i.e. price levels differ insignificantly from the reference country (Germany). In comparison to early years we see clearly beta-convergence.

[23] Most demand functions have varying elasticities (Appelbaum/Schettkat 1999) where price elasticities greater than 1 classify unsaturaed markets and elasticities smaller than one saturated markets.
[24] VAT rates have converged (see Appendix Table A.1).

Why is the coefficient for NL significantly negative in 2009 even in the models with country-specific cost components (models 2 and 3)? Actually the mean price across all products in the 2009 sample is not the lowest in The Netherlands[25] but the country's mean of the relative deviation from the product-means [$\ln(p_{iNL}) - \ln(p_{i.})$] is substantially lower (about 5% whereas most other countries are in the range of less than 1% up to 2%). In the Netherlands 81 products in the 2009 sample are priced below the mean and for 46 products the Dutch price is the lowest. At the same time, the Dutch VAT rate in 2009 is lower than in many other countries but not substantially (see Appendix Table A1). Assuming that the VAT translates one-to-one into prices, the VAT rate in The Netherlands is 1%-pt. (5%) below the mean VAT (20%) in the sample, but the same is true for Germany and Spain (see Appendix Table A.1) and hourly wages in The Netherlands are not the lowest. Even if some unobserved cost component is lower in The Netherlands, why would IKEA pass this advantage on to consumers? Probably the Dutch price elasticity is higher but since not all products are lowest priced in The Netherlands, IKEA must know product-specific price-demand functions. Determining price-demand functions requires knowledge of prices and quantities, information not available to outside observers and it is questionable whether IKEA has such information. Determing price-demand functions requires at least two price-quantity combinations. In principle IKEA could creat this information but if the store lowers the price, it will be difficult to raise it again. Therefore, IKEA may guess the price-demand function but the company will hardly know it.

IKEA uses blue and yellow to be identified as Swedish and actually the design center is located in Sweden, but the parent company of the IKEA operations is INGKA Holding, which in turn belongs to Stichting Ingka Foundation, a tax –exempt, non-profit entity under Dutch law (Economist 2011). The IKEA conglomerat is obviously setup to minimize taxes but it remains –for the outside observer- a conundrum why Dutch prices are on average lower than in other countries.

[25]

| | Germany | Belgium | Spain | Italy | France | Austria | Netherlands | Finland |
|---|---|---|---|---|---|---|---|---|
| Mean price (Euro) 2009 | 117.95 | 116.35 | 115.46 | 108.88 | 119.18 | 110.52 | 112.46 | 123.82 |

**Table 5: Regression analysis of price dispersion, relative to Germany.**

| | 1998 | | | 2001 | | | 2009 | | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (1) | (2) | (3) | (1) | (2) | (3) |
| Dependent Variable | $\ln(p_{i,c})-\ln(p_{i,.})$ | $\ln(p_{i,c})-\ln(p_{i,.})$ | $\ln(p_{i,c})-\ln(p_{i,.})$ | $\ln(p_{i,c})-\ln(p_{i,.})$ | $\ln(p_{i,c})-\ln(p_{i,.})$ | $\ln(p_{i,c})-\ln(p_{i,.})$ | $\ln(p_{i,c})-\ln(p_{i,.})$ | $\ln(p_{i,c})-\ln(p_{i,.})$ | $\ln(p_{i,c})-\ln(p_{i,.})$ |
| **Belgium** | 0.000216 | 0.0385 | 0.0799* | 0.0188 | -0.0461* | 0.0188 | -0.0130 | -0.0414 | -0.0414 |
| | (0.01) | (1.35) | (2.49) | (0.89) | (-2.31) | (0.75) | (-1.09) | (-1.86) | (-1.81) |
| **Spain** | 0.0578** | 0.0578** | | 0.0941*** | 0.0941*** | | -0.0427 | | |
| | (3.10) | (3.10) | | (4.84) | (4.84) | | (-1.82) | | |
| **Italy** | 0.0934*** | 0.124*** | 0.121*** | 0.0506 | -0.00138 | -0.0167 | 0.00194 | -0.0123 | -0.0119 |
| | (4.93) | (6.75) | (6.65) | (1.26) | (-0.04) | (-0.43) | (0.15) | (-0.73) | (-0.71) |
| **France** | 0.0685*** | 0.104*** | 0.122*** | 0.0616** | 0.0148 | 0.0459* | 0.00155 | -0.00699 | -0.00708 |
| | (3.78) | (5.61) | (6.08) | (3.22) | (0.90) | (2.40) | (0.11) | (-0.43) | (-0.36) |
| **Austria** | -0.000103 | 0.0305 | 0.0343 | 0.0645*** | 0.0126 | 0.0132 | 0.00188 | -0.0123 | -0.0121 |
| | (-0.01) | (1.58) | (1.75) | (3.33) | (0.74) | (0.77) | (0.15) | (-0.74) | (-0.88) |
| **Netherlands** | -0.0464** | -0.0350* | -0.0281 | 0.0146 | -0.0243 | 0.00121 | -0.0512*** | -0.0512*** | -0.0513** |
| | (-2.59) | (-2.16) | (-1.62) | (0.75) | (-1.44) | (0.06) | (-3.94) | (-3.94) | (-2.99) |
| **Finland** | -0.0459* | | | 0.0779*** | | | 0.0421 | -0.000576 | |
| | (-2.08) | | | (3.84) | | | (1.84) | (-0.02) | |
| **VAT** | | -0.00765* | -0.0114*** | | 0.0130*** | 0.00881** | | 0.0142 | 0.0140 |
| | | (-2.08) | (-3.42) | | (3.84) | (2.90) | | (1.82) | (1.94) |
| **HLC** | | | -0.00628** | | | -0.0100*** | | | 0.0000678 |
| | | | (-3.10) | | | (-4.84) | | | (0.02) |
| **Constant** | -0.0281* | 0.0943 | 0.311*** | -0.0633*** | -0.271*** | 0.0620 | -0.000475 | -0.271 | -0.269** |
| | (-2.10) | (1.39) | (4.59) | (-4.47) | (-4.18) | (1.02) | (-0.05) | (-1.87) | (-2.77) |
| **F** | 14.80*** | 14.80*** | 14.80*** | 5.703*** | 5.703*** | 5.703*** | 4.812*** | 4.812*** | 4.812*** |
| **adj. R-squared** | 0.075 | 0.075 | 0.075 | 0.017 | 0.017 | 0.017 | 0.029 | 0.029 | 0.029 |
| **Observations** | 873 | 873 | 873 | 885 | 885 | 885 | 884 | 884 | 884 |

*Note:* t-statistics in parentheses; * p<0.05 ** p<0.01 *** p<0.001; Germany is reference country.

Source: IKEA-Prices collected by Hassink/Schettkat (cf. Hassink/Schettkat 2001), the authors.

## 4. Conclusion

Calculating the distributions of the deviations of national log prices from their mean in 8 Euroland countries (Germany, Belgium, Spain, Italy, Austria, France, Netherlands and Finland) for 112 products in the year before the introduction of the Euro (1998), the year before the change over to Euro banknotes and coins (2001), and a year when the Euro was established for some time (2009), we find clear sigma convergence of prices for truly homogeneous products sold by a globally acting furniture company (IKEA). I.e. in 2009 is the distribution significantly more concentrated than in the earlier years. We observe Sigma convergence, which does not necessarily mean that prices convergece to a perfect market price. In 2009 only one country has a significantly lower coefficient whereas in 1998 and 2001 the country deviations are more common and more pronounced. I.e. we also observe beta convergence. However, insignificant country coefficients simply mean that systematic country-effects cannot be detected but prices do nevertheless differ.

Why does convergence occur? If Euroland were a perfect market, competition and arbitrage would enforce the LOP, prices would be identical independent of country-specific cost components. The use of a common currency potentially makes prices more transparent but it is unlikely that consumers discover price differences between countries (or one may say that information costs for consumers are too high) and furthermore transportation costs may prevent consumers to engage in arbitrage. Competition could enforce unique prices but although IKEA products are in the low price segment, they have a distinguished design. Insofar they are ideosyncratric and have sufficient quality that they create their own market niche. But keep the image of low prices the competitors need to be matched. Furthermore, IKEA operates with declining marginal costs, which in addition give room for discretion in price setting.[26]

Price convergence would have advantages for suppliers because it may reduce menu costs (printing price tags or catalogues) but then one would expect products to be sold at exactly the same price everywhere. This pattern does only occur for 1 product in our 2009 sample which is sold at exactly the same price in all 8 countries. Two products are priced equally in 7 countries and eight products in 6 countries. These are roughtly 10% of the products in the

[26] See Blinder et al. for price setting practices.

sample.[27] Why do we then see may small deviations in prices but hardly any systematic, significant effects? One answer may be that IKEA assumes the price-demand functions to be similar in all countries but that small product-specific differences in price-demand functions exists between countries. Whether such a pricing strategy is maximizing profits in praxis remains unobservable. However, this would require substantial knowledge about the country and product-specific demand functions unlikely to be present in the IKEA organization. The answer may only be found if we "ask about prices" (Blinder1998).

[27] This analysis applies to our 2009 dataset only, because in former years prices were expressed in national currencies (see above) and one cannot expect exactly the same price when expressed in a common currency.

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# Appendix

## Table A.1: VAT-rates in Euroland-countries

| | 1998 | 2001 | 2009 |
|---|---|---|---|
| **Deutschland** | 16.0 | 16.0 | 19.0 |
| **Belgien** | 21.0 | 21.0 | 21.0 |
| **Spanien** | 16.0 | 16.0 | 16.0 |
| **Italien** | 20.0 | 20.0 | 20.0 |
| **Frankreich** | 20.6 | 19.6 | 19.6 |
| **Österreich** | 20.0 | 20.0 | 20.0 |
| **Niederlande** | 17.5 | 19.0 | 19.0 |
| **Finnland** | 22.0 | 22.0 | 22.0 |
| **Portugal** | 17.0 | 17.0 | 20.0 |
| **Coeff. of variation (incl. Portugal)** | 0.121 | 0.114 | 0.084 |

Source: European Commission (2013).

**Table A.2: Products in the 1998 data, mean price and standard deviations**

| item | product group | mean price | standard deviation | coefficient of variation |
|---|---|---|---|---|
| TIMRA | audio furniture | 137.43 | 29.24 | 0.21 |
| KUBIST | audio furniture | 107.37 | 20.41 | 0.19 |
| KOMPAS | audio furniture | 10.96 | 1.90 | 0.17 |
| ABO | audio furniture | 128.36 | 7.33 | 0.06 |
| FRACK | bathroom | 11.11 | 2.90 | 0.26 |
| VISDALEN | bedroom | 313.76 | 35.43 | 0.11 |
| VISDALEN | bedroom | 99.66 | 7.22 | 0.07 |
| TROMSNES | bedroom | 265.90 | 31.47 | 0.12 |
| HADELAND | bedroom | 99.88 | 6.14 | 0.06 |
| NARVIK | bedroom | 342.28 | 39.25 | 0.11 |
| NARVIK | bedroom | 88.70 | 9.00 | 0.10 |
| VRADAL | bedroom | 215.72 | 34.46 | 0.16 |
| EGEBY | carpets and basement | 148.13 | 10.24 | 0.07 |
| TUNDRA | carpets and basement | 19.77 | 3.39 | 0.17 |
| ABO | chairs and tables | 69.09 | 9.06 | 0.13 |
| ABO | chairs and tables | 312.70 | 45.61 | 0.15 |
| IGGESUND | chairs and tables | 151.81 | 11.65 | 0.08 |
| PELTO | chairs and tables | 326.27 | 44.87 | 0.14 |
| HENDRIKSAL | chairs and tables | 110.82 | 18.64 | 0.17 |
| KRONVIK | chairs and tables | 376.37 | 49.40 | 0.13 |
| KRONVIK | chairs and tables | 105.54 | 15.48 | 0.15 |
| JUSSI | chairs and tables | 35.27 | 3.45 | 0.10 |
| INGO | chairs and tables | 46.53 | 4.08 | 0.09 |
| ADAM | chairs and tables | 49.57 | 6.74 | 0.14 |
| RONALD | chairs and tables | 48.33 | 6.34 | 0.13 |
| DENNIS | chairs and tables | 28.22 | 2.60 | 0.09 |
| RINGO | chairs and tables | 31.03 | 4.19 | 0.14 |
| TERJE | chairs and tables | 15.71 | 2.26 | 0.14 |
| OGLA | chairs and tables | 37.18 | 6.21 | 0.17 |
| BABORD | corridor | 12.74 | 1.80 | 0.14 |
| LOGGA | corridor | 43.89 | 13.49 | 0.31 |
| BONETT | corridor | 25.72 | 11.35 | 0.44 |
| BRA | corridor | 92.42 | 8.61 | 0.09 |
| BABORD | corridor | 12.02 | 2.37 | 0.20 |
| RIGG | corridor | 20.16 | 3.08 | 0.15 |
| PILOT | corridor | 60.72 | 12.21 | 0.20 |
| TOMELIA | couch | 760.59 | 72.48 | 0.10 |
| EKTORP | couch | 692.21 | 74.31 | 0.11 |
| KLIPPAN | couch | 336.79 | 45.38 | 0.13 |
| TULSTA | couch | 144.85 | 14.77 | 0.10 |
| STEN | cupboards | 21.98 | 5.52 | 0.25 |
| FJORD | cupboards | 134.19 | 24.55 | 0.18 |
| HARPUN | cupboards | 96.39 | 10.44 | 0.11 |

| | | | | |
|---|---|---|---|---|
| IVAR | cupboards | 63.05 | 13.28 | 0.21 |
| IVAR | cupboards | 12.93 | 2.31 | 0.18 |
| BILLY | cupboards | 60.04 | 6.69 | 0.11 |
| BENNO | cupboards | 56.18 | 3.70 | 0.07 |
| LIO | cupboards | 48.10 | 4.52 | 0.09 |
| BONDE | cupboards | 226.70 | 25.25 | 0.11 |
| KUBUS | cupboards | 199.55 | 23.74 | 0.12 |
| AKROBAT | cupboards | 88.26 | 9.85 | 0.11 |
| NARTORP | cupboards | 150.56 | 20.03 | 0.13 |
| KRONVIK | cupboards | 453.59 | 38.75 | 0.09 |
| KRYSS | cupboards | 85.00 | 8.86 | 0.10 |
| SKANDOR | cupboards | 147.14 | 5.86 | 0.04 |
| ABO | cupboards | 340.63 | 45.49 | 0.13 |
| NARVIK | cupboards | 195.14 | 8.57 | 0.04 |
| BIALITT | cupboards | 104.93 | 18.21 | 0.17 |
| FJORD | cupboards | 107.82 | 13.58 | 0.13 |
| KURS | cupboards | 93.29 | 4.27 | 0.05 |
| RAST | cupboards | 40.82 | 5.91 | 0.14 |
| PRAGEL | kitchen | 70.69 | 17.81 | 0.25 |
| EDSVIK | kitchen | 53.43 | 8.18 | 0.15 |
| HAGGVINK | kitchen | 60.30 | 9.73 | 0.16 |
| FACTUM | kitchen | 98.22 | 16.94 | 0.17 |
| PERFECT | kitchen | 82.26 | 9.92 | 0.12 |
| ANTOFINO | lamp | 51.13 | 12.24 | 0.24 |
| KVINTOL | lamp | 29.59 | 5.58 | 0.19 |
| TERTIAL | lamp | 14.42 | 2.62 | 0.18 |
| ERBIUM | lamp | 39.36 | 6.17 | 0.16 |
| NORSSKEN | lamp | 52.96 | 9.36 | 0.18 |
| NORSSKEN | lamp | 12.37 | 3.58 | 0.29 |
| ANTILOP | nursery | 14.78 | 2.38 | 0.16 |
| GOK | nursery | 63.10 | 18.81 | 0.30 |
| TROFAST | nursery | 103.28 | 10.53 | 0.10 |
| TROFAST | nursery | 75.88 | 6.16 | 0.08 |
| GLIS | nursery | 12.13 | 1.50 | 0.12 |
| VIKARE | nursery | 134.50 | 15.27 | 0.11 |
| DUKTIG | nursery | 8.25 | 2.79 | 0.34 |
| DUKTIG | nursery | 15.41 | 1.92 | 0.12 |
| MAMMUT | nursery | 12.55 | 1.67 | 0.13 |
| PANTER | nursery | 18.23 | 2.71 | 0.15 |
| MAMMUT | nursery | 228.98 | 28.33 | 0.12 |
| GLIS | nursery | 7.71 | 1.07 | 0.14 |
| HELMER | office | 65.06 | 11.24 | 0.17 |
| EFFECTIV | office | 191.27 | 22.88 | 0.12 |
| OPERATIV | office | 271.13 | 20.48 | 0.08 |
| EFFECTIV | office | 194.86 | 40.29 | 0.21 |
| MAXIMAL | office | 163.62 | 12.94 | 0.08 |
| MAXIMAL | office | 165.09 | 14.36 | 0.09 |

| | | | | |
|---|---|---|---|---|
| TORE | office | 119.55 | 11.91 | 0.10 |
| BRA | office | 37.09 | 6.04 | 0.16 |
| BERTIL | office | 37.89 | 3.85 | 0.10 |
| FRASSE | office | 23.29 | 2.91 | 0.13 |
| ANTONIUS | organizing | 47.35 | 17.29 | 0.37 |
| MOPPE | organizing | 15.34 | 2.09 | 0.14 |
| LACK | storage | 19.72 | 1.17 | 0.06 |
| JUSSI | tables | 60.94 | 13.20 | 0.22 |
| KROKSHULT | tables | 149.24 | 10.21 | 0.07 |
| TIMBRA | tables | 91.34 | 7.09 | 0.08 |
| LACK | tables | 37.80 | 6.12 | 0.16 |
| DRAGON | textile and accessory | 33.19 | 5.37 | 0.16 |
| AGEN | textile and accessory | 26.15 | 2.17 | 0.08 |
| INDEX | textile and accessory | 9.78 | 2.75 | 0.28 |
| RESLIG | wall decoration | 21.66 | 1.59 | 0.07 |
| NYTTJA | wall decoration | 6.12 | 1.18 | 0.19 |
| HAPPEN | wardrobe | 44.92 | 10.84 | 0.24 |
| KOMPLEMENT | wardrobe | 9.19 | 2.75 | 0.30 |
| ASKEDAL | wardrobe | 211.86 | 29.84 | 0.14 |
| VISDALEN | wardrobe | 356.29 | 35.07 | 0.10 |
| BIALITT | wardrobe | 178.55 | 16.77 | 0.09 |
| TROGEN | wardrobe | 137.73 | 17.94 | 0.13 |

**Table A.3: Products in the 2001 data, mean price and standard deviations**

| item | product group | mean price | standard deviation | coefficient of variation |
|---|---|---|---|---|
| TIMRA | audio furniture | 65.31 | 62.46 | 0.96 |
| KUBIST | audio furniture | 49.18 | 50.40 | 1.02 |
| KOMPAS | audio furniture | 4.90 | 5.25 | 1.07 |
| ABO | audio furniture | 47.53 | 70.01 | 1.47 |
| FRACK | bathroom | 5.63 | 4.75 | 0.84 |
| VISDALEN | bedroom | 127.35 | 161.44 | 1.27 |
| VISDALEN | bedroom | 37.25 | 54.05 | 1.45 |
| TROMSNES | bedroom | 109.07 | 135.82 | 1.25 |
| HADELAND | bedroom | 37.37 | 54.14 | 1.45 |
| NARVIK | bedroom | 137.40 | 177.49 | 1.29 |
| NARVIK | bedroom | 35.06 | 46.46 | 1.33 |
| VRADAL | bedroom | 94.29 | 105.16 | 1.12 |
| EGEBY | carpets and basement | 56.14 | 79.66 | 1.42 |
| TUNDRA | carpets and basement | 8.64 | 9.65 | 1.12 |
| ABO | chairs and tables | 27.99 | 35.63 | 1.27 |
| ABO | chairs and tables | 134.62 | 154.22 | 1.15 |
| IGGESUND | chairs and tables | 58.37 | 80.92 | 1.39 |
| PELTO | chairs and tables | 135.26 | 165.49 | 1.22 |
| HENDRIKSAL | chairs and tables | 49.25 | 53.33 | 1.08 |
| KRONVIK | chairs and tables | 158.19 | 188.95 | 1.19 |
| KRONVIK | chairs and tables | 44.82 | 52.59 | 1.17 |
| JUSSI | chairs and tables | 14.06 | 18.37 | 1.31 |
| INGO | chairs and tables | 17.96 | 24.75 | 1.38 |
| ADAM | chairs and tables | 20.89 | 24.84 | 1.19 |
| RONALD | chairs and tables | 19.76 | 24.75 | 1.25 |
| DENNIS | chairs and tables | 11.03 | 14.89 | 1.35 |
| RINGO | chairs and tables | 13.02 | 15.60 | 1.20 |
| TERJE | chairs and tables | 6.73 | 7.77 | 1.15 |
| OGLA | chairs and tables | 16.52 | 17.89 | 1.08 |
| BABORD | corridor | 5.44 | 6.32 | 1.16 |
| LOGGA | corridor | 22.88 | 18.22 | 0.80 |
| BONETT | corridor | 15.87 | 8.54 | 0.54 |
| BRA | corridor | 36.55 | 48.39 | 1.32 |
| BABORD | corridor | 5.49 | 5.65 | 1.03 |
| RIGG | corridor | 8.77 | 9.86 | 1.12 |
| PILOT | corridor | 28.10 | 28.24 | 1.00 |
| TOMELIA | couch | 301.84 | 397.29 | 1.32 |
| EKTORP | couch | 279.20 | 357.68 | 1.28 |
| KLIPPAN | couch | 142.26 | 168.46 | 1.18 |
| TULSTA | couch | 57.54 | 75.62 | 1.31 |
| STEN | cupboards | 10.99 | 9.52 | 0.87 |
| FJORD | cupboards | 60.94 | 63.44 | 1.04 |
| HARPUN | cupboards | 38.82 | 49.85 | 1.28 |

| | | | | |
|---|---|---|---|---|
| IVAR | cupboards | 29.76 | 28.83 | 0.97 |
| IVAR | cupboards | 5.81 | 6.17 | 1.06 |
| BILLY | cupboards | 24.47 | 30.80 | 1.26 |
| BENNO | cupboards | 21.19 | 30.30 | 1.43 |
| LIO | cupboards | 19.00 | 25.20 | 1.33 |
| BONDE | cupboards | 92.34 | 116.35 | 1.26 |
| KUBUS | cupboards | 82.21 | 101.62 | 1.24 |
| AKROBAT | cupboards | 35.71 | 45.51 | 1.27 |
| NARTORP | cupboards | 63.31 | 75.56 | 1.19 |
| KRONVIK | cupboards | 177.01 | 239.53 | 1.35 |
| KRYSS | cupboards | 34.24 | 43.96 | 1.28 |
| SKANDOR | cupboards | 52.82 | 81.68 | 1.55 |
| ABO | cupboards | 143.70 | 170.55 | 1.19 |
| NARVIK | cupboards | 70.76 | 107.72 | 1.52 |
| BIALITT | cupboards | 46.84 | 50.30 | 1.07 |
| FJORD | cupboards | 43.98 | 55.31 | 1.26 |
| KURS | cupboards | 33.87 | 51.46 | 1.52 |
| RAST | cupboards | 17.45 | 20.24 | 1.16 |
| PRAGEL | kitchen | 35.44 | 30.53 | 0.86 |
| EDSVIK | kitchen | 23.04 | 26.32 | 1.14 |
| HAGGVINK | kitchen | 26.26 | 29.48 | 1.12 |
| FACTUM | kitchen | 43.21 | 47.65 | 1.10 |
| PERFECT | kitchen | 33.80 | 41.97 | 1.24 |
| ANTOFINO | lamp | 25.20 | 22.46 | 0.89 |
| KVINTOL | lamp | 13.54 | 13.91 | 1.03 |
| TERTIAL | lamp | 6.35 | 7.00 | 1.10 |
| ERBIUM | lamp | 17.23 | 19.17 | 1.11 |
| NORSSKEN | lamp | 23.45 | 25.56 | 1.09 |
| NORSSKEN | lamp | 6.46 | 5.12 | 0.79 |
| ANTILOP | nursery | 6.52 | 7.16 | 1.10 |
| GOK | nursery | 33.56 | 25.59 | 0.76 |
| TROFAST | nursery | 41.44 | 53.55 | 1.29 |
| TROFAST | nursery | 29.40 | 40.26 | 1.37 |
| GLIS | nursery | 5.05 | 6.14 | 1.22 |
| VIKARE | nursery | 55.01 | 68.84 | 1.25 |
| DUKTIG | nursery | 4.61 | 3.15 | 0.68 |
| DUKTIG | nursery | 6.41 | 7.79 | 1.21 |
| MAMMUT | nursery | 5.21 | 6.36 | 1.22 |
| PANTER | nursery | 7.76 | 9.07 | 1.17 |
| MAMMUT | nursery | 94.61 | 116.37 | 1.23 |
| GLIS | nursery | 3.26 | 3.85 | 1.18 |
| HELMER | office | 28.12 | 32.03 | 1.14 |
| EFFECTIV | office | 78.34 | 97.80 | 1.25 |
| OPERATIV | office | 103.12 | 145.51 | 1.41 |
| EFFECTIV | office | 91.76 | 89.29 | 0.97 |
| MAXIMAL | office | 62.87 | 87.25 | 1.39 |
| MAXIMAL | office | 64.26 | 87.33 | 1.36 |

| | | | | |
|---|---|---|---|---|
| TORE | office | 47.00 | 62.84 | 1.34 |
| BRA | office | 16.33 | 17.98 | 1.10 |
| BERTIL | office | 15.15 | 19.69 | 1.30 |
| FRASSE | office | 9.67 | 11.79 | 1.22 |
| ANTONIUS | organizing | 27.17 | 17.48 | 0.64 |
| MOPPE | organizing | 6.50 | 7.66 | 1.18 |
| LACK | storage | 7.35 | 10.72 | 1.46 |
| JUSSI | tables | 28.44 | 28.16 | 0.99 |
| KROKSHULT | tables | 56.55 | 80.28 | 1.42 |
| TIMBRA | tables | 34.76 | 49.00 | 1.41 |
| LACK | tables | 16.65 | 18.32 | 1.10 |
| DRAGON | textile and accessory | 14.60 | 16.10 | 1.10 |
| AGEN | textile and accessory | 10.15 | 13.86 | 1.37 |
| INDEX | textile and accessory | 4.92 | 4.22 | 0.86 |
| RESLIG | wall decoration | 8.23 | 11.63 | 1.41 |
| NYTTJA | wall decoration | 2.80 | 2.87 | 1.02 |
| HAPPEN | wardrobe | 21.51 | 20.30 | 0.94 |
| KOMPLEMENT | wardrobe | 4.87 | 3.74 | 0.77 |
| ASKEDAL | wardrobe | 87.41 | 107.88 | 1.23 |
| VISDALEN | wardrobe | 139.83 | 187.49 | 1.34 |
| BIALITT | wardrobe | 69.52 | 94.44 | 1.36 |
| TROGEN | wardrobe | 57.20 | 69.75 | 1.22 |

**Table A.4: Products in the 2009 data, mean price and standard deviations**

| item | product group | mean price | standard deviation | coefficient of variation |
|---|---|---|---|---|
| LACK | audio furniture | 50.73 | 3.38 | 0.07 |
| BENNO | audio furniture | 127.75 | 3.54 | 0.03 |
| LIATORP | audio furniture | 1006.00 | 64.62 | 0.06 |
| LILLHOLMEN | bathroom | 15.08 | 0.33 | 0.02 |
| GODMORGON | bathroom | 21.09 | 3.20 | 0.15 |
| VÄNNA | bedroom | 34.84 | 3.60 | 0.10 |
| EIDE | bedroom | 49.59 | 0.49 | 0.01 |
| PAX BALLSTAD | bedroom | 80.38 | 6.44 | 0.08 |
| ENGAN | bedroom | 88.21 | 31.64 | 0.36 |
| ODDA | bedroom | 98.09 | 3.32 | 0.03 |
| ASPELUND | bedroom | 156.50 | 19.09 | 0.12 |
| HEMNES | bedroom | 235.25 | 14.08 | 0.06 |
| PAX HEMNES | bedroom | 358.38 | 19.29 | 0.05 |
| EDLAND | bedroom | 399.00 | 0.00 | 0.00 |
| ERSLEV | carpets and basement | 27.09 | 3.66 | 0.14 |
| HEMMET | carpets and basement | 171.50 | 13.89 | 0.08 |
| VITTEN | carpets and basement | 97.71 | 5.15 | 0.05 |
| ALVINE RUTA | carpets and basement | 140.25 | 9.91 | 0.07 |
| ANTILOP | chairs and tables | 13.22 | 1.48 | 0.11 |
| HERMAN | chairs and tables | 13.29 | 2.16 | 0.16 |
| GILBERT | chairs and tables | 24.96 | 2.67 | 0.11 |
| MALTE | chairs and tables | 31.21 | 2.31 | 0.07 |
| NILS | chairs and tables | 35.45 | 3.63 | 0.10 |
| INGO | chairs and tables | 42.34 | 7.42 | 0.18 |
| MELLTORP | chairs and tables | 43.96 | 5.72 | 0.13 |
| MELLTORP | chairs and tables | 48.59 | 3.91 | 0.08 |
| HENRIKSDAL | chairs and tables | 56.96 | 6.55 | 0.11 |
| BERNHARD | chairs and tables | 136.50 | 7.07 | 0.05 |
| STORNÄS | chairs and tables | 336.50 | 23.15 | 0.07 |
| EKBY JÄRPEN | corridor | 12.64 | 2.51 | 0.20 |
| EKBY BJÄRNUM | corridor | 12.83 | 2.23 | 0.17 |
| SKÄR | corridor | 69.57 | 0.47 | 0.01 |
| KLOBO | couch | 94.96 | 12.73 | 0.13 |
| POÄNG | couch | 99.45 | 0.48 | 0.00 |
| KLIPPAN | couch | 257.75 | 32.27 | 0.13 |
| KARLSTAD | couch | 395.25 | 19.96 | 0.05 |
| EKTORP | couch | 469.00 | 35.05 | 0.07 |
| KRAMFORS | couch | 534.00 | 29.76 | 0.06 |
| IKEA STOCKHOLM | couch | 1371.13 | 50.09 | 0.04 |
| LACK | cupboards | 5.36 | 0.51 | 0.10 |
| HYLLIS | cupboards | 8.85 | 1.12 | 0.13 |
| PAX | cupboards | 11.75 | 2.31 | 0.20 |
| ÄTRAN | cupboards | 15.96 | 1.93 | 0.12 |
| EXPEDIT | cupboards | 16.75 | 2.19 | 0.13 |

| | | | | |
|---|---|---|---|---|
| LERBERG | cupboards | 17.39 | 2.35 | 0.13 |
| LACK | cupboards | 20.20 | 2.19 | 0.11 |
| BILLY | cupboards | 20.56 | 2.84 | 0.14 |
| UDDEN | cupboards | 22.48 | 4.57 | 0.20 |
| EXPEDIT | cupboards | 26.63 | 2.26 | 0.09 |
| BILLY | cupboards | 27.24 | 2.18 | 0.08 |
| BILLY BYOM | cupboards | 28.38 | 2.13 | 0.08 |
| BILLY | cupboards | 36.87 | 2.04 | 0.06 |
| EXPEDIT | cupboards | 58.95 | 5.60 | 0.09 |
| LACK | cupboards | 99.45 | 11.85 | 0.12 |
| EXPEDIT | cupboards | 139.75 | 16.35 | 0.12 |
| MARKÖR | cupboards | 271.50 | 13.89 | 0.05 |
| RINGSKÄR | kitchen | 90.84 | 7.96 | 0.09 |
| UDDEN | kitchen | 98.36 | 10.77 | 0.11 |
| RATIONELL | kitchen | 111.25 | 22.00 | 0.20 |
| OXSKÄR | kitchen | 221.00 | 17.34 | 0.08 |
| STORNÄS | kitchen | 315.25 | 23.26 | 0.07 |
| DATID OV10 | kitchen | 423.50 | 58.57 | 0.14 |
| NUTID HF560 | kitchen | 631.00 | 38.59 | 0.06 |
| KVART | lamp | 16.34 | 1.30 | 0.08 |
| ARSTID | lamp | 19.21 | 1.99 | 0.10 |
| GRUNDTAL | lamp | 19.34 | 1.77 | 0.09 |
| FORSA | lamp | 19.71 | 0.71 | 0.04 |
| JANSJÖ | lamp | 46.71 | 4.50 | 0.10 |
| IKEA 365+ BRASA | lamp | 49.71 | 0.44 | 0.01 |
| DIODER | lamp | 57.08 | 4.42 | 0.08 |
| MAMMUT | nursery | 19.96 | 0.02 | 0.00 |
| JULES | nursery | 41.69 | 3.79 | 0.09 |
| HENSVIK | nursery | 64.07 | 4.94 | 0.08 |
| HENSVIK | nursery | 80.94 | 3.64 | 0.05 |
| HENSVIK | nursery | 93.21 | 14.85 | 0.16 |
| MAMMUT | nursery | 99.46 | 0.49 | 0.00 |
| HENSVIK | nursery | 109.23 | 8.99 | 0.08 |
| MAMMUT | nursery | 111.11 | 41.56 | 0.37 |
| LEKSVIK | nursery | 112.98 | 20.37 | 0.18 |
| LEKSVIK | nursery | 116.23 | 21.00 | 0.18 |
| LEKSVIK | nursery | 141.50 | 7.07 | 0.05 |
| MAMMUT | nursery | 146.50 | 12.82 | 0.09 |
| LEKSVIK | nursery | 202.25 | 10.90 | 0.05 |
| ANDY | office | 19.60 | 0.50 | 0.03 |
| DAVE | office | 20.83 | 3.76 | 0.18 |
| SNILLE | office | 21.13 | 1.97 | 0.09 |
| KOLON | office | 23.71 | 5.18 | 0.22 |
| MIKAEL | office | 37.09 | 6.94 | 0.19 |
| JULES | office | 59.57 | 5.60 | 0.09 |
| SMADAL | office | 64.57 | 5.48 | 0.08 |
| ASPVIK | office | 79.57 | 0.47 | 0.01 |

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|---|---|---|---|---|
| VIKA AMON | office | 83.86 | 11.36 | 0.14 |
| FREDERIK | office | 94.46 | 5.12 | 0.05 |
| ALEX | office | 99.46 | 0.49 | 0.00 |
| GALANT | office | 137.25 | 8.38 | 0.06 |
| KOMPLEMENT | organizing | 7.68 | 1.44 | 0.19 |
| KASSETT | organizing | 7.74 | 1.31 | 0.17 |
| BENNO | organizing | 36.33 | 3.50 | 0.10 |
| KOMPLEMENT | storage | 20.37 | 1.92 | 0.09 |
| LACK | tables | 6.73 | 1.98 | 0.29 |
| RÖRBERG | tables | 57.18 | 4.59 | 0.08 |
| KLUBBO | tables | 76.95 | 7.27 | 0.09 |
| VEJMON | tables | 151.50 | 7.07 | 0.05 |
| MARKÖR | tables | 157.75 | 6.41 | 0.04 |
| LUPIN | textile and accessory | 10.79 | 1.26 | 0.12 |
| RATIONELL | textile and accessory | 21.09 | 2.80 | 0.13 |
| IKEA STOCKHOLM | textile and accessory | 26.71 | 2.44 | 0.09 |
| BIGARRA | textile and accessory | 28.70 | 2.31 | 0.08 |
| RIBBA | wall decoration | 10.24 | 1.16 | 0.11 |
| SLÄTTHULT | wall decoration | 10.86 | 1.79 | 0.17 |
| IKEA PS | wall decoration | 31.84 | 3.72 | 0.12 |
| SKÄR | wardrobe | 98.21 | 3.37 | 0.03 |