Separated by a Common Currency?
Evidence from the Euro Changeover*

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Abstract

We study the price convergence of goods and services in the euro area in 2001-2002. To measure the degree of convergence, we compare the prices of around 220 items in 32 European cities. The width of the border is the price difference attributed to the fact that the two cities are in different countries. We find that the 2001 European borders are negative, which suggests that the markets were very integrated before the euro changeover. Moreover, we do not identify an integration effect attributable to the introduction of the euro. We then explore the determinants of the European borders. We find that different languages, wealth and population differences tend to split the markets. Historical inflation, though, tends to lead to price convergence.

I Introduction

In 1992, the E.U. "*resolved to achieve the strengthening and the convergence of their economies and to establish an economic and monetary union including [...] a single and stable currency*" as part of the Maastricht Treaty (E.U., 1992). Ten years later, in January 2002, twelve European countries began using the euro as their common currency.[1] The euro (€) was intended to increase international price transparency, as this would ideally foster competition, locational arbitrage and cross-border trade (Rose and Wincoop, 2001; Frankel and Rose, 2002), which should result in price convergence.

However, post-euro price disparities across — and within— countries were still prevalent in 2002. Figure 1 summarizes the prices of toothpaste, fast-food, CDs, electricity, dentist visits and daily newspapers across European cities. It seems clear that the convergence was not perfect and that travellers in 2002 paid different prices for identical items in different locations. For example, the price of toothpaste in Vienna was more than twice that of Munich (€3.42 against €1.42). In an expanded version of the classic Big Mac example, the price of a fast-food menu consisting of hamburger, fries and drink went for €3.75 in Lisbon but €5 in Madrid. Figure 1 is only a small example based on our larger dataset, but similar disparities were found across the European continent for a wide range of products.

In the present paper we study the magnitude of those disparities and some of their causes, as well as the magnitude of a possible convergence due to the euro changeover.

We **first** characterize price differences among European cities by computing the width of the border between two countries in kilometers implied by price differences, on a large sample of traded goods. Such methodology follows the pioneering study by Engel and Rogers (1996)[2] — E&R henceforth.

[1] On 1-January, 2002, the citizens in twelve European Union (EU) countries began to phase out their national currencies and use the euro - €. The countries involved were Austria, Belgium, Finland, France, Germany, Greece, Ireland, Luxembourg, Netherlands, Portugal and Spain. Smaller non-EU countries such as the Co-Principality of Andorra, the Principalities of Liechtenstein and Monaco, the Republic of San Marino and Vatican City were already using some of the EU currencies and, hence, were also included in the changeover. Denmark, Sweden and the United Kingdom decided not to join the single currency at that time, in spite of being EU members. On 1-January, 2007, the original euro countries were joined by Slovenia.

The irrevocably fixed changeover rates between each of the thirteen national currencies and the euro were determined by dividing the market value of the euro by that of each participating currency. The conversions occurred based on the exchange rate in December 1998 for 11 of the original currencies, in December 2000 for the Greek drachma and in June 2004 for the Slovenian Tolar.

[2] E&R (1996) use data for US and Canadian cities to show how the variation in the prices of similar goods is much higher for two cities located in different countries than for two equidistant cities in the same country. They find that the existence of a border corresponds approximately to 75,000 miles. Sticky nominal prices account for part of the border effect but most of it is left unexplained.

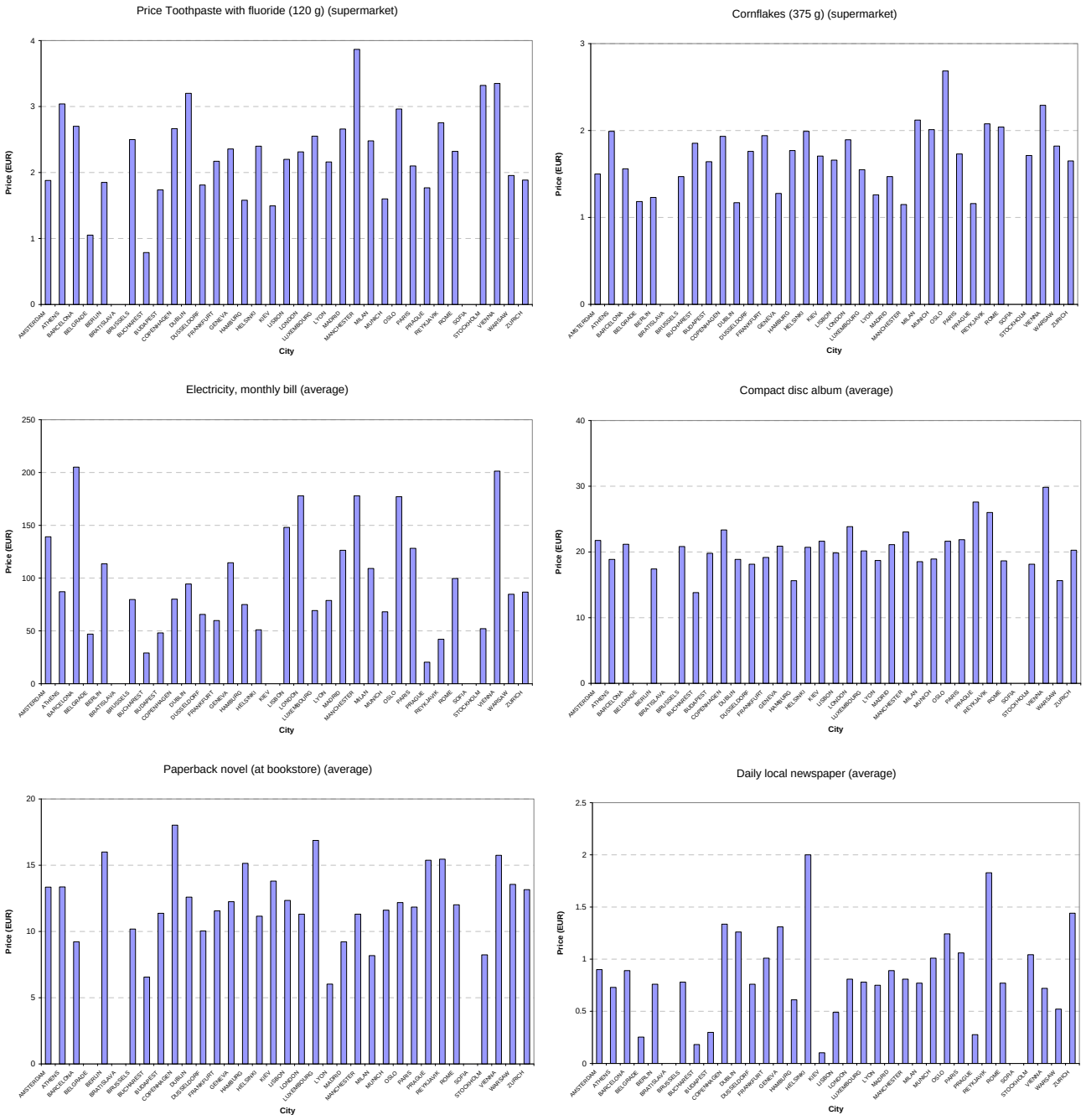

Figure 1: Prices of Toothpaste, Fast-food, CDs, Electricity,

Dentist visits and Daily newspapers across European cities

For example, the physical distance Madrid-Barcelona is very similar to Madrid-Lisbon (501 kms. vs. 502 kms.) but prices might be different. In 2002, five razor blades cost €2.70 in Madrid, €2.71 in

Barcelona, and €2.74 in Lisbon. The 501 kms. which separate Madrid and Barcelona translate into a one-cent difference in the price of razor blades. Therefore, the four-cent difference between Madrid and Lisbon implies a physical distance of 2,004 kms.. Given that the actual distance is 502 kms., we estimate an implicit width of the border between Spain and Portugal of 1,502 kms.. The advantages of the border width, compared to simpler price differences, are that: (i) It is easily interpretable; (ii) It is comparable across different items; and (iii) It takes into account the physical distance between cities when assessing price divergences.

The positive border effect is well-known in the literature. E&R identified it between Canada and the United States. The same authors identified it across European countries (Engel and Rogers, 2001), as did Parsley and Wei (2001) between Japan and the US. Supporting the importance of currency as a market unification factor, Hardouvelis et al. (2006) found that euro stock markets converged towards full integration amongst themselves but not with the UK, who stayed out of the euro .

Many cross-country studies of consumer prices (including Engel and Rogers, 2001) use price index data. However, indices are problematic to assess price level differences because they depend on different reference levels, so that one can only test whether prices have converged proportionally, i.e. in reference to unknown base values. We, on the contrary, follow Engel and Rogers (2004)[3] and use the specific items included in the Economist Intelligence Unit (EIU) city data. We select tradable goods,[4] and apply the borders methodology to all possible pairs. We measure the widths of the borders between cities in 24 European countries and the six European nations with at least two cities in the dataset: France, Italy, Germany, Spain, Switzerland and the United Kingdom. By using non-euro and non-E.U. countries we control for price convergence driven by factors other than the common currency.

In direct contrast to previous findings, our borders are largely negative both before and after the changeover. We show that international traded prices are relatively more similar between them than national prices. This implies that prices are not proportional to geographical distances in Europe, which suggests that European cities are economically closer than what their distances seem to suggest.

Secondly, we analyze some economic, social and cultural determinants of the 2001 European borders' widths. We conjecture that borders will be wider (less negative) when the two countries speak different languages, as language acts as a trade barrier. Moreover, price disparity could grow on the cities' wealth and size disparity: prices could be more similar between cities with comparable GDP per capita and populations.

[3] However, Engel and Roberts (2004) take 1999 as their date for the introduction of the euro. That year corresponds to its introduction as a virtual currency for financial transactions. We study the introduction of actual euro bank notes and coins.

[4] EIU includes also non traded, such as "Haircut, without tip" and real estate.

Further, national capitals might have more similar prices between themselves than with non-capitals. In addition, measures of cultural affinity, trust and others should lead to less price dispersion.

We examine these issues both through general regressions and specific cases. The European setting is amongst the richest in the world to study those issues and their effects on price convergence. For example, while some countries are the only ones to speak a language, e.g. Italy, Spain or Finland, some others share it. The language in both Germany and Austria (both euro countries) is German. Belgium, Luxembourg and France are French speaking but Belgium also shares Dutch with The Netherlands. Further, Ireland shares English with the UK, which stayed out of the euro in spite of being a E.U. member, and we have data for Swiss cities in both French- (Geneva) and German-speaking (Zurich) cantons. In addition, we use the Duchy of Luxembourg and Belgium, two different countries with the same currency. We first hypothesize that, pre-euro , prices should be more similar between Luxembourg and Belgium than between either one and any other country. Further, we hypothesize that the euro changeover should have had less influence in their price disparity because the currency effect should be alleviated. We consider other specific situations to study the issues of language and capital status. Finally, we include other possibly important cultural features.

On the whole, our empirical results are widely supportive of the conjectures. We find that language, together with differences in country size and city wealth, increase price disparities. If one country is twice as large as another, price differences between two cities from each country are 100 meter wider. A one percent difference in GDP per capita between two cities increases the width of the border by about 30 meters. When two cities from different countries speak the same language, the width of the border is two kilometers narrower (although this result is only weakly significant) than otherwise. Our results are robust and appear consistently in several econometric specifications.

With respect to macroeconomic figures, we show that historical inflation naturally results in relative price changes. We compute the difference in inflation between two cities in the period 1996-2001, and find that it has a significant effect on price convergence in 2001, which is just an indication of the effectiveness of the Maastricht convergence process. Indeed the previous results are stronger when the two countries belong to the European Union, and in particular to the euro area.

Thirdly, we use the changeover as a natural experiment in which to study whether moving from many to a single currency has any effect on price convergence. Our idea is that so long as there are many currencies in Europe, citizens are discouraged from engaging in international purchases because of the complexity of understanding prices expressed in different currencies, which will undermine their arbitrage opportunities. In an extreme example of this, Asplund and Friberg (2001) identify price differences for the

same goods in the same duty-free shops when expressed in Swedish kronor and Finnish markka. This barrier to international arbitrage should have been removed for the currencies participating in the changeover.

In fact, we find that the changeover has had a negligible effect on the integration of consumer good markets. The only euro country whose border width with other euro countries significantly changes upon the introduction of the common currency is Italy. However the Italian border becomes 3.9 kilometers wider, not narrower. Instead, the border between the U.K. and euro countries is 3.9 kilometers narrower in 2002 than in 2001. In Germany the effect of the euro changeover is not significant, yet it significantly reduces its borders with E.U., non-euro cities 6.2 kilometers. Our results are suggestive of progressive integration starting with the European single market in 1993, followed by changes in expectations as a result of the euro introduction. The integration seems to have been accomplished by the time national exchange rates were irrevocably fixed against the euro in 1999. However the benefits of paying with the same currency are economically meaningless. Overall, from 2001 to 2002, there is more price convergence between cities inside the European Union, than for cities inside the euro area. Furthermore, prices have converged the most between cities in Euroland, and cities in the EU but outside the euro (e.g. between London and Dublin).

Our analysis produces some other interesting findings. For instance, we find that in 2001 international price convergence within Euroland was stronger for the following items: food (perishables and non-perishables), alcohol, and recreation. In contrast, in 2001 price convergence was significantly stronger in the European Union at large, relative to the euro area, for the following items: personal care, house supplies, cars, and tobacco. On balance, the common currency itself does not induce any significant price convergence. Interestingly, though, it does not lead to significant price divergences either—in contrast to a common perception. We also provide results on price convergence depending on the magnitude of prices. We find that by 2001 the products whose prices had converged most in the euro area were those prices of items below 10euro (for them, the border was 37 kilometers narrower between euro countries). However, the introduction of the euro in 2002 significantly increased price divergence for items below 10€, and those above 100€. These results are consistent with Dziuda and Mastrobuoni (2006), who show that consumers base their perceptions of inflation on items that are cheaper. Indeed Dziuda and Mastrobuoni (2006) show that cheaper products experience higher price increases after the introduction of the euro, yet the overall inflationary effect of the common currency was negligible.

The recent literature includes some papers studying the causes of inflation (or of its lack) upon the introduction of the European single currency, including price stickiness (Angeloni et al., 2006; Álvarez et al., 2006), menu costs (Hobijn et al. 2006) and cognitive rules of thumb (Bris et al., 2007b). Some other

papers have analyzed international price convergence upon the 2002 euro changeover (Rogers, 2002; Lutz, 2002; and Baye et al., 2002). We are the first to compare price convergence within the euro area, with price convergence outside, and in that sense we can truly identify the effect of the introduction of the euro.

Finally, we analyze whether any of the elements integrating the border have colluded with the changeover and led to price convergence. We find that cultural affinity is a pre-condition for a common currency to work. More specifically, we find that bilateral trust (we use the measurement by Guiso et al., 2007) has a negative effect on the border width change between 2001 and 2002. When we split our sample depending on euro membership, we find that such negative impact is concentrated only among euro countries. A one-standard deviation increase in bilateral trust (standard deviation=0.17) between two countries in Euroland reduces border width by about 250 meters. However, the same increase in trust between two countries in the European Union, but outside Euroland , does not have any significant effect. We use other indices of cultural affinity, like the index of Cultural Openness computed by the IMD World Competitiveness Center. The more culturally open two countries are, the narrower the price border becomes in 2002. Again, this result is significant only for cities in euro countries. Finally, bilateral trade (the sum of imports and exports between two countries), which we deem the result of economic affinity, leads to price convergence as well. A one-standard deviation increase in bilateral trade (standard deviation=€29.6 billion) decreases the border width by about three kilometers from 2001 to 2002 in the euro area. Interestingly, the effect is stronger for countries in the European Union, but outside the euro: for these countries the border width reduces by about 8.6 kilometers. We conclude that for the euro to be a successful endeavour in terms of price convergence, the expansion of its borders will have to go naturally towards countries that share similar cultural values and economic attitudes.

We believe that our findings have profound implications. We provide specific patterns of price convergence in the European Union, and predict what might happen when other countries adopt the euro. All countries joining the E.U. after 2001 are expected to change over as soon as they fulfil some macroeconomic convergence criteria (a budget deficit of less than 3 % of GDP, a debt ratio of less than 60 % of GDP, low inflation and interest rates close to the E.U. average). Hence, the list of changeovers is likely to include in the medium term the ten Central and Eastern European currencies which joined on 1 May 2004, as well as any other future members.[5]

The remaining of the paper is organized as follows: In section II we describe the dataset and method-

[5] A first case where our paper would have been useful was to forecast the outcomes of the Slovenian changeover in Jan-2007. Unfortunately, we lack price data about Ljubljana, the Slovenian capital, or any other city in the country. That information would have been useful to make an out-of-sample analysis of our results.

ology, and in section III we focus on the calculation of border widths. Section IV reports the results of our tests of the size of the European borders widths and of their possible reduction upon the changeover. Section V empirically addresses the issue of their linguistic and cultural determinants. Finally, we conclude in Section V.

II Data and Sources

A City Data

Our primary source is the "City Data" dataset released by The Economist Intelligence Unit –EIU–, which details the price on individual, homogeneous retail items in similar outlets for a large number of cities around the world. EIU does not provide indices but individual, "scanner", prices.

We obtain detailed price information for 299 goods and services in 33 cities from 24 European countries. Table 1 lists the cities in our dataset with language and currency information. The table also includes the number of items for which there is price information. There is data for all E.U.-15 countries as well as others outside the E.U., or with accession after 2002. Our sample includes all capitals except Bern for Switzerland. Out of the 33 cities, 19 cities participated in the 2002 euro changeover, eight Western European ones did not participate, either because their countries were not members of the E.U. (Geneva, Oslo, Reykjavik and Zurich) or in spite of that (Copenhagen, London, Manchester and Stockholm). In addition, there are six Eastern European cities.

[Insert Table 1]

In 19 cases, there is only data for the country's capital (i.e. Lisbon, Prague, Stockholm,...). However, for reasons we discuss further below, countries with more than one city are critical to the calculation of the border widths. We have data for at least two locations in the following countries: Italy (Milan and Rome), France (Lyon and Paris), Germany (Berlin, Dusseldorf, Frankfurt, Hamburg and Munich) and Spain (Barcelona and Madrid) within Euroland; and Switzerland (Geneva and Zurich) and the UK (Manchester and London) outside of Euroland.

There are at least 20 languages spoken across the dataset. Some of them are spoken in only one city (e.g. Portuguese in Lisbon, Danish in Copenhagen), and in two cases the language is only spoken in two locations of the same country (Italy and Spain). There are also four languages spoken in several countries:

French is spoken in Brussels (Belgium), France, Luxembourg and the Swiss city of Geneva. Dutch is spoken in the Netherlands but also in bilingual Brussels. British and Irish (Dublin) cities use English. German is spoken in Vienna (Austria) and Zurich (Switzerland) plus in all five German sites.

Previous to the changeover, each country had its own currency with only one exception: a fixed parity of 1:1 between the Belgian (BFF) and Luxembourg Franc meant that the two currencies were used interchangeably in practice. In 2002, 12 countries experienced the changeover ("euro countries") and the rest remained with the same currencies as in 2001.

Despite its advantages and the difficulty in finding other data, the EIU dataset has its own limitations (Engel and Rogers, 2004). The data are collected for a very limited number of outlets in each city compared to national surveys. Typically, there is only one observation for a discount outlet and premium supermarket. Second, packaging is not uniform across countries and EIU standardizes prices to account for that. For example, if the good is "Canned tomatoes, 500 grams" but that good is sold in 400 grams units only in a supermarket, they provide us with their observed price plus 25% to correct for the packaging difference. Thirdly, the EIU measures prices of comparable goods but does not distinguish product quality differences, nor accounts for different perceptions of product quality across countries.

In the Appendix Table I we report pairwise distances (in kilometers) between the cities in our dataset. Physical distance is essential when calculating price distance. Physical distances range from a minimum of 113 kms. (Lyon-Geneva) to a maximum of 3,362 kms. (Lisbon-Kiev). Naturally, distances are on average smaller nationally than internationally but European cities are physically closer than what national borders would suggest. In fact, there are several cases in which one can identify similar equidistant national and international city pairs. For example, the distances Madrid- Barcelona and Madrid-Lisbon are very similar (501 kms. and 502 kms. respectively). Moreover, the distance Geneva-Zurich (223 kms.) is higher than Geneva-Lyon (113 kms.), and approximately of the same magnitude as Geneva-Milan (255 kms.), and Zurich-Milan (216 kms.). In fact, 245 kms. Zurich-Munich across the Swiss-German border are considerably more than Munich-Hamburg (611 kms.) within Germany.

The discussion above suggests that our city sample is rich in peculiarities. For example, Geneva and Zurich share national border and currency, but not language. Luxembourg is an independent country but shares currency and language with others. Brussels is bilingual in French and Dutch, but with its own currency. The dataset includes Western European countries which did not join the euro, either because they were outside the E.U. (such as Iceland, Norway and Switzerland) or because they opted out (Denmark, Sweden and UK), as well as Eastern European countries. In the empirical results part, we will draw selectively from these special cases to illustrate the main effects revealed by our regressions.

One of our main claims is that the border might be disguising economic and social differences between cities, including wealth and population differences or national capital effects. Therefore, we include those variables in our dataset. The GDP per capita data is mainly based on Parkinson et al. (2004). The population data comes primarily from the "City Mayors" association website. Whenever city-specific GDP per capital was not available, we use the country's GDP per capita from the World Bank Development Indicators database.[6] We also report price indices by city in 2001 and 2002 as reported by EIU. These variables are in Table 2.

[Insert Table 2]

B Product Data

The list of items for which we have price information is detailed in Table 3. Obviously there are goods and services for which price convergence is difficult if not impossible, even in the presence of a common currency. This is the case for non-tradable goods, like haircuts or restaurant meals. Consequently the focus of our paper is on tradable goods. Out of the 299 items in our dataset, we classify 217 of them as tradable and 82 as non-tradable. We follow the classification by Engel and Roberts (2004) and our own criteria. With respect to the Engel and Roberts (2004) classification, our grouping differs in two aspects. First, we classify tobacco products as tradable even though Engel and Roberts (2004) classify them as "other" because of their specific tax treatment. However, within tradable items we consider tobacco products as a special subcategory. Second, there are 32 items that they do not classify in either group because of their particular characteristics (example: office space rentals), but we include them in the "non-tradable" group.

[Insert Table 3]

In Table 3 we also show the classification of items into subgroups. The EIU classifies its data into thirteen categories: food; alcohol; household supplies; personal care; tobacco; utilities; clothing; domestic help; recreation; transport; office and residential rents; international schools, health and sports and business trip costs. As some of these sub-categories only include non-tradable products (transport), we end up with nine categories of tradable items for which we provide separate results in the next sections. The largest category in our sample corresponds to perishable food items (example: 1 kilo of bananas). Table 3 also provides one example for each of the product categories.

[6] For an overview of complementary data sources, please see the appendix.

In what follows, we focus on tradable goods. We have performed similar tests to the ones provided here for the subsample of non-tradable goods, and in most cases the convergence effects are meaningless.

III The Width of Borders

Our main measure of price divergence is the economic width of the borders. To obtain a measure of the borders width, we first need a measurement of price disparity between any given cities i (e.g. London) and j (e.g. Paris) for item k (Tomatoes, canned, 500 grams, supermarket) at time t (2001 or 2002) in our dataset. Alternatively we could have computed price disparity in two longer subperiods around 2002, but the objective of our study is to analyze the immediate effects of the common currency.

We first reduce our data set to consist of unique city pairs, e.g. we keep either London-Paris or Paris-London, but not both. Second, we define a measurement of price disparity[7] as

$$\Phi(P_{i,j}^{k,t}) = 1 + \frac{abs(p_i^{k,t} - p_j^{k,t})}{\min(p_i^{k,t}, p_j^{k,t})}. \tag{1}$$

where prices p_i and p_j are computed in euros.[8]

It would be tempting to use a simple price ratio, i.e. $\frac{p_i^{k,t}}{p_j^{k,t}}$. However, price ratios are not insensitive to the ordering of the cities (that, is, whether London is city i or j). This explains the second part of (1). Besides, because we use Φ in the denominator of our distance measure, we need to avoid zero values, thus we add one to the pure price disparity ratio.

Price ratios are expressed in excess of one unit, $\Phi(P_{i,j}^{k,t}) \in]1, \infty[$, and do not depend of whether a given city is in the numerator or denominator, $\Phi(P_{i,j}^{k,t}) = \Phi(P_{j,i}^{k,t})$. For example, if $p_i^{k,t} = 1.23$ and $p_j^{k,t} = 1.45$ then $\Phi(P_{i,j}^{k,t}) = 1 + \frac{0.22}{1.23} = 1.1788 = \Phi(P_{j,i}^{k,t})$, which intuitively means that price of item k is 17.9% higher in one of the cities. Once the price disparity metric is computed, we use it to obtain the borders' width.

To see how, imagine the simplest situation in which we calculate the "border width" between a country in which we have data for two cities, a_1 and a_2 and another with data about one city, b_1. We first obtain a distance-normalized measurement of price disparity for any good $k = 1...K$ between national cities, $\frac{\Phi(P_{a_1,a_2}^{k,t})}{D_{a_1,a_2}}$, where $D_{a_1,a_2}$is the physical distance in kilometers between a_1 and a_2.

Then, we use a simple rule of three to determine a hypothetical distance $H_{a_1,b_1}^{k,t}$between a_1 and b_1:

[7] We use the term "disparity" to reflect price differences in the cross-section of cities and reserve the terms "convergence" and "divergence" to describe what occurs dynamically from to 2001 to 2002.

[8] The conversion between local currencies and euros before 2002, and for countries outside the euro area is done through a hybrid local currency/euro exchange rate that takes into account the weights of each legacy currency in the euro after 2002. EIU then computes hybrid exchange rates between each local currency and the resulting currency basket.

$$\frac{\Phi(P^{k,t}_{a_1,a2})}{D_{a_1,a_2}} = \frac{\Phi(P^{k,t}_{a_1,b_1})}{H^{k,t}_{a_1,b_1}}. \tag{2}$$

which implies, solving for $H^{k,t}_{a_1,b_1}$,

$$H^{k,t}_{a_1,b_1} = \frac{\Phi(P^{k,t}_{a_1,b_1}) \cdot D_{a_1,a_2}}{\Phi(P^{k,t}_{a_1,a_2})}. \tag{3}$$

$H^{k,t}_{a_1,b_1}$ is a measurement of how far apart a_3 should be located (in kms.) from a_1 if the proportionality ratio were constant between national and international distances. The width of the border between cities a_1 and b_1, Ψ_{a_1,b_1}, is thus calculated as the difference between the hypothetical and actual distances,

$$\Psi^{k,t}_{a_1,b_1} = H^{k,t}_{a_1,b_1} - D_{a_1,b_1}, \tag{4}$$

which is our dependent variable. We similarly compute the width of the border between cities a_2 and b_1, $\Psi^{k,t}_{a_2,b_1}$. Note that since we need two cities from a country in order to compute hypothetical distances, we can only compute border widths between cities in Germany, Spain, France, Italy, Switzerland, and the U.K., and any other city in our dataset.

$\Psi^{k,t}_{a_1,b_1}$ can be analyzed from a variety of points of view. For instance, we can average $\Psi^{k,t}_{a_1,b_1}$ and $\Psi^{k,t}_{a_2,b_1}$ across products to obtain the average border width between the two countries,

$$\Psi^{t}_{A,B} = \frac{\sum_{k=1}^{K}\sum_{i=1}^{2}(H^{k,t}_{a_i,b_1} - D_{a_i,b_1})}{2 \cdot K}. \tag{5}$$

One final complication arises because in the case where we have more than one city with data available for countries A and B, we then have two different ways to compute the border width between a city from country A and a city from country B (for instance, the border width between Madrid and Paris). In these cases , we average the two numbers measures by city, product, and year.

The previous discussion shows that we can compute both city-specific and country-specific border widths. Although in our cross-sectional regressions our left-hand side variable is the city-specific width, in the next tables we report values of $\Psi^{t}_{A,B}$ as well. Table 4 summarizes the average width between two countries, classified by euro and E.U. membership.

[Insert Table 4]

Our first result is that border widths between European countries are consistently negative. This implies that, as a function of geographical distance, international price differences are small relative to national differences. This finding is irrespective of whether items are tradable or not. When both countries are in Euroland , the 2001 border is $-1,110$ kilometers wide, and it becomes 400 meters narrower in 2002 for all goods, and 500 meters wider for tradable goods. Border widths are wider between euro countries and E.U., non-euro countries (-990 kilometers for all items, and -985 kilometers for tradable goods only). The narrowest border (the longest distance as well) is between euro countries and non-E.U. countries. Overall, border changes between 2001 and 2002 are of a meaningless economic magnitude.

In Table 5 we report border widths by pairs of countries. All 2001 borders are negative, which consistently suggests price integration across Europe irrespective of E.U. membership. Border width is negatively related to the distance between two cities, implying again that price divergence is not proportional to geographical distance. The effect of the euro is reported in the second column for each country. Between 2001 and 2002 the border between German cities and other cities in Euroland decreases 600 meters on average, although this result is not statistically significant. However, the border between German cities and the average cities in the E.U., but not in the euro area, shrinks by 6.2 kilometers (significant at the one percent level). We find the same effect for other euro countries like Spain and France. In Italy, the border with the average euro country widens by 3.9 kilometers in 2002, and it increases slightly less (2.3 kilometers) with respect to non-euro, E.U. cities (both estimates are significant at the one percent level). In Switzerland price disparity decreases with France, Germany, Spain, and the Czech Republic, and increases with all other countries. In the U.K. there has been strong convergence with respect to all euro countries (except for Belgium and Portugal) and on average the border width between the U.K. and Euroland reduced by 3.9 kilometers in 2002. It also reduced (1.8 kilometers on average) with non-E.U. countries (both significant at the one percent level).

[Insert Table 5]

Of course such results do not take into account product differences across cities, country characteristics and geographical factors. Product features are important. Local daily newspapers are not easily tradable because local news are often of little interest to those living in other cities. Moreover, whether people have the habit of purchasing newspapers through subscription (e.g. Stockholm) or at the newsstand (e.g. Madrid) is likely to influence prices. Further, some products are inherently city-specific: for instance, item #250, "Taxi: airport to city centre (average)". Another example is that of electricity: transmission

constrains prevent it from flowing freely across Europe, which results in electricity "islands" with their own price dynamics in places such as Scandinavia, the Iberian peninsula or Italy.

City and country characteristics are important as well. The existence of a physical border between two countries facilitates price arbitrage. Further, novels published in Finnish are not easily sold in Dublin due to language barriers. Even, the instructions in toothpaste or cornflakes packages are translated into the local languages. It could even be possible that, because of historical and cultural reasons, people are reluctant to buy certain items in certain countries even if they are much cheaper than in their own. Macro conditions are important determinants of price levels. In general, prices tend to be higher in wealthier countries and also in those with stronger currencies. Moreover, due to standard gravity model reasons, cities which are further apart will trade less with each other and might have more different prices.

In the next sections we analyze all these determinants of the border widths. Ultimately, we are trying to isolate the pure effect of the introduction of the euro on price convergence.

IV The Nature of the Pre-Euro Borders, 2001

A The width of the European borders

We start by estimating a simple multivariate regression of product-specific border widths on indicators of E.U. and euro membership. Our left-hand side variable is time, product, and city-pair specific, and we have more than $250,000$ observations. We therefore estimate our model with product-fixed, as well as city-fixed effects. Product-fixed effects take into account the differences in magnitude of the prices of different items. City-fixed effects are two-dimensional, meaning that we have two fixed effects per observation, corresponding to each of the two cities in the pair. The results are reported in Table 6. The first and second columns present the estimation results for the border widths in 2001 and 2002, and the third column uses the change in border width from 2001 to 2002 as endogenous variable.

[Insert Table 6]

Controlling for geographical distance, border widths are positive for countries in the European Union which are not euro members. For these countries, price discrepancy is 24.4 kilometers ($= 12.76 + 8.64$) in 2001, and 12.82 kilometers in 2002 (the intercept in the regression is not significant). In contrast, in euro countries border widths are negative. In Euroland , border width is -25.71 kilometers ($= 12.76 - 38.47$) in 2001, and -31.81 in 2002. In 2001, Price divergence is also positive between cities in Euroland those

outside the euro , but in the E.U. (e.g. Copenhagen and Paris). Between 2001 and 2002 there is a significant reduction of borders for all countries, and especially between euro , and E.U., non-euro countries, where border width reduces 10 kilometers (significant at the one percent level) between 2001 and 2002. Additionally price convergence after the introduction of the euro is stronger outside the area than inside.

Taking Table 6's results together, the euro's product market integration effects seem to be weak. The table presents evidence of strong international product market integration in Europe but also indicates that euro cities had achieved a high degree of international price homogeneity *before* 2002. Further, the results suggest that, upon the introduction of the single currency, prices in euro cities converged between themselves by about the same amount as for those not joining. The cities experiencing highest convergence with the euro region are those in the E.U. but who kept their own currency. In the following section we address some other potentially important factors influencing price convergence in Europe.

B Results by Product Categories

Table 7 summarizes the cross-sectional and difference regressions obtained by splitting the sample in nine product categories. The Table illustrates how the main general principles introduced in Table 6 are general across product classes, leading to negative border widths in Euroland .

[Insert Table 7]

Perishable and non-perishable food prices are less integrated between European Union, non-euro cities (positive coefficients of 75 and 9 respectively[9], both significant at the one percent level) compared to cities in the Eurozone (coefficients of $+1$ and -35 respectively, both significant at the one percent level). Price convergence is also stronger within the euro area for clothing, alcohol, and recreation. Personal care, house supplies and car prices diverge more in the euro area in 2001, and tobacco prices have converged significantly in the European Union.

The cross-sectional regression of alcohol prices shows that disparities are smallest for euro cities between themselves. The E.U., non-euro cities have somewhat different alcohol prices. Taxation is the main component of European alcohol prices and the results are likely to reflect the historical fiscal independence in Denmark, the UK and Sweden, combined with a continuous taxation convergence process between euro, non-euro countries and those joining the E.U. in 2006.

Overall, the product category regressions reinforce the view of European markets being integrated before the introduction of the euro. Moreover, we find that pre-euro markets are more integrated amongst

[9] For each variable, we report here the sum of the intercept and the corresponding coefficient.

themselves than with those of the countries which did not join the single currency. This evidence might be suggestive of a certain price anticipation previous to the economic integration which occurred upon the euro introduction. For example, economic policy and taxation had become integrated in the euro area before 2001, but the non-euro cities remained to some extent outside of the economic convergence process. As a result, there was less scope for further integration in the euro zone upon the changeover.

C What factors determine the width of the borders?

E.U. and euro membership are not the only determinants of price borders. Consumer prices are affected by taxes, in particular in items like cars and tobacco. The size of a population and its citizens purchasing power, i.e. GDP per capita, affects demand and hence prices. Price arbitrage is intuitively easier when two countries have a common border, and also when consumers in both sides speak the same language. We use this variables together to disentangle some of the determinants of the European borders' widths.

We measure [10] differences in taxation with the absolute value of 2001 VAT difference between the two cities, and historical inflation as the absolute value of the difference in city price indices (average) between 1996 and 2001 (1996 = 100). Additionally, we use city- and country-specific GDP per capita, and population size, as control variables. We compute the absolute value of the difference in GDP per capita between two cities, and divide it by the GDP per capita of the poorest one in the pair. We compute a similar indicator for population size. Further, we construct a dummy with value equals to one when the two countries have a common physical border. We compute the absolute value of the difference in country sizes in square kilometers, since we hypothesize that arbitrage will be more likely among countries of similar sizes. We standardize country size by the size of the smallest country in the pair. Finally, we control for the distance between cities as a primer determinant of the border width.

Once we have studied the variables that intuitively determine cross-sectional price divergences, we consider other institutional and cultural characteristics. Specifically we test for the effect of a common language and the legal origin as social differences. In a later part of the paper, we construct more sophisticated measures of cultural heterogeneity, and test their effect of border widths.

In this section, we proceed sequentially, first discussing product-specific factors and then moving on to city-, country-, currency- and cultural issues which could potentially influence the degree to product market integration in Europe. We round up the section with a short general discussion.

[10] See Appendix Table III for a definition of the variables in our study.

C.1 City Characteristics

Table 8 summarizes the influence of city characteristics on cross-sectional price disparities in 2001. The city variables considered are a language dummy (taking the value of 1 if the same language is spoken in the two cities and zero otherwise), plus wealth, population and inflation differences (absolute values of GDP / capita, total city population and inflation in the 1996-2001 period). We include results both with and without interaction terms between the covariates and the regional types, which are also used as control variables. The first column reports regression coefficients without interaction terms and columns II-V provide several interaction term combinations.

Cities sharing the same language have less price disparities than those with different languages. In model (I), the common-language dummy has an insignificant negative coefficient. However, when interacted with E.U. and euro membership dummies (model II), we find differences across countries. Common language has a negative effect on disparities for E.U. countries (-17.2 kilometers, significant at the one percent level), and especially in euro countries ($-17.2-1.9=-19.1$ kilometers, significant at the 10 percent level). The effect of language is also very strong between E.U., non-euro and euro countries (-19.4 kilometers).

In general, the difference in GDP/capita leads to more different prices (positive and significant coefficient). A one-standard deviation increase in GDP per capita difference (=182 percent) between two countries in the euro area results in a border which is 3.6 kilometers wider. However, it leads to a border which is 13.83 kilometers wider for two countries in the E.U., but outside the euro. For non-E.U. countries, the combined coefficient represents an economic effect of 5.3 kilometers (significant at the one percent level).

Differences in population lead to more price convergence in E.U., non-euro cities, and to price divergence in euro cities, as well as in cities outside the European Union. All these coefficients are significant at the one percent level. Intuitively, larger cities should have higher prices due to higher costs for inputs such as real estate and staff, as well as more potential demand. Also, capitals tend to be more expensive (see Table 18 below) and also more populated.

[Insert Table 8]

We find that historical inflation has a significantly positive effect on price convergence (model I)—when historical inflation differentials widen, price convergence is stronger. However, this result disguises a different pattern across countries. For cities in Euroland , a one-standard deviation increase in inflation difference (= 17 percent per year) results in borders which are 197 kilometers wider. On the contrary,

the same increase in inflation difference results in an increase of the border of 547 kilometers for E.U. countries outside the euro. Such positive non-euro E.U. coefficient indicates that some cities in the group (Copenhagen, London, Manchester and Stockholm) have increased prices above the rest, and the main culprit would seem to be the large prices increases in London.

Overall, the regressions on city characteristics provide a consistent picture. While cities sharing the same language show more similar prices, those with more different populations and average wealth tend to have more different prices. Historical inflation tends to equalize prices, cheaper cities have higher inflation than more expensive ones. The exception to that is the E.U., non-euro region, possibly due to price increases in London which, being already one of the most expensive in the World, has separated from the others.

Finally note that, after controlling for city characteristics, there is a very strong effect of euro membership on price convergence. Overall, 2001 euro borders are about 40 kilometers narrower than elsewhere. This is a strong indication of the economic impact of the Maastricht Treaty on price harmonization in Euroland . This is particularly interesting given Table 8: the 2001 price borders between E.U. members that stayed outside the euro had become significantly wider (about 8 kilometers on average), while borders between countries outside the E.U. had converged (average coefficient of about -4 kilometers).

C.2 Country Characteristics

Tables 9 summarize the regressions for country characteristics. The first column in Table 9 provides the coefficients of a model without interaction terms. Although the intercepts are large enough so that price differences are generally significant, some of the country characteristics have different effect on cities depending on their E.U. and euro membership.

[Insert Table 9]

We first control for the legal origin of the two countries in each pair. We argue that a similar origin reduces uncertainties and facilitates economic exchange, as it reflects institutional affinity between two countries. However we estimate a positive coefficient in model (I), significant at the 10 percent level. When we interact the legal origin dummy in model (II), we find that the positive coefficient is driven by price differences between Sweden and Denmark, both E.U., non-euro countries. For euro countries the combined effect of legal origin is not significantly different from zero ($+15.69 - 15.00$, p-value of the sum is 0.992), and the coefficient is negative for countries outside the E.U. (most of them share a socialist legal

origin, with the exception of Iceland, Switzerland and Norway). The strongest effect of legal origin on convergence is for pairs of E.U., non-euro, and euro cities (London and Dublin, or Stockholm and Helsinki, for instance) with a combined coefficient of about -23 kilometers (significant at the one percent level).

We also analyze the effect of country size differences. In the extreme, if the country is very large, consumers will not need, or will not find it convenient, to travel to another country to arbitrage price differences away. On the contrary, in very small countries (e.g. Switzerland) it is customary to go shopping to neighboring countries (e.g. France) when it is cheaper there. We find in fact that the first effect dominates, as the coefficient of the difference in country size is positive and significant (at the one percent level). In the interactions, we do not find any strong significant difference across countries.

VAT differences are associated with lower cross-sectional disparities in the euro and non-E.U. groups. Especially strong is the effect of VAT differences on price convergence between euro cities and E.U., non-euro cities.

We finally consider the effect of a common border. A common border facilitates price arbitrage, and we find a negative and significant coefficient equivalent to 6.6 kilometers. This effect is particularly strong in E.U., non-euro cities (i.e. Stockholm and Copenhagen). In euro cities, a common border results a 3.8 kilometers narrower price border.

C.3 Low- vs. High-Price Items

Dziuda and Mastrobuoni (2006) show that citizens of Euroland have miss-perceived the inflationary effect of the euro by comparing actual and perceived inflation. They find that, while in euro countries perceived inflation is higher than actual inflation, in E.U., non-euro countries the relationship is the opposite. They argue that is due to people's inability to deal with changeover rates, which results in retailers charging higher prices for smaller, low-priced, frequently purchased, items, relative to larger, high-priced, seldom purchased, items. Dziuda and Mastrobuoni (2006) study inflation rates but not price convergence, so we can complement their results by analyzing price convergence in Europe depending on the magnitude of price levels.

[Insert Table 10]

In Table 10, we report cross-sectional regressions of price borders on city- and country-specific controls, classified by three product price categories: prices below €10; between €10 and €100;and above €100.[11]

[11] This classification is arbitrary, so as to have a meaningful number of items in each category. Most of the items in the dataset correspond to "low-price" items (i.e., below €10)

In the first three columns we present results without E.U. and euro membership dummies. Language reduces disparities for prices above 100 euros (coeff. −2.365, significant at the 10 percent level), but the opposite effect for low-price items (coeff. 0.738, insignificant). Interestingly, we find that a common border reduces the disparities more clearly for lower-price items (coeff. −6.48,significant at the one percent level) than for high-price items (coeff. −3.25, significant at the one percent level). Country size and legal origin have the expected signs, but only for low-price items. Finally inflation rates in the period 1996-2001 result in less disparities for high-priced items (coeff. −1.0, significant at the one percent level), and in more disparities for low-priced items (coeff. 0.48,significant at the one percent level).

In the last three columns we report results by euro membership. When the two cities are in Euroland , 2001 prices are relatively more similar for low-priced items (coeff. −37.7, significant at the one percent level). Prices of low-priced items in euro cities (e.g. toothpaste) tend to be more similar with those of cities outside the euro (coeff. −6.36), and the E.U. (coeff. −12.89). Conversely, prices of high-priced items in euro cities (e.g. cars) are significantly more different from those in non-euro cities (coeff. 11.76), and from non-E.U. cities (coeff. 13.61). These four coefficients are significant at the five percent level, or better.

C.4 The Effect of Cultural Affinity

We have so far identified economic and geopolitical factors that determine price differences between European cities. Still, having controlled for those variables, there are severe price differences that remain unexplained. Therefore an remaining open question concerns the elements conforming a barriers to trade in a continent which is perfectly integrated geographically and economically, with countries that sometimes share cultural features like language and legal origin.

In this section we analyze the effect of cultural affinity variables in the propensity of people to arbitrage away price differences between countries. Guiso et al. (2007) [GSZ] have shown that the relative trust that European citizens have for each other determines the bilateral trade, investment, and financial flows between countries. They also show that the trust level is determined by history, but also by common language and religion.

We use the adjusted trust index[12] from GSZ and modify it in the following way. Because our endogenous variable is the price difference between city pairs, and because the trust variable is unidirectional,[13] we use a symmetric matrix computed as the average for each pair of countries in the GSZ dataset.[14]

[12] We have also replicated our regressions using the unadjusted trust index from Table 2.A in GSZ, without any qualitative change in our results.

[13] That is, how much the Italians trust the Dutch is not the same as how much the Dutch trust the Italians.

[14] The weakness of this approach is that the bidirectional trust between two countries can become meaningless if the two

In addition, we create another variable with data on Cultural Openness from the IMD World Competitiveness report. The Cultural Openness index ranges from 0 to 10 and measures whether the national culture is open to foreign ideas, based on a survey conducted among business managers across the world.[15] For each pair of cities, we then assign to the pair the minimum of the two indices in 2001 as a measure of the bilateral cultural openness of the two countries. Finally, we control for trade flows between two countries measured as the sum of imports and exports (in euro billion) between the countries in 2001.

Table 11 introduces the regressions for the influence of these social and cultural factors on the border width. The proxies for cultural affinity are reciprocal trust, cultural openness, bilateral trade, and we also estimate coefficients for dummies which indicate whether the two cities share language, legal origin and whether their countries have a common border. The regressions control for city features and country size.

Our results can be summarized as follows:

1. Once we control for cultural affinity variables, the coefficient of the euro-membership dummy turns positive. This result is in contrast with model (I) in Tables 8 and 9, where the euro-dummy coefficient is significantly negative. Conversely, the coefficient of the E.U.-membership dummy turns negative and significant, while it is significantly positive in Tables 8 and 9. The intuition of this result is that price divergences do not seem to depend on euro membership but on cultural affinity. Euro members are in general quite similar and this tends to equalize their prices.

2. Price disparities are positively related to bilateral trust. A one-standard deviation increase in bilateral trust between two countries (standard deviation=0.17) reduces the border width by 85 meters for the overall sample. Within the European Union, a one-standard deviation increase in bilateral trust led in 2001 to a border width reduction of 1.4 kilometers. However, for members of Euroland the effect is negligible. And the effect of trust for non-E.U. countries is the opposite: a one-standard deviation increase in trust, increases the border width by one kilometer.[16] Results are qualitatively similar in model (III).

3. The effect of price differences on bilateral trade is consistently negative . A one-standard deviation increase in bilateral trade (standard deviation=€29.6 billion) reduces price differences by 2.4

original indices are very different: the Greeks trust the French considerably (an unadjusted index of 26), but the French do not trust the Greeks at all (an unadjusted index of 9).

[15] These surveys are sent to senior business leaders who represent a cross-section of the business community in each country. The data are converted from a 1 - 6 scale (from which the survey respondents choose the most appropriate answer) to a 0 - 10 scale.

[16] All these results are significantly different from zero at the one percent level.

kilometers (significant at the one percent level) from model (I). By areas, the effect is very strong in Euroland (a reduction of 175 kilometers, statistically significant), the E.U., non-euro area (−130 kilometers, statistically significant), but it is insignificant for countries outside the European Union. Results are qualitatively similar in model (IV).

4. Price differences are smaller in more culturally open city pairs. A one-standard deviation increase in the cultural openness index (standard deviation= 0.39) reduces price differences 16 kilometers in the euro area. However, the effect is stronger for E.U., non-euro countries (5 kilometers reduction), and for non-E.U. countries (3.24 kilometers reduction). All results are statistically significant at the standard levels. The findings are qualitatively similar in model (V).

5. Controlling for cultural affinity, 2001 prices differences in were smaller when: (1) The two cities do not speak the same language; (2) The two countries have the same legal origin; (3) The two countries have a common border; (4) The more similar the two cities are in terms of GDP per capita and the more different they are in terms of population. These results are all statistically significant.

[Insert Table 11]

To summarize—variables that measure cultural affinity between two countries explain price differences in 2001, and this result is weaker when both cities are in the euro. In the next section, we take the 2001 results as given and analyze the effect of the introduction of the common currency in 2002 on price differences.

V The change in the borders' widths, 2001-2002

Brussels and Paris are 261 kilometers apart. The same language is spoken in both cities (French), and their countries share legal origin, monetary policy, and a long common border. In January 2002, consumers could also use the same currency in the two cities. Moreover, the Schengen agreement allowed any customer to travel between both cities without any custom clearance and police control. Therefore, a customer from Paris could drive his car to Brussels in a little more than two hours and spend around €35 in the journey (back and forth)[17] to buy a two-piece business suit for €570. The same item would have cost €880 in

[17] The petrol price in Paris was €1.1 in 2002, and we assume that a mid-size car, driving at an average speed of 120 kms per hour would consume about 6 liters of petrol per 100 kms. We exclude tolls from this calculation.

Paris. That is, a Parisian was paying €290 euros (or one third of its full price) for the convenience of buying the suit at home, rather than in the much cheaper Brussels.

If the convenience of using the same currency was priced by consumers, then we should observe that the price difference of a business suit between Brussels and Paris had become lower in 2002 than in 2001. Yet, the price difference grew from €130 to €290 (Paris more expensive) [18] in 2002. Thus the price divergence for this particular item has more than doubled upon the introduction of the common currency.

The objective of this section is to analyze the determinants of price convergence/divergence upon the introduction of the euro . We use our control sample of non-euro and non-E.U. countries to isolate the effect of the common currency. The endogenous variable in this section is the change in border width from 2001 and 2002. We take a conservative approach by focusing on the one-year change in prices around the introduction of the euro as prices in a longer period would be subject to fluctuations induced by factors different from the common currency.

Table 6 above shows that between 2001 and 2002, European borders reduced significantly, but also that the reduction was smallest for Euroland . It is a first indication that the euro has not worked as a device for price convergence. In what follows we provide more detailed evidence.

Table 12 shows the results of cross-sectional regressions of the change in border 2001/2002, by product category. Prices of food perishables and house supplies are more similar across countries in 2002 for the entire sample (negative intercepts of -23.2 and -25.4 kilometers respectively, both significant at the one percent level). Alcohol prices diverge more though (intercept 17.3 kilometers). E.U. membership has significant effect on convergence for food perishables $(-)$, clothing $(-)$, alcohol $(+)$, house supplies $(-)$, and cars $(+)$. However, the effect of the euro is not significant. Outside the E.U., price convergence with the euro area increased in alcohol, but decreased in food perishables, cars, and tobacco products.

[Insert Table 12]

A The Effect of City and Country Characteristics

In Table 13, we find that the introduction of the euro results in Euroland borders which are about 10 kilometers wider, in contrast to other E.U. countries, where borders have increased by about 4 kilometers on average, after controlling for city characteristics.

We find a positive effect of common language on convergence (the coefficient of the common language dummy is -2.9 kilometers in model II, significant at the one percent level). However the language effect

[18] The price of a two-piece business suit in a mid-priced store was €564.14 in Brussels, and €694 in Paris, in 2001.

is lower for euro countries (-1.0 kilometers only, significant at the one percent level). Other city characteristics display the expected effect: larger differences in GDP per capita translate into more different prices (coeff. 0.388 in model I, and 0.878 in model III, both significant). Such effect is stronger in the E.U. area (combined effect of $0.878 - 4.666$ kilometers in model III, significant at the five-percent level), and insignificant in the euro area (combined effect of $0.878 - 4.666 + 4.552$), possibly because the convergence process had resulted in small differences in GDP per capita.

[Insert Table 13]

In the euro area, differences in population have resulted in more price convergence, and differences in 1996-2001 inflation have resulted in less convergence (see models IV and V). This result is opposite to those in Table 8, suggesting that the euro offset part of the convergence effects of the Maastricht Treaty.

Table 14 reports the effect of country characteristics—differences in VAT and country size, common border and legal origin. The effect of VAT differences on convergence in the euro area is insignificant (combined effect $1.092 - 0.900$ kilometers). The common border dummy displays a negative and significant coefficient (coeff. -4.292), and this effect is stronger for euro countries (combined effect of $-4.3 - 4.5$ kilometers). This is natural as borders have become irrelevant for the purpose of trading goods and services once legacy currencies have disappeared. Country size is positively related to border width increases, and even more so within the euro area.

[Insert Table 14]

Overall, the euro dummy remains positive and significant. In terms of economic significance, borders have enlarged by about 6 kilometers on average after controlling for macro variables. This is again evidence of a price separation effect occurring at the time of the introduction of the single currency.

B Effects of the euro on Low- and High-priced Items

In Section IV.C.3 we show that by 2001, prices had converged relatively more in Euroland for low-priced items (below €100). In contrast, prices of high-priced items in euro cities were significantly different from prices in E.U., non-euro cities and in non-E.U. cities. In this section we analyze the incremental effect induced by the introduction of the common currency.

Table 15 shows that in 2002, there has been convergence in the prices of high-priced items (above €100) in all countries in Europe: the intercept in the third column implies that in economic terms, borders have

reduced by 192.5 kilometers for those items. In the sixth column of the Table we find that such effect is especially large in the European Union in general, and less so in the euro area and outside the E.U..

[Insert Table 15]

Focusing on the euro countries, price divergence for low-priced items has significantly increased in 2002 (coeff. 7.2 kilometers, significant at the one percent level). This is in contrast with the result for high-priced items, whose prices have converged by 193.6 kilometers ($= -205.9 + 12.2$). Therefore we find results consistent with Dziuda and Mastrobuoni (2006): for the items in our dataset, the average inflation in 2002 has been negative in the euro area (see Table 2), despite consumers' perception that the euro has lead to significant price increases. Our findings suggest that this is due to the pricing of low-priced items: these have become truly more expensive (Dziuda and Mastrobuoni (2006), with an increasing price divergence across countries.

With respect to the control variables, common language and border do not have a significant effect on convergence. Further, wealth differences tend to reduce disparities in expensive items but not cheap ones, suggesting a product segmentation in terms of basic and luxury goods. Finally, common legal systems lead to less disparities for low-priced items, and country size has a positive effect on convergence, which is larger for high-priced items. As expected, differences in VAT lead to price differences across all regions and price categories.

C Cultural Affinity and the effect of the euro on Price Convergence

In Table 16 we control for the three indices of cultural affinity described in Section IV.C.4. We report multiple regression results in model (I), as well as interactions among variables in models (II)-(V).

Controlling for cultural variables, the euro dummy displays a negative coefficient. The combined effect between E.U. dummy and euro dummy implies a price divergence effect of the introduction of the euro (combined effect is $126.8 - 24.2$, significantly different from zero at the one percent level in model I). Similarly, the E.U. dummy shows a positive and significant coefficient. The trust index is not significant in model (I), and bilateral trade and cultural openness display negative coefficients (-0.043 and -8.809 respectively, significant at the one percent level).

The join effect of trust and euro membership is noteworthy. A one-standard deviation increase in the trust index (standard deviation=0.17) reduces border width between euro countries 250 meters in model II and 155 meters in model III. After controlling for trust in model III, the effect of the euro dummy is positive in model III (combined effect $26.1 - 16.1$, significantly different from zero).

We find similar results for the cultural openness index. A one-standard deviation increase in cultural openness (standard deviation= 0.39) reduces border width between euro countries 11.5 kilometers. The effect on E.U. countries is the opposite. After controlling for cultural affinity, the effect of the euro dummy is insignificant (combined effect $-132.2 + 140.9$, p-value of the difference 0.1411).

[Insert Table 16]

Bilateral trade has a significant effect on the change in border width in 2002. A one-standard deviation increase in bilateral trade (standard deviation=€29.6 billion), increases the border width in Euroland 5.7 kilometers. This result is significant only at the 10 percent level. After controlling for bilateral trade, the euro dummy is insignificant. We argue that bilateral trade displays some kind of endogeneity, as price differences themselves have induced bilateral trade between countries, especially after January-2002.

Therefore cultural affinity appears to be a pre-condition for the euro to induce price convergence. Variables that intuitively should have an effect on price arbitrage—distance, common border and language, macroeconomic conditions and regulations—enter into our regressions with the expected signs, yet the effect of the euro is either insignificant or the opposite to what it was intended. However, conditional on cultural affinity, the introduction of the euro induces price convergence.

These results shed considerable light on the effectiveness of macroeconomic policies inside the European Union. Cultural factors (or biases in the Guiso et al., 2007 terminology) are important determinants of economic outcomes, and our paper presents a good example. The European Union, and in particular the euro area, is a region with significant cultural differences. The table below shows for instance the adjusted trust index, for a few countries.

		Trust Index
Finland	Portugal	-0.360
Netherlands	Greece	-0.180
Italy	Belgium	-0.120
Ireland	Italy	-0.065
Portugal	Spain	0.045
France	Belgium	0.165
Spain	Italy	0.165
Austria	Germany	0.240

Source: Guiso et al. (2007)

Our study predicts that the euro has led to less price convergence between Paris and Brussels (which share language, border, and are 261 kilometers apart), than between Vienna and Berlin (which share language, border, and are 519 kilometers apart). Similarly, we predict that, because culturally, Germany and Austria are more open than France and Belgium (see below), price convergence between Berlin and Vienna should also be stronger.

		Cultural Openness Index
France	Belgium	5.74
Germany	Austria	6.62
Spain	Greece	6.96
Italy	Netherlands	6.98
Source: IMD World Competitiveness Report		

Cultural affinity thus partially explains the striking example at the beginning of this section.

D Currency Characteristics

Bris et al. (2007a) find that the euro was most beneficial for those countries that had weak currencies.[19] If the legacy currency was weaker, then the exchange rate pre-euro was more volatile and inflation was probably higher. In such a case, one would expect price convergence to happen more often for country pairs with weak pre-euro currencies.[20]

[Insert Table 17]

Table 17 introduces the results separating the strong and weak pre-changeover currencies. We control for the geographical distance between cities because countries with weak currencies are also in the periphery.[21] After controlling for distance, we find that in 2001 economic borders were wider when both countries had weak currencies, although a common border has an offsetting effect (Spain and Portugal only). When one country had a weak currency, borders were also significantly wider than elsewhere.

Upon the introduction of the euro, we consistently find that the common currency benefits price convergence the most for countries that had the weakest currencies. When two countries had weak currencies,

[19] Their definition of weak vs. strong refers to the vulnerability of the currency to devaluations during the nineties, not to the weakness of the national economy.

[20] The weak-currency countries in Bris et al. (2007) are the euro countries with a history of currency crises—Finland, Italy, Ireland, Portugal and Spain.

[21] And therefore their physical distance is longer, thus resulting automatically in lower border widths

the euro has resulted in an overall price convergence of -8.9 kilometers (combined effect $4.0 + 6.3 - 19.2$). The combined effect when only one currency is weak is insignificant. Summarizing, the introduction of the euro led to convergence when both legacy currencies were weak pre-euro.

VI Discussion and Conclusions

In this paper we evaluate the E&R (1996) border effect in Europe, disentangle some of its components (including product-, city-, country-, and currency-specific elements, and cultural factors), and analyze the effect of the euro changeover in January, 2002.

Firstly, we study the width of the European borders. In our case, international price disparities are small compared to national disparities, which results in negative border widths. We are not able to reproduce a border effect like the one identified for Canada and the United States and within Europe (Engel and Rogers, 1996 and 2001), and also between the US and Japan (Parsley and Wei, 2001). Our results suggest that international consumer markets are more integrated in the E.U. than in North America and, more generally, that the border effect might not be as universal as one would have learned to expect.

The E.U. economic integration has been a long process. In particular, both political statements (e.g. Duisemberg, 2002) and academic research (e.g. Engel and Rogers, 2004) credit the Maastricht Treaty with bringing about the single E.U. market. The Treaty led to the removal of obstacles to the free movement of goods, services, people and capital between member states. It covered, among others, the elimination of custom barriers, the liberalization of capital movements, the opening of public procurement markets and the mutual recognition of professional qualifications. It also created the first vision of a common currency which would eventually lead to the creation of the euro. In view of our historical inflation trends results, it served well its purpose. We found that during the 90s, inflation was generally higher in cheaper than in expensive cities, resulting in overall convergence.

Moreover, we show that the economic influence of the E.U. has extended itself well beyond its borders. In fact, we find that the smallest price disparities occur between euro cities and those located *outside* of the E.U.. There are at least two formal ways in which the E.U. might have influenced prices in adjacent territories:

1. The terms of international agreements between the E.U. and neighboring countries extend the single market. In particular, the European Economic Area (EEA) agreement – including the E.U., Iceland, Liechtenstein and Norway – applies the exact terms of the single market to those countries, including

the implementation of E.U. directives. In practice, this means that non-E.U. EEA countries are bound by the E.U. without being able to influence them, in what the Norwegian Prime Minister Jens Stoletenberg reportedly described as "fax democracy", with Norway waiting for "its" new legislation to be faxed from Brussels (International Herald Tribune, 2005). Without those restrictions on national sovereignty, the Convention of the European Free Trade Association (EFTA) – EEA and Switzerland – also establishes free trade.

2. Between the introduction of the euro and 2007, twelve additional countries (mainly from Central and Eastern Europe) have become members of the E.U..[22] As part of the pre-requisites for admission, those countries were asked to adapt many parts of their economic system (e.g. legislation, monetary policy) and open their borders to E.U. trade. As a result, it is very likely that their consumer prices started to converge with the E.U. well before accession.

Other economic motives for the E.U. influence on the surrounding economies include the stable exchange rate between the euro and their currencies, both in the cases of new accession and EFTA members, the convergence in monetary policy and the more widespread movement of citizens across Europe.

Secondly, we study the determinants of the borders' width. The fit of the cross-sections presented in Table 6 are good ($R^2 = 0.98$) but the unexplained variance points toward the existence of other determinants of the degree of price disparities in Europe. We focus on product, city, country and currency characteristics, as well as cultural elements linking (or separating) European prices. The disaggregation by products reinforces the view of European markets being integrated before the introduction of the euro. Further, pre-euro markets are shown to be more integrated amongst themselves than with those of the countries which did not join the single currency.

City characteristics are a strong reason for prices to be different between locations. For example, we show that cities located in different countries but where the same language is spoken (e.g. French is spoken both in Brussels and Geneva) tend to have more similar prices than those where they speak different languages (e.g. Brussels and Frankfurt). Thus, language differences emerge as a barrier to international market integration in Europe.

We can think of at least two ways in which language reduces market integration. From the supply side, written instructions are an important element in the specification of many products, including their packaging, instruction brochures, etc. Items intended for markets where the same language is spoken can

[22] Cyprus, Czech Republic Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia and Slovenia entered in 2004. Bulgaria and Romania entered in 2007.

be produced together and might have more common costs. In contrast, items produced for countries with different languages might be produced separately, which would make their production costs different. From the demand side, it is easier for citizens to engage in cross-border arbitrage if they can speak the local language, and that is specially likely if it is their own. For example, many residents in Geneva cross the border to do their purchases in Lyon, but to a lesser extend in Milan, although the distance is approximately the same. Similarly, residents in Zurich often drive to Austria and Germany and not to Italy. Thus, we believe that the introduction of a common European lingua franca is likely to reduce price disparities even further in the long run. In Europe, as in the rest of the world, English is becoming the dominant language. Therefore, our research suggests that policies promoting the quality of the English spoken in Europe would also tend to integrate its markets.

Together with the languages spoken, differences in city size and wealth also contribute to separate prices across Europe. A number of factors might be contributing to this. First, the firm might incur in higher costs for several non-traded inputs, including personnel, real estate and others. Those costs are part of the final good prices, even under perfect competition. Second, it is well-known that salaries are generally higher in larger cities (e.g. Glaeser, 1998), average wealth will also be higher, and their citizens are likely to have a higher willingness to pay for the convenience of purchasing their goods in a city shop.

Another interesting insight concerns the historical inflation trends. If historical inflation differences led to more cross-sectional disparities, that would be evidence of a process of divergence across European cities. From a similar base, prices in some locations would have increased more than in others and this would have resulted in cross-sectional disparities. However, we found that inflationary trends tend to equalize prices. During the 90s, inflation was higher in the cheaper cities, resulting in convergence. The 2001 snapshot is of a strongly integrated market. The exception to that story was the E.U., non-euro region. We speculate that this result might be due to the dominant effect of the price increases in London during the late-1990s. Given that was already one of the most expensive in the World, the increases resulted in further separation from its peers in the E.U. non-euro group, Copenhagen, Manchester and Stockholm.

Thirdly we study the factors leading to market integration upon the changeover. Since in 2001 euro prices were more integrated amongst themselves. Thus, it is not surprising that price convergence within the euro zone is slower than in the reference groups. It is ironic that Denmark, Sweden and the UK converge more with the euro area upon the changeover, in spite of not adopting the currency.

Wim Duisemberg, President of the European Central Bank, anticipated that "the introduction of the euro might act as a catalyst for further European integration in other policy areas" (E.U., 2002). We show that, in 2002, legal systems do not lead to less disparities, except when they appear in conjunction with

the euro. The changeover might have a positive externality in enhancing the legal systems' integration effect. Duisemberg also suggested that

> "The introduction of the euro will probably give new impetus to the initiatives taken in the 1980s to establish a single market. This means the elimination of more obstacles to cross-border activities, and – at the same time – either harmonization or mutual recognition of standards, in order to avoid undesirable competition between regions and countries. *The well-known textbook example is undesirable tax competition, the so-called race to the bottom*" (E.U., 2002, the emphasis is ours).

Our research supports this view by showing that differences in VAT lead to price divergence across all regions and price categories. The lack of VAT harmonization is a large regulatory obstacle to the unified euro market.

The creation of the European Central Bank (ECB) should have introduced a discontinuity in monetary policy, changing expectations and, thus, the mechanics of price determination in the Eurozone (Angeloni et al., 2006). However, most integration was achieved right after the Maastricht Treaty in the early 90s, and before exchange rates were fixed in 1999 (Engel and Rogers, 2004). In our research, we study not the fixed exchange rates but the 2002 changeover and find integration for those cities using weak legacy currencies.

Economic integration also relies on a reciprocal trust effect. Our results indicate that the euro increased trust among the participating countries and this led to integration. Further, as international trust is replaced by the common currency, cultural affinities yield economic convergence. In this view, the existence of different currencies was an obstacle for cultural affinities to yield price convergence, which was removed with the changeover.

In this paper we have focused on the immediate effects arising upon the introduction of the euro, i.e. 2001-2002. Previous literature suggests that it takes about 4-5 years for prices to converge. It would therefore be useful to run a similar study in a longer time perspective, for example between the euro introduction and 2007. In addition, there are a number of factors still separating European prices. The analysis of historical inflation differences suggests the existence of three types of European cities: (a) Strong currency and expensive cities, whose prices grow continuously (e.g. London); (b) Strong currency and inexpensive cities, whose prices grow less (e.g. Lyon); and (c) Cheap cities with a weak currency, whose prices grow fast (e.g. Madrid). This categorization has brought about a common E.U. price level, with a cities deviating from the norm. The prototypical outlier is London whose prices, due to its international

standing as one of the World's capitals, might be more similar to those in New York or Tokyo than to those of Lyon or Amsterdam, regardless of physical distance or economic treaties. We leave these issues as interesting topics for further research.

The above results provide new insights on the euro changeover, which are pertinent to understand the dynamics of the European economic integration and, in general, of international single currency areas. In this context, we believe that the policy implications of our research are profound. For example, many Central and Eastern European countries are expected to join the euro in the coming years. It is not impossible that in the medium term similar situations will be found in the Americas (Mercosur,[23] the "dollar block"[24]) and Asia (Asean[25]). The euro experience would serve those countries well in the event.

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Country	City	Number of Items	Language	Currency (Pre-Euro)
Euro Countries				
Austria	Vienna	294	German	ATS
Belgium	Brussels	298	French	BEF
Finland	Helsinki	291	Finnish	FIM
France	Lyon	288	French	FF
	Paris	294	French	FF
Germany	Berlin	288	German	DM
	Düsseldorf	292	German	DM
	Frankfurt	299	German	DM
	Hamburg	297	German	DM
	Munich	286	German	DM
Greece	Athens	288	Greek	GRD
Ireland	Dublin	290	English	IEP
Italy	Milan	294	Italian	ITL
	Rome	297	Italian	ITL
Luxembourg	Luxembourg	299	French	BEF
Netherlands	Amsterdam	300	Dutch	NLG
Portugal	Lisbon	300	Portuguese	PTE
Spain	Barcelona	300	Spanish	ESP
	Madrid	300	Spanish	ESP
E.U., non-Euro Countries				
United Kingdom	London	295	English	GBP
	Manchester	284	English	GBP
Denmark	Copenhagen	296	Dannish	DKK
Sweden	Stockholm	292	Swedish	SEK
Non-E.U. Countries Western Europe				
Iceland	Reykjavik	260	Icelandic	ISK
Norway	Oslo	286	Norwegian	NOK
Switzerland	Geneva	300	French	CHF
	Zurich	300	German	CHF
Non-E.U. Countries Eastern Europe				
Czech Republic	Prague	300	Czech	CZK
Hungary	Budapest	292	Hungarian	HUF
Poland	Warsaw	299	Polish	PLN
Romania	Bucarest	266	Romanian	RON
Serbia & Montenegro	Belgrade	222	Serbo-Croatian	CSD
Ukraine	Kiev	268	Ukranian	UAH

Table 1. Countries, Cities, and Items

This Table describes the countries in our sample and the cities for which we have price data, as well as the number of price items per city. Our primary source is the "City Data" dataset released by The Economist Intelligence Unit.

City	City's (Country's) GDP per Capita 2001	Population 2001 (millions)	Price index (1996 = 100) 2001	2002	Inflation 2001-2002
AMSTERDAM	€ 38,203	0.73	157.10	149.01	-5.15%
ATHENS*	€ 20,424	0.77	167.15	159.05	-4.85%
BARCELONA	€ 18,449	1.46	157.31	149.55	-4.93%
BELGRADE		1.59	981.68	1094.27	11.47%
BERLIN	€ 23,428	3.39	147.88	137.60	-6.95%
BRUSSELS	€ 51,106	0.14	150.61	140.56	-6.67%
BUCHAREST*	€ 7,142	2.02	1599.20	1799.32	12.51%
BUDAPEST*	€ 15,298	1.83	246.89	238.98	-3.20%
COPENHAGEN	€ 50,775	0.50	154.45	145.26	-5.95%
DUBLIN	€ 36,591	0.48	161.49	155.16	-3.92%
DUSSELDORF	€ 54,053	0.57	147.88	137.60	-6.95%
FRANKFURT	€ 74,465	0.64	147.88	137.60	-6.95%
GENEVA*	€ 35,010	0.38	143.61	132.71	-7.59%
HAMBURG	€ 43,098	1.71	147.88	137.60	-6.95%
HELSINKI	€ 35,322	0.55	152.09	141.83	-6.75%
KIEV*	€ 5,011	2.59	311.76	288.38	-7.50%
LISBON*	€ 20,768	0.56	159.67	151.87	-4.88%
LONDON	€ 35,072	7.07	147.69	137.31	-7.03%
LUXEMBOURG	€ 57,400	0.32	151.27	141.77	-6.28%
LYON	€ 28,960	0.42	146.19	136.80	-6.42%
MADRID	€ 22,573	2.82	157.31	149.55	-4.93%
MANCHESTER	€ 22,099	0.43	147.69	137.31	-7.03%
MILAN	€ 32,122	1.31	154.00	144.88	-5.92%
MUNICH	€ 61,360	1.20	147.88	137.60	-6.95%
OSLO	€ 44,160	0.51	157.58	146.55	-7.00%
PARIS	€ 67,200	2.15	146.19	136.80	-6.42%
PRAGUE*	€ 18,024	1.19	184.18	172.15	-6.53%
REYKJAVIK*	€ 32,516	0.11	165.15	159.52	-3.41%
ROME	€ 24,766	2.65	154.00	144.88	-5.92%
SOFIA*	€ 7,105	1.14	2307.21	2241.52	-2.85%
STOCKHOLM	€ 35,733	0.74	143.97	135.04	-6.20%
VIENNA	€ 36,572	1.54	149.21	139.50	-6.51%
WARSAW*	€ 11,905	1.62	221.19	206.95	-6.44%
ZURICH*	€ 35,010	1.18	143.61	132.71	-7.59%

Table 2. Macro Variables

This Table report the GDP per capita, population and inflation rates for the cities in our sample. City GDP is available from XXX, except for countries with (*), for which we report country GDP from the World Bank Development Indicators. For Oslo, the GDP per capita corresponds to year 2000. Inflation rates and Population are from XXX.

Product Category	Number of Products	Example
Tradable Items	217	
…of which:		
Food, Perishables	78	Bananas (1 kg) (supermarket)
Food, Non Perishables	34	Coca-Cola (1 l) (supermarket)
Clothing	32	Child's jeans (chain store)
Alcohol	20	Beer, local brand (1 l) (supermarket)
House Supplies	18	Light bulbs (two, 60 watts) (supermarket)
Personal Care	14	Toothpaste with fluoride (120 g) (supermarket)
Cars	8	Compact car (1300-1799 cc) (low)
Recreation	8	Kodak colour film (36 exposures) (average)
Tobacco	5	Cigarettes, Marlboro (pack of 20) (mid-priced store)
Non-Tradable Items	82	Man's haircut (tips included) (average)
Total	299	

Table 3. Items and Item Categories

Classification of Tradable Items into categories, and number of products per category. Our primary source is the "City Data" dataset released by The Economist Intelligence Unit.

Panel A: All Goods

	Euro Countries		E.U. Countries		Non E.U. Countries	
	Boder Width in 2001	Change 2001-2002	Boder Width in 2001	Change 2001-2002	Boder Width in 2001	Change 2001-2002
Euro Countries	-1,110	-0.4	-990	-3.9	-1,373	-1.6
E.U. Countries			-942	0.2	-1,071	0.1
Non-E.U. Countries					-1,143	3.7

Panel B: Tradable Goods only

	Euro Countries		E.U. Countries		Non E.U. Countries	
	Boder Width in 2001	Change 2001-2002	Boder Width in 2001	Change 2001-2002	Boder Width in 2001	Change 2001-2002
Euro Countries	-1,111	0.5	-985	-3.8	-1,380	-0.7
E.U. Countries			-937	0.0	-1,080	1.8
Non-E.U. Countries					-1,158	6.3

Table 4. The Width of the Border

This table reports the width of the border between two European countries in 2001, and the change in border width from 2001 to 2002. To obtain a measure of the borders width, we first need a measurement of price disparity between any given cities i and j for item k at time t (2001 or 2002) in our dataset, as:

$$\Phi(P_{i,j}^{k,t}) = 1 + \frac{abs(p_i^{k,t} - p_j^{k,t})}{\min(p_i^{k,t}, p_j^{k,t})}.$$

where prices p_i and p_j are computed in euros. We calculate the "border width" between a country in which we have data for two cities, a_1 and a_2 and another with data about one city, b_1. We first obtain a distance-normalized measurement of price disparity for any good k=1...K between national cities:

$$\frac{\Phi(P_{a_1,a_2}^{k,t})}{D_{a_1,a_2}}$$

where $D_{a1,a2}$ is the physical distance (in kilometers) between cities a_1 and a_2. Then, we use a simple rule of three to determine a hypothetical distance $H_{a1,b1}$ between a_1 and b_1.

$$\frac{\Phi(P_{a_1,a2}^{k,t})}{D_{a_1,a_2}} = \frac{\Phi(P_{a_1,b_1}^{k,t})}{H_{a_1,b_1}^{k,t}}.$$

Which implies:

$$H_{a_1,b_1}^{k,t} = \frac{\Phi(P_{a_1,b_1}^{k,t}) \cdot D_{a_1,a_2}}{\Phi(P_{a_1,a_2}^{k,t})}$$

The table reports the estimates of H by pairs of countries classified by regional groups.

	Germany		Spain		France		Italy		Switzerland		United Kingdom	
	Border Width in 2001	Change 2001-2002	Border Width in 2001	Change 2001-2002	Border Width in 2001	Change 2001-2002	Border Width in 2001	Change 2001-2002	Border Width in 2001	Change 2001-2002	Border Width in 2001	Change 2001-2002
Euro Countries												
Austria	-399.5	-0.1	-1372.9	-3.7 ***	-845.4	1.3 ***	-520.3	5.1 ***	-622.8	2.3 ***	-1240.6	-0.1
Belgium	-277.9	-2.1 ***	-1017.0	1.2 *	-295.9	0.7	-783.0	1.2	-435.8	1.0 **	-344.5	0.0
Finland	-1184.7	0.6	-2580.5	-5.4 ***	-1858.8	-0.9	-1894.0	2.8 ***	-1802.7	1.2 ***	-1724.6	-0.4
France	-1067.9	-4.0 ***	-523.0	-4.3 ***			-433.9	6.1 ***	-216.3	-0.7	-449.6	-4.7 ***
Germany			-1067.9	-4.0 ***	-1067.9	-4.0 ***	-519.3	1.0	-281.8	-12.3 ***	-522.1	-21.1 ***
Greece	-1620.4	-4.0 ***	-1933.4	3.0 ***	-1794.6	0.6	-1075.1	1.0 *	-1567.7	2.1 ***	-2410.3	-3.7 ***
Ireland	-971.8	-1.3 **	-1270.0	1.2	-840.7	-0.5	-1484.3	1.0	-1135.8	1.3 ***	-285.2	-1.0 ***
Italy	-519.3	1.0	-703.1	5.9 ***	-433.9	6.1 ***			-208.5	6.1 ***	-1044.4	-4.5 ***
Luxembourg	-214.8	-0.5	-954.2	-1.3	-244.7	1.0 **	-604.7	5.3 ***	-263.1	3.0 ***	-515.2	-0.6
Netherlands	-254.1	-2.1 ***	-1178.1	-5.0 ***	-455.6	-4.7 ***	-900.2	-0.2	-576.4	0.4	-338.0	-4.1 ***
Portugal	-1858.4	9.4 ***	-577.5	4.1 ***	-1285.9	10.1 ***	-1615.4	13.0 ***	-1521.2	8.3 ***	-1552.0	4.9 **
Spain	-1067.9	-4.0 ***			-523.0	-4.3 ***	-703.1	5.9 ***	-639.9	-2.4 *	-1002.6	-11.1 ***
Average	**-857.9**	**-0.6**	**-1198.0**	**-0.8**	**-876.9**	**0.5**	**-957.6**	**3.9** ***	**-772.7**	**0.9**	**-952.4**	**-3.9** ***
E.U., non-Euro												
Denmark	-367.8	3.6 ***	-1713.2	3.3 ***	-1000.6	0.6	-1171.3	9.3 ***	-982.7	1.2 **	-886.5	1.4 ***
Sweden	-862.8	-1.1 **	-2243.6	-1.0	-1512.6	-3.6 ***	-1639.0	2.0 ***	-1489.0	0.5	-1334.4	-0.3
United Kingdom	-522.1	-21.1 ***	-1002.6	-11.1 ***	-449.6	-4.7 ***	-1044.4	-4.5 ***	-719.7	2.6 ***		
Average	**-584.2**	**-6.2** ***	**-1653.2**	**-2.9** ***	**-987.6**	**-2.6** ***	**-1284.9**	**2.3** ***	**-1063.8**	**1.4** ***	**-1110.5**	**0.5**
Non E.U.												
Czech Republic	-188.4	-6.5 ***	-1363.4	0.7	-703.2	-5.7 ***	-588.1	-3.1 ***	-528.7	-1.5 **	-1008.2	-9.7 ***
Hungary	-517.0	-11.2 ***	-1485.7	1.8	-961.4	-3.9 ***	-566.0	-7.8 ***	-743.5	2.1 ***	-1397.6	-10.5 ***
Iceland	-2150.2	2.8 ***	-2706.8	0.3	-2284.2	-1.0	-2867.3	7.3 ***	-1948.7	1.7 ***	-1670.5	2.8 ***
Norway	-772.2	7.4 ***	-2022.3	3.6 ***	-1335.6	2.7 ***	-1600.1	10.8 ***	-1402.3	3.3 ***	-1022.4	5.3 ***
Poland	-571.1	12.1 ***	-1871.5	12.1 ***	-1211.2	15.7 ***	-1035.2	8.2 ***	-1048.3	14.1 ***	-1396.4	6.0 ***
Romania	-1151.8	4.1 **	-1981.7	16.9 ***	-1568.2	8.2 ***	-992.1	7.7 ***	-1346.2	10.9 ***	-2047.8	-2.3 *
Serbia	-766.1	-8.0 ***	-1533.5	10.0 ***	-1123.5	-4.5 ***	-375.8	-8.2 ***	-899.6	5.1 ***	-1618.9	-12.6 ***
Switzerland	-281.8	-12.3 ***	-639.9	-2.4 *	-216.3	-0.7	-208.5	6.1 ***			-719.7	2.6 ***
Ukraine	-1216.2	10.0 ***	-2408.9	9.7 ***	-1822.1	13.6 ***	-1457.9	8.1 ***	-1634.1	16.8 ***	-2076.7	5.7 ***
Average	**-846.1**	**-0.2**	**-1779.3**	**5.9** ***	**-1247.3**	**2.7** **	**-1076.8**	**3.2** **	**-1193.9**	**6.6** ***	**-1439.8**	**-1.4** *
All	**-739.2**	**-2.7** ***	**-1607.4**	**2.3** ***	**-1164.1**	**1.7** ***	**-1118.0**	**3.9** ***	**-979.5**	**3.5** ***	**-1192.8**	**-1.8** ***

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 5. The Width of the Border

This table reports the width of the border between two European countries in 2001, and the change in border width from 2001 to 2002. To obtain a measure of the borders width, we first need a measurement of price disparity between any given cities i and j for item k at time t (2001 or 2002) in our dataset, as:

$$\Phi(P_{i,j}^{k,t}) = 1 + \frac{abs(p_i^{k,t} - p_j^{k,t})}{\min(p_i^{k,t}, p_j^{k,t})}.$$

where prices p_i and p_j are computed in euros. We calculate the "border width" between a country in which we have data for two cities, a_1 and a_2 and another with data about one city, b_1. We first obtain a distance-normalized measurement of price disparity for any good k=1...K between national cities:

$$\frac{\Phi(P_{a_1,a_2}^{k,t})}{D_{a_1,a_2}}$$

where $D_{a1,a2}$ is the physical distance (in kilometers) between cities a_1 and a_2. Then, we use a simple rule of three to determine a hypothetical distance $H_{a1,b1}$ between a_1 and b_1.

$$\frac{\Phi(P_{a_1,a2}^{k,t})}{D_{a_1,a_2}} = \frac{\Phi(P_{a_1,b_1}^{k,t})}{H_{a_1,b_1}^{k,t}}.$$

Which implies:

$$H_{a_1,b_1}^{k,t} = \frac{\Phi(P_{a_1,b_1}^{k,t}) \cdot D_{a_1,a_2}}{\Phi(P_{a_1,a_2}^{k,t})}$$

The table reports the estimates of H by pairs of countries classified by pairs of countries. Tests of significance are based on a two-tailed t-statistic.

	Border Width in 2001	Border Width in 2002	Difference in Border 2002-2001
Constant	12.755***	2.742	-10.013***
	[3.826]	[3.992]	[1.678]
Distance Between Cities	-0.994***	-0.995***	-0.001
	[0.001]	[0.001]	[0.000]
Both Countries in European Union	8.644***	12.820***	4.177***
	[1.326]	[1.422]	[0.721]
Both Countries in Euro Area	-38.466***	-31.814***	6.652***
	[3.787]	[3.983]	[1.681]
Euro Country vs EU-non Euro Country	-6.138***	-5.479***	0.659
	[1.986]	[2.100]	[0.906]
Euro Country vs non-EU	-1.515	2.445	3.961***
	[1.889]	[1.991]	[0.821]
Observations	252,537	252,537	252,537
Number of Items	217	217	217
R-squared	0.98	0.98	0.06

Robust standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 6. Regression Results

We estimate cross-sectional regressions where the endogenous variable is the width of the border between cities i and j in 2001 and 2002 (first two columns), and the change in border width from 2001 to 2002 (third column). We use product-fixed effects, city-i fixed effects, and city-j fixed effects, in all three regressions. The sample includes pairwise price differences between cities in Europe, only for the tradable items in our dataset. Distance between cities, and border width, is in kilometers. Robust standard errors are in parentheses.

Dependent Variable: Border Width in 2001

	Food Perishables	Food Non-Perishables	Clothing	Alcohol	Recreation	Personal Care	House Supplies	Cars	Tobacco
Distance Between Cities	-0.999***	-0.991***	-1.004***	-0.975***	-0.995***	-1.001***	-0.991***	-0.999***	-0.943***
	[0.001]	[0.001]	[0.001]	[0.002]	[0.002]	[0.002]	[0.002]	[0.001]	[0.006]
Both Countries in European Union	22.771***	15.951***	10.382***	10.277**	13.696**	-8.427**	-11.557***	-8.673*	-153.434***
	[1.914]	[2.628]	[2.070]	[4.699]	[5.462]	[3.695]	[3.721]	[4.705]	[20.275]
Both Countries in Euro Area	-74.265***	-43.251***	-2.437	-59.301***	-35.814***	11.511	-1.065	9.348	42.857
	[7.322]	[8.052]	[6.364]	[9.160]	[13.664]	[12.865]	[16.026]	[8.417]	[33.045]
Euro Country vs EU-non Euro Country	-36.542***	-11.357***	1.45	28.686***	-12.808*	36.058***	7.442	26.938***	91.767***
	[3.759]	[4.349]	[3.331]	[5.063]	[7.241]	[6.715]	[8.315]	[5.594]	[17.136]
Euro Country vs non-EU	-13.558***	-10.071**	18.424***	23.293***	-0.315	7.394	-0.613	3.727	-37.605**
	[3.654]	[3.950]	[3.161]	[4.561]	[6.860]	[6.256]	[7.917]	[3.613]	[17.209]
Constant	52.256***	-7.373	-22.552***	-8.707	-2	-33.312***	20.852	13.106*	1.623
	[7.430]	[8.266]	[6.386]	[8.957]	[13.286]	[12.736]	[16.146]	[7.579]	[33.439]
Observations	88,466	39,426	37,720	23,850	9,650	16,695	21,527	9,158	6,045
Number of Items	78	34	32	20	8	14	18	8	5
R-squared	0.99	0.99	0.99	0.98	0.99	0.99	0.99	0.98	0.96

Robust standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 7. Product Categories and Borders in 2001

We estimate cross-sectional regressions where the endogenous variable is the width of the border between cities i and j in 2001. We use product-fixed effects in all three regressions. Distance between cities, and border width, is in kilometers. We use product-fixed effects, city-i fixed effects, and city-j fixed effects, in all the regressions. The sample includes pairwise price differences between cities in Europe, only for the tradable items in our dataset. Robust standard errors are in parentheses. The classification into product categories follows Engel and Rogers (2004), EIU, and our own classification.

Dependent Variable: Border Width in 2001

	(I)	(II)	(III)	(IV)	(V)
Constant	382.224**	75.564***	3.75	56.611***	-1,099.148***
	[152.191]	[2.753]	[2.717]	[2.985]	[180.581]
Distance Between Cities	-0.996***	-0.995***	-0.996***	-0.995***	-0.994***
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Both Countries in European Union	8.117***	8.702***	5.161***	10.427***	0.804
	[1.214]	[1.329]	[1.483]	[1.552]	[2.754]
Both Countries in Euro Area	-36.521***	-42.470***	-32.444***	-41.959***	-28.197***
	[3.758]	[3.834]	[3.826]	[3.894]	[4.545]
Euro Country vs EU-non Euro Country	-4.771**	-7.006***	-3.836*	-8.357***	10.098***
	[1.971]	[2.005]	[2.184]	[2.112]	[3.202]
Euro Country vs non-EU	-1.038	-3.311*	-0.219	-3.741*	1.167
	[1.871]	[1.910]	[1.888]	[1.912]	[1.897]
Cities Speak Same Language (Y/N)	-0.548	-3.076			
	[0.610]	[2.169]			
Difference in City GDP per capita (Abs. Value)	2.747***		2.934***		
	[0.237]		[0.430]		
Difference in City Population (Abs. Value)	-0.042			-0.096***	
	[0.030]			[0.031]	
Difference in City Inflation 1996-2001 (Abs. Value)	-0.103*				0.413***
	[0.053]				[0.062]
Both Countries in European Union x Cities Speak Same Language (Y/N)		-17.23***			
		[1.442]			
Both Countries in Euro Area x Cities Speak Same Language (Y/N)		-1.932*			
		[1.155]			
Euro Country vs EU-non Euro Country x Cities Speak Same Language (Y/N)		-19.438***			
		[2.426]			
Euro Country vs non-EU x Cities Speak Same Language (Y/N)		3.387			
		[2.273]			
Both Countries in European Union x Difference in City GDP per capita (Abs. Value)			4.669***		
			[1.550]		
Both Countries in Euro Area x Difference in City GDP per capita (Abs. Value)			-5.614***		
			[1.555]		
Euro Country vs EU-non Euro Country x Difference in City GDP per capita (Abs. Value)			-1.497		
			[1.584]		
Euro Country vs non-EU x Difference in City GDP per capita (Abs. Value)			-0.334		
			[0.347]		
Both Countries in European Union x Difference in City Population (Abs. Value)				-0.402***	
				[0.132]	
Both Countries in Euro Area x Difference in City Population (Abs. Value)				0.602***	
				[0.151]	
Euro Country vs EU-non Euro Country x Difference in City Population (Abs. Value)				0.335***	
				[0.127]	
Euro Country vs non-EU x Difference in City Population (Abs. Value)				0.716***	
				[0.077]	
Both Countries in European Union x Difference in City Inflation 1996-2001 (Abs. Value)					1.298***
					[0.468]
Both Countries in Euro Area x Difference in City Inflation 1996-2001 (Abs. Value)					-1.095**
					[0.474]
Euro Country vs EU-non Euro Country x Difference in City Inflation 1996-2001 (Abs. Value)					-2.437***
					[0.475]
Euro Country vs non-EU x Difference in City Inflation 1996-2001 (Abs. Value)					0.002
					[0.001]
Observations	244,392	252,537	244,392	252,537	252,537
Number of Items	217	217	217	217	217
R-squared	0.99	0.98	0.99	0.98	0.98

Robust standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 8. The Effect of City Characteristics on the 2001 Borders

We estimate cross-sectional regressions where the endogenous variable is the width of the border between cities i and j in 2001. We use product-fixed effects, city-i fixed effects, and city-j fixed effects, in all the regressions. The sample includes pairwise price differences between cities in Europe, only for the tradable items in our dataset. Distance between cities, and border width, is in kilometers. Robust standard errors are in parentheses.

Dependent Variable: Border Width in 2001					
	(I)	(II)	(III)	(IV)	(V)
Constant	62.733***	75.532***	47.772***	44.537***	78.478***
	[2.656]	[2.742]	[3.149]	[2.798]	[2.780]
Distance Between Cities	-1.000***	-0.995***	-0.994***	-0.997***	-0.996***
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Both Countries in European Union	9.078***	7.286***	7.465***	0.689	6.961***
	[1.354]	[1.340]	[1.667]	[2.568]	[1.321]
Both Countries in Euro Area	-35.135***	-36.108***	-38.148***	-39.192***	-34.400***
	[3.780]	[3.836]	[3.911]	[2.310]	[3.819]
Euro Country vs EU-non Euro Country	-4.176**	-3.777*	-3.807*	0	-2.582
	[1.972]	[1.999]	[2.205]	[0.000]	[2.004]
Euro Country vs non-EU	-3.353*	-0.394	-0.323	-1.052	-0.563
	[1.889]	[1.892]	[1.976]	[2.434]	[1.907]
Countries Share Legal Origin (Y/N)	0.925*	15.696***			
	[0.492]	[1.889]			
Difference in Country Size (Sq. Kms., Abs. Value)	0.102***		0.244**		
	[0.006]		[0.123]		
Difference in VAT (Absolute Value)	-1.122***			-0.961***	
	[0.112]			[0.154]	
Common Border (Y/N)	-6.646***				-0.104
	[0.597]				[1.797]
Both Countries in European Union x Countries Share Legal Origin (Y/N)		-7.324			
		[6.422]			
Both Countries in Euro Area x Countries Share Legal Origin (Y/N)		-15.000***			
		[2.019]			
Euro Country vs EU-non Euro Country x Countries Share Legal Origin (Y/N)		-38.385***			
		[2.197]			
Euro Country vs non-EU x Countries Share Legal Origin (Y/N)		-12.470***			
		[2.044]			
Both Countries in European Union x Difference in Country Size (Sq. Kms., Abs. Value)			0.337		
			[0.412]		
Both Countries in Euro Area x Difference in Country Size (Sq. Kms., Abs. Value)			-0.508		
			[0.366]		
Euro Country vs EU-non Euro Country x Difference in Country Size (Sq. Kms., Abs. Value)			-0.616*		
			[0.365]		
Euro Country vs non-EU x Difference in Country Size (Sq. Kms., Abs. Value)			-0.258		
			[0.164]		
Both Countries in European Union x Difference in VAT (Absolute Value)				0.935***	
				[0.327]	
Both Countries in Euro Area x Difference in VAT (Absolute Value)				-0.447	
				[0.299]	
Euro Country vs EU-non Euro Country x Difference in VAT (Absolute Value)				-1.566***	
				[0.286]	
Euro Country vs non-EU x Difference in VAT (Absolute Value)				-1.265***	
				[0.145]	
Both Countries in European Union x Common Border (Y/N)					-16.156***
					[2.041]
Both Countries in Euro Area x Common Border (Y/N)					12.370***
					[1.195]
Euro Country vs EU-non Euro Country x Common Border (Y/N)					0
					[0.000]
Euro Country vs non-EU x Common Border (Y/N)					-1.21
					[1.815]
Observations	210,887	252,537	252,537	210,887	252,537
Number of Items	217	217	217	217	217
R-squared	0.98	0.98	0.98	0.98	0.98

Robust standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 9. The Effect of Country Characteristics on the 2001 Borders

We estimate cross-sectional regressions where the endogenous variable is the width of the border between cities i and j in 2001. We use product-fixed effects, city-i fixed effects, and city-j fixed effects, in all the regressions. The sample includes pairwise price differences between cities in Europe, only for the tradable items in our dataset. Distance between cities, and border width, is in kilometers. Robust standard errors are in parentheses.

	Dependent Variable: Border Width in 2001					
	Item is less than 10 euros	Item is less than 100 euros	Item is more than 100 euros	Item is less than 10 euros	Item is less than 100 euros	Item is more than 100 euros
Constant	-654.065***	-26.072***	1,629.157***	7.424**	1,603.247***	1,384.229***
	[98.456]	[2.775]	[153.689]	[3.730]	[309.800]	[154.177]
Both Countries in European Union				-3.056*	20.471***	-2.528
				[1.723]	[2.852]	[2.861]
Both Countries in Euro Area				-37.571***	-24.692***	6.893
				[5.230]	[6.167]	[6.561]
Euro Country vs EU-non Euro Country				-6.361**	5.325	11.759***
				[2.695]	[3.323]	[3.577]
Euro Country vs non-EU				-12.888***	15.548***	13.616***
				[2.600]	[3.065]	[3.264]
Cities Speak Same Language (Y/N)	0.738	8.348***	-2.365*	-1.765**	2.032	-5.515***
	[0.806]	[1.222]	[1.227]	[0.831]	[1.247]	[1.258]
Difference in City GDP per capita (Abs. Value)	3.172***	6.761***	1.584*	2.680***	5.237***	0.986
	[0.344]	[0.616]	[0.821]	[0.346]	[0.620]	[0.827]
Difference in City Population (Abs. Value)	-0.278***	0.166**	-0.092	-0.326***	0.053	-0.1
	[0.054]	[0.082]	[0.085]	[0.055]	[0.082]	[0.085]
Difference in City Inflation 1996-2001 (Abs. Value)	0.480***	-0.598***	-1.001***	0.531***	-0.503***	-0.887***
	[0.068]	[0.109]	[0.106]	[0.069]	[0.107]	[0.107]
Countries Share Legal Origin (Y/N)	-2.415***	-7.761***	1.145	-0.051	-1.971*	3.742***
	[0.610]	[1.013]	[0.902]	[0.634]	[1.049]	[0.950]
Difference in Country Size (Sq. Kms., Abs. Value)	0.040***	0.075***	0.011	0.079***	0.163***	0.056***
	[0.007]	[0.012]	[0.012]	[0.008]	[0.012]	[0.012]
Difference in VAT (Absolute Value)	-1.240***	-3.041***	-1.087***	-0.679***	-1.800***	-0.477**
	[0.135]	[0.217]	[0.205]	[0.139]	[0.223]	[0.208]
Common Border (Y/N)	-6.487***	3.395***	-3.247***	-7.703***	-0.324	-5.277***
	[0.769]	[1.207]	[1.225]	[0.776]	[1.200]	[1.257]
Distance Between Cities	-1.003***	-1.007***	-1.006***	-1.002***	-1.001***	-1.004***
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Observations	123,942	62,028	24,917	123,942	62,028	24,917
Number of Items	159	92	28	159	92	28
R-squared	0.99	0.98	0.99	0.99	0.98	0.99

Robust standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 10. The Magnitude of Prices and Border Width in 2001

We estimate cross-sectional regressions where the endogenous variable is the width of the border between cities i and j in 2001. We use product-fixed effects, city-i fixed effects, and city-j fixed effects, in all the regressions. The sample includes pairwise price differences between cities in Europe, only for the tradable items in our dataset. Distance between cities, and border width, is in kilometers. Robust standard errors are in parentheses.

Dependent Variable: Border Width in 2001

	(I)	(II)	(III)	(IV)	(V)
Constant	268.336***	369.486***	47.835***	28.205***	588.568***
	[82.895]	[24.270]	[4.617]	[5.138]	[159.553]
Distance Between Cities	-1.000***	-1.002***	-1.002***	-0.999***	-0.998***
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Both Countries in European Union	-315.505***	0	-9.844	-0.079	126.246**
	[79.499]	[0.000]	[9.395]	[1.509]	[57.139]
Both Countries in Euro Area	230.287***	-576.220***	139.569***	-22.237***	-61.051
	[5.339]	[37.643]	[7.798]	[3.876]	[55.570]
Euro Country vs non-EU	130.915***	-99.780***	42.308***	-0.466	48.484***
	[2.683]	[21.871]	[4.534]	[1.879]	[14.798]
Euro Country vs EU-non Euro Country	127.589***	-214.974***	1.897	-1.219	-80.115
	[2.783]	[21.044]	[4.425]	[2.133]	[55.485]
Trust	-0.498***	-0.931***	-0.432***		
	[0.052]	[0.072]	[0.058]		
Bilateral Trade (Imports+Exports), Euro bn	-0.082***	-10.189***		-0.548***	
	[0.013]	[1.024]		[0.056]	
Cultural Openness, Min of 2 Countries (0-10)	-8.727***	-41.146***			-10.047***
	[1.862]	[6.313]			[2.625]
Countries Share Legal Origin (Y/N)	0.772	-2.142***	-0.948*	-2.641***	0.3
	[0.565]	[0.690]	[0.559]	[0.588]	[0.518]
Cities Speak Same Language (Y/N)	5.401***	2.964***	0.256	3.533***	-0.782
	[0.798]	[0.865]	[0.745]	[0.699]	[0.668]
Common Border (Y/N)	-2.434***	-1.266*	-4.598***	-1.999***	-5.985***
	[0.685]	[0.732]	[0.646]	[0.660]	[0.612]
Difference in City GDP per capita (Abs. Value)	3.810***	3.701***	3.936***	2.406***	2.880***
	[0.310]	[0.330]	[0.314]	[0.249]	[0.246]
Difference in City Population (Abs. Value)	-0.111**	-0.095**	-0.106**	0.015	-0.04
	[0.046]	[0.046]	[0.045]	[0.032]	[0.030]
Difference in City Inflation 1996-2001 (Abs. Value)	-0.196***	-0.057	-0.162***	0.240***	-0.196***
	[0.055]	[0.071]	[0.059]	[0.059]	[0.055]
Difference in Country Size (Sq. Kms., Abs. Value)	0.059***	0.029***	0.090***	0.057***	0.101***
	[0.007]	[0.008]	[0.007]	[0.007]	[0.006]
Both Countries in European Union x Trust		-7.219***	-1.887***		
		[1.073]	[0.262]		
Both Countries in Euro Area x Trust		7.921***	2.130***		
		[1.123]	[0.276]		
Euro Country vs non-EU x Trust		6.755***	0.845***		
		[1.114]	[0.256]		
Euro Country vs EU-non Euro Country x Trust		0.750***	0.326***		
		[0.067]	[0.048]		
Both Countries in European Union x Bilateral Trade (Imports+Exports), Euro bn		5.793***		0.703***	
		[0.545]		[0.182]	
Both Countries in Euro Area x Bilateral Trade (Imports+Exports), Euro bn		4.270***		-0.198	
		[0.800]		[0.176]	
Euro Country vs non-EU x Bilateral Trade (Imports+Exports), Euro bn		4.517***		0.029	
		[0.803]		[0.177]	
Euro Country vs EU-non Euro Country x Bilateral Trade (Imports+Exports), Euro bn		10.289***		0.771***	
		[1.036]		[0.075]	
Both Countries in European Union x Cultural Openness, Min of 2 Countries (0-10)	-41.146	27.478***			-17.552**
	32.819	[5.899]			[8.373]
Both Countries in Euro Area x Cultural Openness, Min of 2 Countries (0-10)	-8.327	2.123			3.737
	-3.24753	[5.304]			[8.110]
Euro Country vs non-EU x Cultural Openness, Min of 2 Countries (0-10)		15.329***			11.394
		[1.164]			[8.119]
Euro Country vs EU-non Euro Country x Cultural Openness, Min of 2 Countries (0-10)		32.819***			-7.099***
		[5.897]			[2.272]
Observations	198,777	198,777	201,969	239,612	244,392
Number of Items	217	217	217	217	217
R-squared	0.98	0.98	0.98	0.99	0.99

Robust standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 11. Cultural Variables and Border Width in 2001

We estimate cross-sectional regressions where the endogenous variable is the width of the border between cities i and j in 2001. We use product-fixed effects, city-i fixed effects, and city-j fixed effects, in all the regressions. The sample includes pairwise price differences between cities in Europe, only for the tradable items in our dataset. Distance between cities, and border width, is in kilometers. Robust standard errors are in parentheses.

Dependent Variable: Change in Border Width from 2001 to 2002

	Food Perishables	Food Non-Perishables	Clothing	Alcohol	Recreation	Personal Care	House Supplies	Cars	Tobacco
	dwidth	dwidth	dwidth	dwidth	dwidth	dwidth	dwidth	dwidth	dwidth
Distance Between Cities	0	-0.003***	-0.002***	-0.001	-0.003***	0.001	0.001	-0.002**	0.017**
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.009]
Both Countries in European Union	11.156***	-1.707	3.117**	-6.126***	1.395	-2.6	6.689***	-5.619***	13.099
	[1.303]	[1.536]	[1.506]	[2.268]	[2.594]	[2.237]	[2.240]	[1.867]	[10.262]
Both Countries in Euro Area	4.695	4.423	5.871	8.091*	4.229	8.154*	7.95	19.599***	19.294
	[3.074]	[4.256]	[4.017]	[4.401]	[4.425]	[4.643]	[5.969]	[4.619]	[17.204]
Euro Country vs EU-non Euro Country	-0.821	0.657	4.150*	-1.857	-1.562	-0.912	1.467	7.750***	3.097
	[1.644]	[2.276]	[2.184]	[2.392]	[2.353]	[2.555]	[3.264]	[2.636]	[9.133]
Euro Country vs non-EU	7.506***	1.568	1.021	-4.620**	2.18	2.622	4.289	8.661***	13.735*
	[1.528]	[2.069]	[1.966]	[2.108]	[2.204]	[2.119]	[2.920]	[2.116]	[7.735]
Constant	-23.247***	2.258	-6.254	17.311***	-0.735	6.125	-25.436***	-7.088	-24.698
	[3.093]	[4.331]	[4.068]	[4.322]	[3.909]	[4.432]	[6.113]	[4.365]	[15.042]
Observations	88,466	39,426	37,720	23,850	9,650	16,695	21,527	9,158	6,045
Number of Items	78	34	32	20	8	14	18	8	5
R-squared	0.08	0.08	0.07	0.11	0.09	0.1	0.11	0.14	0.23

Robust standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 12. Product Categories and the Introduction of the Euro

We estimate cross-sectional regressions where the endogenous variable is the change in border width between cities i and j from 2001 to 2002. We use product-fixed effects, city-i fixed effects, and city-j fixed effects, in all the regressions. Distance between cities, and border width, is in kilometers. The sample includes pairwise price differences between cities in Europe, only for the tradable items in our dataset. Robust standard errors are in parentheses. The classification into product categories follows Engel and Rogers (2004), EIU, and our own classification.

Dependent Variable: Change in Border Width from 2001 to 2002

	(I)	(II)	(III)	(IV)	(V)
Constant	-348.871***	7.236***	18.614***	8.547***	-68.23
	[92.205]	[1.457]	[1.826]	[1.594]	[106.524]
Distance Between Cities	-0.001**	0.000	-0.001**	0.000	0.000
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Both Countries in European Union	2.457***	4.084***	5.098***	3.700***	8.848***
	[0.737]	[0.725]	[0.906]	[0.857]	[1.569]
Both Countries in Euro Area	9.096***	6.892***	5.651***	8.935***	0.903
	[1.731]	[1.727]	[1.776]	[1.776]	[2.224]
Euro Country vs EU-non Euro Country	1.907**	0.541	0.651	1.505	-6.117***
	[0.932]	[0.924]	[1.086]	[1.007]	[1.723]
Euro Country vs non-EU	4.855***	4.241***	4.411***	4.881***	3.528***
	[0.850]	[0.838]	[0.851]	[0.839]	[0.841]
Cities Speak Same Language (Y/N)	-0.416	-2.867***			
	[0.384]	[0.988]			
Difference in City GDP per capita (Abs. Value)	0.388**		0.878***		
	[0.160]		[0.286]		
Difference in City Population (Abs. Value)	0.126***			0.168***	
	[0.019]			[0.020]	
Difference in City Inflation 1996-2001 (Abs. Value)	0.128***				0.03
	[0.032]				[0.037]
Both Countries in European Union x Cities Speak Same Language (Y/N)		0			
		[0.000]			
Both Countries in Euro Area x Cities Speak Same Language (Y/N)		1.858*			
		[1.105]			
Euro Country vs EU-non Euro Country x Cities Speak Same Language (Y/N)		7.467***			
		[1.244]			
Euro Country vs non-EU x Cities Speak Same Language (Y/N)		0.583			
		[1.064]			
Both Countries in European Union x Difference in City GDP per capita (Abs. Value)			-4.666***		
			[0.998]		
Both Countries in Euro Area x Difference in City GDP per capita (Abs. Value)			4.552***		
			[1.003]		
Euro Country vs EU-non Euro Country x Difference in City GDP per capita (Abs. Value)			1.874*		
			[0.997]		
Euro Country vs non-EU x Difference in City GDP per capita (Abs. Value)			-0.252		
			[0.222]		
Both Countries in European Union x Difference in City Population (Abs. Value)				0.11	
				[0.079]	
Both Countries in Euro Area x Difference in City Population (Abs. Value)				-0.402***	
				[0.093]	
Euro Country vs EU-non Euro Country x Difference in City Population (Abs. Value)				-0.08	
				[0.079]	
Euro Country vs non-EU x Difference in City Population (Abs. Value)				-0.162***	
				[0.044]	
Both Countries in European Union x Difference in City Inflation 1996-2001 (Abs. Value)					-0.936***
					[0.276]
Both Countries in Euro Area x Difference in City Inflation 1996-2001 (Abs. Value)					1.081***
					[0.281]
Euro Country vs EU-non Euro Country x Difference in City Inflation 1996-2001 (Abs. Value)					1.254***
					[0.284]
Euro Country vs non-EU x Difference in City Inflation 1996-2001 (Abs. Value)					0.003***
					[0.001]
Observations	244,392	252,537	244,392	252,537	252,537
Number of Items	217	217	217	217	217
R-squared	0.02	0.02	0.02	0.02	0.02

Robust standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 13. The Effect of City Characteristics on the 2001 Borders

We estimate cross-sectional regressions where the endogenous variable is the width of the border between cities i and j in 2001. We use product-fixed effects, city-i fixed effects, and city-j fixed effects, in all the regressions. Distance between cities, and border width, is in kilometers. The sample includes pairwise price differences between cities in Europe, only for the tradable items in our dataset. Robust standard errors are in parentheses.

Dependent Variable: Change in Border Width from 2001 to 2002					
	(I)	(II)	(III)	(IV)	(V)
Constant	-1.633	6.442***	10.858***	2.452	7.228***
	[1.335]	[1.461]	[1.742]	[1.945]	[1.447]
Distance Between Cities	0	0	-0.001	0	0
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Both Countries in European Union	4.934***	3.960***	5.626***	5.952***	4.747***
	[0.826]	[0.728]	[0.933]	[1.384]	[0.724]
Both Countries in Euro Area	4.201**	5.533***	6.103***	11.579***	6.168***
	[1.757]	[1.717]	[1.764]	[1.230]	[1.705]
Euro Country vs EU-non Euro Country	-0.549	-0.121	-1.144	0	-0.133
	[0.943]	[0.916]	[1.041]	[0.000]	[0.920]
Euro Country vs non-EU	3.145***	3.764***	5.562***	10.158***	3.935***
	[0.872]	[0.824]	[0.893]	[1.325]	[0.833]
Countries Share Legal Origin (Y/N)	-0.656*	-0.999			
	[0.368]	[1.231]			
Difference in Country Size (Sq. Kms., Abs. Value)	-0.033***		0.293***		
	[0.004]		[0.079]		
Difference in VAT (Absolute Value)	0.598***			1.092***	
	[0.076]			[0.099]	
Common Border (Y/N)	0.792**				-4.292***
	[0.398]				[0.833]
Both Countries in European Union x Countries Share Legal Origin (Y/N)		0			
		[0.000]			
Both Countries in Euro Area x Countries Share Legal Origin (Y/N)		1.243			
		[1.334]			
Euro Country vs EU-non Euro Country x Countries Share Legal Origin (Y/N)		5.679***			
		[1.466]			
Euro Country vs non-EU x Countries Share Legal Origin (Y/N)		-2.036			
		[1.320]			
Both Countries in European Union x Difference in Country Size (Sq. Kms., Abs. Value)			-0.938***		
			[0.244]		
Both Countries in Euro Area x Difference in Country Size (Sq. Kms., Abs. Value)			0.609***		
			[0.214]		
Euro Country vs EU-non Euro Country x Difference in Country Size (Sq. Kms., Abs. Value)			0.654***		
			[0.214]		
Euro Country vs non-EU x Difference in Country Size (Sq. Kms., Abs. Value)			-0.537***		
			[0.106]		
Both Countries in European Union x Difference in VAT (Absolute Value)				0.06	
				[0.177]	
Both Countries in Euro Area x Difference in VAT (Absolute Value)				-0.900***	
				[0.161]	
Euro Country vs EU-non Euro Country x Difference in VAT (Absolute Value)				0.555***	
				[0.140]	
Euro Country vs non-EU x Difference in VAT (Absolute Value)				-0.428***	
				[0.090]	
Both Countries in European Union x Common Border (Y/N)					8.476***
					[1.039]
Both Countries in Euro Area x Common Border (Y/N)					-4.500***
					[0.802]
Euro Country vs EU-non Euro Country x Common Border (Y/N)					0
					[0.000]
Euro Country vs non-EU x Common Border (Y/N)					3.827***
					[0.841]
Observations	210,887	252,537	252,537	210,887	252,537
Number of Items	217	217	217	217	217
R-squared	0.02	0.02	0.02	0.02	0.02

Robust standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 14. The Effect of Country Characteristics on the 2001 Borders

We estimate cross-sectional regressions where the endogenous variable is the width of the border between cities i and j in 2001. We use product-fixed effects, city-i fixed effects, and city-j fixed effects, in all the regressions. Distance between cities and border width, is in kilometers. The sample includes pairwise price differences between cities in Europe, only for the tradable items in our dataset. Robust standard errors are in parentheses.

Dependent Variable: Change in Border Width from 2001 to 2002

	Item is less than 10 euros	Item is less than 100 euros	Item is more than 100 euros	Item is less than 10 euros	Item is less than 100 euros	Item is more than 100 euros
Constant	-61.179	2.696	-192.461*	-3.198	-983.180***	-205.852**
	[68.448]	[1.670]	[102.934]	[2.557]	[168.250]	[103.520]
Distance Between Cities	0	0.001**	-0.002**	0	0.001*	-0.002***
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Both Countries in European Union				3.142***	6.792***	-4.496***
				[1.177]	[1.564]	[1.745]
Both Countries in Euro Area				7.212***	2.639	12.228***
				[2.647]	[2.950]	[3.743]
Euro Country vs EU-non Euro Country				0.603	-1.306	5.432***
				[1.407]	[1.583]	[2.085]
Euro Country vs non-EU				5.740***	-0.321	4.390**
				[1.297]	[1.485]	[1.775]
Cities Speak Same Language (Y/N)	0.683	-0.643	-0.786	0.682	0.146	-0.644
	[0.575]	[0.737]	[0.907]	[0.587]	[0.753]	[0.924]
Difference in City GDP per capita (Abs. Value)	0.217	1.115**	-1.503***	0.186	1.268***	-1.445***
	[0.266]	[0.438]	[0.467]	[0.269]	[0.442]	[0.471]
Difference in City Population (Abs. Value)	0.171***	0.257***	0.062	0.183***	0.229***	0.082
	[0.038]	[0.048]	[0.058]	[0.039]	[0.048]	[0.059]
Difference in City Inflation 1996-2001 (Abs. Value)	0.052	0.395***	0.139*	0.069	0.338***	0.156**
	[0.047]	[0.058]	[0.071]	[0.048]	[0.058]	[0.072]
Countries Share Legal Origin (Y/N)	-1.015*	-0.714	0.246	-1.117**	-1.439**	0.074
	[0.537]	[0.602]	[0.651]	[0.548]	[0.623]	[0.689]
Difference in Country Size (Sq. Kms., Abs. Value)	-0.019***	-0.040***	-0.026***	-0.020***	-0.057***	-0.028***
	[0.005]	[0.006]	[0.008]	[0.005]	[0.007]	[0.008]
Difference in VAT (Absolute Value)	0.724***	0.959***	0.147	0.703***	0.684***	0.121
	[0.104]	[0.126]	[0.142]	[0.107]	[0.126]	[0.145]
Common Border (Y/N)	0.899	0.476	0.898	0.831	1.316*	0.823
	[0.568]	[0.700]	[0.793]	[0.576]	[0.699]	[0.804]
Observations	123,942	62,028	24,917	123,942	62,028	24,917
Number of Items	159	92	28	159	92	28
R-squared	0.02	0.03	0.03	0.02	0.03	0.03

Robust standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 15. The Magnitude of Prices and the effect of the Introduction of the Euro

We estimate cross-sectional regressions where the endogenous variable is the width of the border between cities i and j in 2001. We use product-fixed effects, city-i fixed effects, and city-j fixed effects, in all the regressions. Distance between cities, and border width, is in kilometers. The sample includes pairwise price differences between cities in Europe, only for the tradable items in our dataset. Robust standard errors are in parentheses.

Dependent Variable: Change in Border Width from 2001 to 2002

	(I)	(II)	(III)	(IV)	(V)
Constant	-46.451	55.110***	-11.502***	-0.161	-158.880*
	[50.761]	[12.860]	[0.642]	[2.316]	[95.860]
Distance Between Cities	0.000	0.000	0.004***	0.000	0.000
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Both Countries in European Union	126.838**	67.073***	26.099***	5.327***	-132.184***
	[49.454]	[17.111]	[3.660]	[0.873]	[34.311]
Both Countries in Euro Area	-24.178***	58.379***	-16.138***	-1.179	140.892***
	[3.270]	[17.289]	[3.688]	[1.796]	[33.665]
Euro Country vs non-EU	-12.223***	21.462*	8.410***	2.310***	10.682
	[1.654]	[11.376]	[0.646]	[0.856]	[7.999]
Euro Country vs EU-non Euro Country	-15.299***	4.774	-29.444***	-0.136	121.353***
	[1.728]	[11.330]	[3.668]	[1.036]	[33.484]
Trust	0.014	0.009	-0.189***		
	[0.035]	[0.043]	[0.015]		
Bilateral Trade (Imports+Exports), Euro bn	-0.043***	-0.204		0.058	
	[0.009]	[0.538]		[0.036]	
Cultural Openness, Min of 2 Countries (0-10)	-8.809***	-10.240***			-10.007***
	[1.110]	[3.317]			[1.511]
Countries Share Legal Origin (Y/N)	-0.472	2.513***	0.148	2.105***	-0.408
	[0.426]	[0.480]	[0.416]	[0.408]	[0.383]
Cities Speak Same Language (Y/N)	-1.534***	-0.516	-0.198	-1.241***	-0.443
	[0.559]	[0.648]	[0.551]	[0.441]	[0.431]
Common Border (Y/N)	1.985***	0.457	1.139***	0.514	1.314***
	[0.457]	[0.494]	[0.442]	[0.416]	[0.400]
Difference in City GDP per capita (Abs. Value)	-0.124	-0.042	0.126	0.423**	0.363**
	[0.216]	[0.232]	[0.220]	[0.169]	[0.165]
Difference in City Population (Abs. Value)	0.171***	0.161***	0.163***	0.129***	0.139***
	[0.029]	[0.030]	[0.029]	[0.020]	[0.019]
Difference in City Inflation 1996-2001 (Abs. Value)	0.093***	-0.107**	0.193***	-0.133***	0.085**
	[0.034]	[0.045]	[0.037]	[0.034]	[0.033]
Difference in Country Size (Sq. Kms., Abs. Value)	-0.039***	-0.024***	-0.045***	-0.015***	-0.030***
	[0.004]	[0.005]	[0.004]	[0.004]	[0.004]
Both Countries in European Union x Trust		0.022	0.899***		
		[0.564]	[0.162]		
Both Countries in Euro Area x Trust		-1.551***	-0.724***		
		[0.464]	[0.175]		
Euro Country vs non-EU x Trust		-0.355***	-0.666***		
		[0.028]	[0.158]		
Euro Country vs EU-non Euro Country x Trust		-52.688***	-0.302***		
		[16.800]	[0.030]		
Both Countries in European Union x Bilateral Trade (Imports+Exports), Euro bn		-1.301***		-0.293***	
		[0.327]		[0.111]	
Both Countries in Euro Area x Bilateral Trade (Imports+Exports), Euro bn		-1.495***		0.194*	
		[0.326]		[0.106]	
Euro Country vs non-EU x Bilateral Trade (Imports+Exports), Euro bn		-1.654***		0.027	
		[0.407]		[0.107]	
Euro Country vs EU-non Euro Country x Bilateral Trade (Imports+Exports), Euro bn		-2.057***		-0.339***	
		[0.469]		[0.046]	
Both Countries in European Union x Cultural Openness, Min of 2 Countries (0-10)		0.926			19.799***
		[3.096]			[5.021]
Both Countries in Euro Area x Cultural Openness, Min of 2 Countries (0-10)		-1.270*			-19.543***
		[0.657]			[4.911]
Euro Country vs non-EU x Cultural Openness, Min of 2 Countries (0-10)		-0.962			-17.586***
		[0.789]			[4.893]
Euro Country vs EU-non Euro Country x Cultural Openness, Min of 2 Countries (0-10)		-2.498			-1.071
		[3.032]			[1.234]
Observations	198,777	198,777	201,969	239,612	244,392
Number of Items	217	217	217	217	217
R-squared	0.02	0.02	0.02	0.02	0.02

Robust standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 16. Cultural Variables and the Effect of the Introduction of the Euro

We estimate cross-sectional regressions where the endogenous variable is the width of the border between cities i and j in 2001. We use product-fixed effects, city-i fixed effects, and city-j fixed effects, in all the regressions. Distance between cities, and border width, is in kilometers. The sample includes pairwise price differences between cities in Europe, only for the tradable items in our dataset. Robust standard errors are in parentheses.

	Border Width in 2001	Border Width Change 2001-2002	Border Width in 2001	Border Width Change 2001-2002
Common Border (Y/N)	-4.768***	0.895**	-4.775***	0.875**
	[0.613]	[0.409]	[0.613]	[0.409]
Distance Between Cities	-1.001***	0.000	-1.001***	0.000
	[0.001]	[0.000]	[0.001]	[0.000]
Constant	-128.758	-36.328	36.327***	-2.691*
	[80.828]	[49.859]	[3.339]	[1.475]
Both Countries in European Union	5.734***	4.041***	5.584***	3.610***
	[1.407]	[0.861]	[1.406]	[0.861]
Both Countries in Euro Area	-31.597***	6.286***	-31.794***	5.724***
	[3.829]	[1.812]	[3.821]	[1.804]
One of the Currencies is a "Weak" Currency (Y/N)	75.218***	-8.353**		
	[6.294]	[3.745]		
Both Currencies are "Weak" Currencies (Y/N)	149.560***	-19.205***		
	[12.213]	[7.243]		
Euro Country vs non-EU	-3.272*	4.191***	-3.471*	3.622***
	[1.913]	[0.897]	[1.902]	[0.887]
Euro Country vs EU-non Euro Country	-2.195	0.232	-2.217	0.169
	[1.991]	[0.964]	[1.990]	[0.964]
Cities Speak Same Language (Y/N)	-0.922	0.084	-0.863	0.253
	[0.661]	[0.428]	[0.655]	[0.425]
Difference in City GDP per capita (Abs. Value)	3.587***	0.087	3.625***	0.194
	[0.304]	[0.216]	[0.299]	[0.213]
Difference in City Population (Abs. Value)	-0.180***	0.178***	-0.180***	0.179***
	[0.043]	[0.028]	[0.043]	[0.028]
Difference in City Inflation 1996-2001 (Abs. Value)	0.064	0.038	0.101*	0.143***
	[0.060]	[0.037]	[0.054]	[0.034]
Countries Share Legal Origin (Y/N)	-0.369	-0.700*	-0.461	-0.964**
	[0.525]	[0.384]	[0.512]	[0.381]
Difference in Country Size (Sq. Kms., Abs. Value)	0.102***	-0.033***	0.102***	-0.033***
	[0.006]	[0.004]	[0.006]	[0.004]
Difference in VAT (Absolute Value)	-1.071***	0.607***	-1.061***	0.635***
	[0.111]	[0.076]	[0.111]	[0.075]
Observations	210887	210887	210887	210887
Number of Items	217	217	217	217
R-squared	0.98	0.02	0.98	0.02

Robust standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 17. The Effect of Currency Characteristics on the 2001 and 2002 Borders

We estimate cross-sectional regressions where the endogenous variable is the width of the border between cities i and j in 2001, and the change in border width from 2001 to 2002. We use product-fixed effects, city-i fixed effects, and city-j fixed effects, in all the regressions. Distance between cities, and border width, is in kilometers. The sample includes pairwise price differences between cities in Europe, only for the tradable items in our dataset. Robust standard errors are in parentheses.

	AMSTERDAM	ATHENS	BARCELONA	BELGRADE	BERLIN	BRUSSELS	BUCHAREST	BUDAPEST	COPENHAGEN	DUBLIN	DUSSELDORF	FRANKFURT	GENEVA	HAMBURG	HELSINKI	KIEV	LISBON	LONDON	LUXEMBOURG	LYON	MADRID	MANCHESTER	MILAN	MUNICH	OSLO	PARIS	PRAGUE	REYKJAVIK	ROME	SOFIA	STOCKHOLM	VIENNA	WARSAW	ZURICH	
AMSTERDAM	-	2,161	1,236	1,413	576	173	1,785	1,146	621	755	179	361	690	368	1,503	1,793	1,860	359	317	734	1,479	496	827	666	914	427	709	2,014	1,307	1,741	1,125	931	1,091	612	**AMSTERDAM**
ATHENS		-	1,877	808	1,803	2,088	745	1,124	2,135	2,852	1,984	1,800	1,709	2,022	2,468	1,489	2,848	2,392	1,903	1,781	2,365	2,628	1,462	1,495	2,605	2,096	1,534	4,157	1,038	526	2,408	1,287	1,601	1,616	**ATHENS**
BARCELONA			-	1,533	1,501	1,063	1,971	1,501	1,758	1,468	1,149	1,093	624	1,473	2,603	2,403	1,003	1,137	964	531	501	1,386	724	1,055	2,142	831	1,353	2,960	869	1,740	2,277	1,352	1,864	833	**BARCELONA**
BELGRADE				-	999	1,373	444	315	1,326	2,146	1,241	1,062	1,126	1,228	1,729	983	2,532	1,693	1,203	1,227	2,029	1,903	890	773	1,797	1,447	739	3,371	328	1,619	493	824	963	963	**BELGRADE**
BERLIN					-	653	1,293	689	352	1,316	478	424	876	252	1,103	1,217	2,312	934	602	975	1,869	1,051	845	505	836	878	281	2,381	1,194	1,318	808	519	514	673	**BERLIN**
BRUSSELS						-	1,769	1,131	766	773	175	317	533	491	1,649	1,850	1,709	322	188	567	1,314	537	696	602	1,086	261	718	2,124	1,185	1,697	1,280	912	1,159	492	**BRUSSELS**
BUCHAREST							-	639	1,571	2,534	1,623	1,452	1,568	1,542	1,749	749	2,972	2,091	1,610	1,671	2,469	2,283	1,334	1,185	2,002	1,870	1,078	3,668	1,131	294	1,742	857	946	1,394	**BUCHAREST**
BUDAPEST								-	1,011	1,895	982	813	992	926	1,458	907	2,470	1,453	978	1,103	1,975	1,642	791	563	1,481	1,247	445	3,069	814	628	1,316	218	545	793	**BUDAPEST**
COPENHAGEN									-	1,238	627	669	1,144	286	883	1,339	2,476	958	800	1,229	2,071	985	1,160	839	484	1,025	632	2,102	1,540	1,634	521	863	667	965	**COPENHAGEN**
DUBLIN										-	915	1,085	1,191	1,075	2,024	2,527	1,639	459	951	1,161	1,450	265	1,412	1,376	1,264	776	1,463	1,492	1,897	2,471	1,626	1,677	1,823	1,236	**DUBLIN**
DUSSELDORF											-	182	560	340	1,505	1,664	1,863	478	184	624	1,448	662	663	486	999	411	557	2,200	1,124	1,569	1,149	767	986	447	**DUSSELDORF**
FRANKFURT												-	474	392	1,513	1,559	1,889	639	190	563	1,445	839	519	304	1,096	478	409	2,372	972	1,388	1,184	595	888	307	**FRANKFURT**
GENEVA													-	862	1,981	1,853	1,503	748	379	113	1,024	1,009	255	463	1,556	411	752	2,637	695	1,414	1,660	802	1,267	223	**GENEVA**
HAMBURG														-	1,163	1,452	2,198	725	514	943	1,786	809	902	611	708	746	489	2,143	1,319	1,552	808	736	748	697	**HAMBURG**
HELSINKI															-	1,141	3,359	1,823	1,669	2,078	2,948	1,798	1,938	1,589	787	1,908	1,301	2,411	2,208	1,944	397	1,434	912	1,777	**HELSINKI**
KIEV																-	3,362	2,148	1,748	1,967	2,873	2,252	1,689	1,406	1,637	2,037	1,155	3,378	1,685	1,025	1,275	1,064	704	1,650	**KIEV**
LISBON																	-	1,582	1,710	1,389	502	1,725	1,679	1,962	2,737	1,452	2,242	2,947	1,869	2,752	2,986	2,297	2,757	1,718	**LISBON**
LONDON																		-	493	737	1,263	262	960	920	1,155	342	1,035	1,884	1,448	2,016	1,433	1,234	1,449	777	**LONDON**
LUXEMBOURG																			-	440	1,279	721	513	429	1,183	288	595	2,310	1,000	1,523	1,322	760	1,078	304	**LUXEMBOURG**
LYON																				-	913	1,000	340	576	1,624	393	863	2,629	747	1,508	1,748	915	1,378	624	**LYON**
MADRID																					-	1,460	1,184	1,483	2,387	1,053	1,771	2,889	1,370	2,251	2,591	1,809	2,288	1,243	**MADRID**
MANCHESTER																						-	1,215	1,136	1,066	606	1,208	1,629	1,690	2,230	1,401	1,428	1,561	1,000	**MANCHESTER**
MILAN																							-	350	1,610	640	647	2,820	490	1,169	1,652	629	1,146	216	**MILAN**
MUNICH																								-	1,310	685	299	2,674	708	1,095	1,313	354	810	245	**MUNICH**
OSLO																									-	1,340	1,117	1,741	2,017	2,095	415	1,345	1,060	1,403	**OSLO**
PARIS																										-	883	2,226	1,120	1,758	1,541	1,032	1,365	488	**PARIS**
PRAGUE																											-	2,631	931	1,065	1,053	247	516	529	**PRAGUE**
REYKJAVIK																												-	3,310	3,696	2,127	2,878	2,763	1,412	**REYKJAVIK**
ROME																													-	887	1,984	775	1,322	696	**ROME**
SOFIA																														-	1,883	820	1,075	1,270	**SOFIA**
STOCKHOLM																															-	1,236	808	1,470	**STOCKHOLM**
VIENNA																																-	552	594	**VIENNA**
WARSAW																																	-	1,045	**WARSAW**
ZURICH																																		-	**ZURICH**

Appendix Table II: List of Items by Category

Tradable Items

Item	Product Category
Beer, local brand (1 l) (mid-priced store)	Alcohol
Beer, local brand (1 l) (supermarket)	Alcohol
Beer, top quality (330 ml) (mid-priced store)	Alcohol
Beer, top quality (330 ml) (supermarket)	Alcohol
Cognac, French VSOP (700 ml) (mid-priced store)	Alcohol
Cognac, French VSOP (700 ml) (supermarket)	Alcohol
Gin, Gilbey's or equivalent (700 ml) (mid-priced store)	Alcohol
Gin, Gilbey's or equivalent (700 ml) (supermarket)	Alcohol
Liqueur, Cointreau (700 ml) (mid-priced store)	Alcohol
Liqueur, Cointreau (700 ml) (supermarket)	Alcohol
Scotch whisky, six years old (700 ml) (mid-priced store)	Alcohol
Scotch whisky, six years old (700 ml) (supermarket)	Alcohol
Vermouth, Martini & Rossi (1 l) (mid-priced store)	Alcohol
Vermouth, Martini & Rossi (1 l) (supermarket)	Alcohol
Wine, common table (1 l) (mid-priced store)	Alcohol
Wine, common table (1 l) (supermarket)	Alcohol
Wine, fine quality (700 ml) (mid-priced store)	Alcohol
Wine, fine quality (700 ml) (supermarket)	Alcohol
Wine, superior quality (700 ml) (mid-priced store)	Alcohol
Wine, superior quality (700 ml) (supermarket)	Alcohol
Low priced car (900-1299 cc) (low)	Cars
Low priced car (900-1299 cc) (high)	Cars
Compact car (1300-1799 cc) (low)	Cars
Compact car (1300-1799 cc) (high)	Cars
Family car (1800-2499 cc) (low)	Cars
Family car (1800-2499 cc) (high)	Cars
Deluxe car (2500 cc upwards) (low)	Cars
Deluxe car (2500 cc upwards) (high)	Cars
Boy's dress trousers (chain store)	Clothing
Boy's dress trousers (mid-priced/branded store)	Clothing
Boy's jacket, smart (chain store)	Clothing
Boy's jacket, smart (mid-priced/branded store)	Clothing
Business shirt, white (chain store)	Clothing
Business shirt, white (mid-priced/branded store)	Clothing
Business suit, two piece, medium weight (chain store)	Clothing
Business suit, two piece, medium weight (mid-priced/bra	Clothing
Child' s shoes, sportswear (mid-priced/branded store)	Clothing
Child's jeans (chain store)	Clothing
Child's jeans (mid-priced/branded store)	Clothing
Child's shoes, dresswear (chain store)	Clothing
Child's shoes, dresswear (mid-priced/branded store)	Clothing
Child's shoes, sportswear (chain store)	Clothing
Dress, ready to wear, daytime (chain store)	Clothing
Dress, ready to wear, daytime (mid-priced/branded stor	Clothing
Girl's dress (chain store)	Clothing
Girl's dress (mid-priced/branded store)	Clothing
Mens raincoat, Burberry type (chain store)	Clothing
Men's raincoat, Burberry type (mid-priced/branded store	Clothing
Men's shoes, business wear (chain store)	Clothing
Men's shoes, business wear (mid-priced/branded store)	Clothing
Socks, wool mixture (chain store)	Clothing
Socks, wool mixture (mid-priced/branded store)	Clothing
Tights, panty hose (chain store)	Clothing
Tights, panty hose (mid-priced/branded store)	Clothing

Item	Product Category
Women's cardigan sweater (chain store)	Clothing
Women's cardigan sweater (mid-priced/branded store)	Clothing
Women's raincoat, Burberry type (chain store)	Clothing
Women's raincoat, Burberry type (mid-priced/branded s	Clothing
Women's shoes, town (chain store)	Clothing
Women's shoes, town (mid-priced/branded store)	Clothing
Chicken: frozen (1 kg) (mid-priced store)	Food, Non Perishables
Chicken: frozen (1 kg) (supermarket)	Food, Non Perishables
Coca-Cola (1 l) (mid-priced store)	Food, Non Perishables
Coca-Cola (1 l) (supermarket)	Food, Non Perishables
Cocoa (250 g) (mid-priced store)	Food, Non Perishables
Cocoa (250 g) (supermarket)	Food, Non Perishables
Drinking chocolate (500 g) (mid-priced store)	Food, Non Perishables
Drinking chocolate (500 g) (supermarket)	Food, Non Perishables
Frozen fish fingers (1 kg) (mid-priced store)	Food, Non Perishables
Frozen fish fingers (1 kg) (supermarket)	Food, Non Perishables
Ground coffee (500 g) (mid-priced store)	Food, Non Perishables
Ground coffee (500 g) (supermarket)	Food, Non Perishables
Instant coffee (125 g) (mid-priced store)	Food, Non Perishables
Instant coffee (125 g) (supermarket)	Food, Non Perishables
Mineral water (1 l) (mid-priced store)	Food, Non Perishables
Mineral water (1 l) (supermarket)	Food, Non Perishables
Olive oil (1 l) (mid-priced store)	Food, Non Perishables
Olive oil (1 l) (supermarket)	Food, Non Perishables
Peaches, canned (500 g) (mid-priced store)	Food, Non Perishables
Peaches, canned (500 g) (supermarket)	Food, Non Perishables
Peanut or corn oil (1 l) (mid-priced store)	Food, Non Perishables
Peanut or corn oil (1 l) (supermarket)	Food, Non Perishables
Peas, canned (250 g) (mid-priced store)	Food, Non Perishables
Peas, canned (250 g) (supermarket)	Food, Non Perishables
Sliced pineapples, canned (500 g) (mid-priced store)	Food, Non Perishables
Sliced pineapples, canned (500 g) (supermarket)	Food, Non Perishables
Tea bags (25 bags) (mid-priced store)	Food, Non Perishables
Tea bags (25 bags) (supermarket)	Food, Non Perishables
Tomatoes, canned (250 g) (mid-priced store)	Food, Non Perishables
Tomatoes, canned (250 g) (supermarket)	Food, Non Perishables
Tonic water (200 ml) (mid-priced store)	Food, Non Perishables
Tonic water (200 ml) (supermarket)	Food, Non Perishables
White rice, 1 kg (mid-priced store)	Food, Non Perishables
White rice, 1 kg (supermarket)	Food, Non Perishables
Apples (1 kg) (mid-priced store)	Food, Perishables
Apples (1 kg) (supermarket)	Food, Perishables
Bacon (1 kg) (mid-priced store)	Food, Perishables
Bacon (1 kg) (supermarket)	Food, Perishables
Bananas (1 kg) (mid-priced store)	Food, Perishables
Bananas (1 kg) (supermarket)	Food, Perishables
Beef: filet mignon (1 kg) (mid-priced store)	Food, Perishables
Beef: filet mignon (1 kg) (supermarket)	Food, Perishables
Beef: ground or minced (1 kg) (mid-priced store)	Food, Perishables
Beef: ground or minced (1 kg) (supermarket)	Food, Perishables
Beef: roast (1 kg) (mid-priced store)	Food, Perishables
Beef: roast (1 kg) (supermarket)	Food, Perishables
Beef: steak, entrecote (1 kg) (mid-priced store)	Food, Perishables
Beef: steak, entrecote (1 kg) (supermarket)	Food, Perishables

Item	Product Category
Beef: stewing, shoulder (1 kg) (mid-priced store)	Food, Perishables
Beef: stewing, shoulder (1 kg) (supermarket)	Food, Perishables
Butter, 500 g (mid-priced store)	Food, Perishables
Butter, 500 g (supermarket)	Food, Perishables
Carrots (1 kg) (mid-priced store)	Food, Perishables
Carrots (1 kg) (supermarket)	Food, Perishables
Cheese, imported (500 g) (mid-priced store)	Food, Perishables
Cheese, imported (500 g) (supermarket)	Food, Perishables
Chicken: fresh (1 kg) (mid-priced store)	Food, Perishables
Chicken: fresh (1 kg) (supermarket)	Food, Perishables
Cornflakes (375 g) (mid-priced store)	Food, Perishables
Cornflakes (375 g) (supermarket)	Food, Perishables
Eggs (12) (mid-priced store)	Food, Perishables
Eggs (12) (supermarket)	Food, Perishables
Flour, white (1 kg) (mid-priced store)	Food, Perishables
Flour, white (1 kg) (supermarket)	Food, Perishables
Fresh fish (1 kg) (mid-priced store)	Food, Perishables
Fresh fish (1 kg) (supermarket)	Food, Perishables
Ham: whole (1 kg) (mid-priced store)	Food, Perishables
Ham: whole (1 kg) (supermarket)	Food, Perishables
Lamb: chops (1 kg) (mid-priced store)	Food, Perishables
Lamb: chops (1 kg) (supermarket)	Food, Perishables
Lamb: leg (1 kg) (mid-priced store)	Food, Perishables
Lamb: leg (1 kg) (supermarket)	Food, Perishables
Lamb: Stewing (1 kg) (mid-priced store)	Food, Perishables
Lamb: Stewing (1 kg) (supermarket)	Food, Perishables
Lemons (1 kg) (mid-priced store)	Food, Perishables
Lemons (1 kg) (supermarket)	Food, Perishables
Lettuce (one) (mid-priced store)	Food, Perishables
Lettuce (one) (supermarket)	Food, Perishables
Margarine, 500g (mid-priced store)	Food, Perishables
Margarine, 500g (supermarket)	Food, Perishables
Milk, pasteurised (1 l) (mid-priced store)	Food, Perishables
Milk, pasteurised (1 l) (supermarket)	Food, Perishables
Mushrooms (1 kg) (mid-priced store)	Food, Perishables
Mushrooms (1 kg) (supermarket)	Food, Perishables
Onions (1 kg) (mid-priced store)	Food, Perishables
Onions (1 kg) (supermarket)	Food, Perishables
Orange juice (1 l) (mid-priced store)	Food, Perishables
Orange juice (1 l) (supermarket)	Food, Perishables
Oranges (1 kg) (mid-priced store)	Food, Perishables
Oranges (1 kg) (supermarket)	Food, Perishables
Pork: chops (1 kg) (mid-priced store)	Food, Perishables
Pork: chops (1 kg) (supermarket)	Food, Perishables
Pork: loin (1 kg) (mid-priced store)	Food, Perishables
Pork: loin (1 kg) (supermarket)	Food, Perishables
Potatoes (2 kg) (mid-priced store)	Food, Perishables
Potatoes (2 kg) (supermarket)	Food, Perishables
Spaghetti (1 kg) (mid-priced store)	Food, Perishables
Spaghetti (1 kg) (supermarket)	Food, Perishables
Sugar, white (1 kg) (mid-priced store)	Food, Perishables
Sugar, white (1 kg) (supermarket)	Food, Perishables
Tomatoes (1 kg) (mid-priced store)	Food, Perishables
Tomatoes (1 kg) (supermarket)	Food, Perishables

Item	Product Category
Veal: chops (1 kg) (mid-priced store)	Food, Perishables
Veal: chops (1 kg) (supermarket)	Food, Perishables
Veal: fillet (1 kg) (mid-priced store)	Food, Perishables
Veal: fillet (1 kg) (supermarket)	Food, Perishables
Veal: roast (1 kg) (mid-priced store)	Food, Perishables
Veal: roast (1 kg) (supermarket)	Food, Perishables
White bread, 1 kg (mid-priced store)	Food, Perishables
White bread, 1 kg (supermarket)	Food, Perishables
Yoghurt, natural (150 g) (mid-priced store)	Food, Perishables
Yoghurt, natural (150 g) (supermarket)	Food, Perishables
Batteries (two, size D/LR20) (mid-priced store)	House Supplies
Batteries (two, size D/LR20) (supermarket)	House Supplies
Dishwashing liquid (750 ml) (mid-priced store)	House Supplies
Dishwashing liquid (750 ml) (supermarket)	House Supplies
Electric toaster (for two slices) (mid-priced store)	House Supplies
Electric toaster (for two slices) (supermarket)	House Supplies
Frying pan (Teflon or good equivalent) (mid-priced store	House Supplies
Frying pan (Teflon or good equivalent) (supermarket)	House Supplies
Insect-killer spray (330 g) (mid-priced store)	House Supplies
Insect-killer spray (330 g) (supermarket)	House Supplies
Laundry detergent (3 l) (mid-priced store)	House Supplies
Laundry detergent (3 l) (supermarket)	House Supplies
Light bulbs (two, 60 watts) (mid-priced store)	House Supplies
Light bulbs (two, 60 watts) (supermarket)	House Supplies
Soap (100 g) (mid-priced store)	House Supplies
Soap (100 g) (supermarket)	House Supplies
Toilet tissue (two rolls) (mid-priced store)	House Supplies
Toilet tissue (two rolls) (supermarket)	House Supplies
Cigarettes, local brand (pack of 20) (mid-priced store)	Other
Cigarettes, local brand (pack of 20) (supermarket)	Other
Cigarettes, Marlboro (pack of 20) (mid-priced store)	Other
Cigarettes, Marlboro (pack of 20) (supermarket)	Other
Pipe tobacco (50 g) (average)	Other
Aspirins (100 tablets) (mid-priced store)	Personal Care
Aspirins (100 tablets) (supermarket)	Personal Care
Facial tissues (box of 100) (mid-priced store)	Personal Care
Facial tissues (box of 100) (supermarket)	Personal Care
Hand lotion (125 ml) (mid-priced store)	Personal Care
Hand lotion (125 ml) (supermarket)	Personal Care
Lipstick (deluxe type) (mid-priced store)	Personal Care
Lipstick (deluxe type) (supermarket)	Personal Care
Razor blades (five pieces) (mid-priced store)	Personal Care
Razor blades (five pieces) (supermarket)	Personal Care
Shampoo & conditioner in one (400 ml) (mid-priced stor	Personal Care
Shampoo & conditioner in one (400 ml) (supermarket)	Personal Care
Toothpaste with fluoride (120 g) (mid-priced store)	Personal Care
Toothpaste with fluoride (120 g) (supermarket)	Personal Care
Compact disc album (average)	Recreation
Cost of six tennis balls eg Dunlop, Wilson (average)	Recreation
Daily local newspaper (average)	Recreation
International foreign daily newspaper (average)	Recreation
Kodak colour film (36 exposures) (average)	Recreation
Paperback novel (at bookstore) (average)	Recreation
Personal computer (64 MB) (average)	Recreation
Television, colour (66 cm) (average)	Recreation

Non-Tradable Items

Cost of developing 36 colour pictures (average)
International weekly news magazine (Time) (average)
Simple meal for one person (average)
Two-course meal for two people (average)
Three course dinner for four people (average)
Four best seats at theatre or concert (average)
Four best seats at cinema (average)
One good seat at cinema (average)
Laundry (one shirt) (standard high-street outlet)
Laundry (one shirt) (mid-priced outlet)
Dry cleaning, man's suit (standard high-street outlet)
Dry cleaning, man's suit (mid-priced outlet)
Dry cleaning, woman's dress (standard high-street outlet)
Dry cleaning, woman's dress (mid-priced outlet)
Dry cleaning, trousers (standard high-street outlet)
Dry cleaning, trousers (mid-priced outlet)
Man's haircut (tips included) (average)
Woman's cut & blow dry (tips included) (average)
Hourly rate for domestic cleaning help (average)
Maid's monthly wages (full time) (average)
Babysitter's rate per hour (average)
Cost of a tune up (but no major repairs) (low)
Cost of a tune up (but no major repairs) (high)
Taxi: initial meter charge (average)
Taxi rate per additional kilometre (average)
Taxi: airport to city centre (average)
Telephone and line, monthly rental (average)
Telephone, charge per local call from home (3 mins) (average)
Electricity, monthly bill (average)
Gas, monthly bill (average)
Water, monthly bill (average)
Furnished residential apartment: 1 bedroom (moderate)
Furnished residential apartment: 1 bedroom (high)
Furnished residential apartment: 2 bedroom (moderate)
Furnished residential apartment: 2 bedroom (high)
Unfurnished residential apartment: 2 bedrooms (moderate)
Unfurnished residential apartment: 2 bedrooms (high)
Unfurnished residential apartment: 3 bedrooms (moderate)
Unfurnished residential apartment: 3 bedrooms (high)
Unfurnished residential apartment: 4 bedrooms (moderate)
Unfurnished residential apartment: 4 bedrooms (high)
Furnished residential house: 3 bedrooms (moderate)
Furnished residential house: 3 bedrooms (high)
Unfurnished residential house: 3 bedrooms (moderate)
Unfurnished residential house: 3 bedrooms (high)
Unfurnished residential house: 4 bedrooms (moderate)
Unfurnished residential house: 4 bedrooms (high)
Yearly road tax or registration fee (low)
Yearly road tax or registration fee (high)
Annual premium for car insurance (low)
Annual premium for car insurance (high)
Regular unleaded petrol (1 l) (average)
Green fees on a public golf course (average)
Hire of tennis court for one hour (average)
Entrance fee to a public swimming pool (average)
One drink at bar of first class hotel (average)
Fast food snack: hamburger, fries and drink (average)
Routine checkup at family doctor (average)
One X-ray at doctor's office or hospital (average)
Visit to dentist (one X-ray and one filling) (average)
Business trip, typical daily cost
Hilton-type hotel, single room, one night including breakfast (average)
Moderate hotel, single room, one night including breakfast (average)
Heating oil (100 l) (average)
Office rent per sq metre per year
Typical lease term for office property (years)
Industrial space, per sq metre per year
French school: annual tuition, ages 5-12 (average)
French school: annual tuition, ages 13-17 (average)
French school: extra costs, ages 5-12 (average)
French school: extra costs, ages 13-17 (average)
French school: kindergarten annual fees (average)
German school: annual tuition, ages 5-12 (average)
German school: annual tuition, ages 13-17 (average)
German school: extra costs, ages 5-12 (average)
German school: extra costs, ages 13-17 (average)
German school: kindergarten annual fees (average)
American /English school: annual tuition, ages 5-12 (average)
American/English school: annual tuition, ages 13-17 (average)
American/English school: extra costs, ages 5-12 (average)
American/English school: extra costs, ages 13-17 (average)
American/English school: kindergarten annual fees (average)

Variable	Definition	Source
City prices	Prices in Euros for Items (Appendix II) and Cities (Table 1)	Economist Intelligence Unit
Cumulative inflation	Absolute value of the difference in Price Index 1996-2001. Index base 1996=100	Economist Intelligence Unit
City population	Absolute value of the difference in City polulation between city i and city j (both in millions) divided by the minimum of the two	http://www.citypopulation.de/Europe.html http://www.citymayors.com/features/euro_cities.html http://en.wikipedia.org/wiki/Largest_cities_of_the_European_Union_by_population_within_city_limits#Top_100_administrative_units http://randburg.com/is/capital/facts-figures-about-Reykjavik.pdf
City wealth	Absolute value of the difference in City's GDP per capita between city i and city j (both in euros) divided by the minimum of the two. When city GDP per Capita is not available, we use the Country's GDP per capita as a proxy	http://www.citymayors.com/statistics/richest-cities-2005.html http://www.communities.gov.uk/pub/129/CompetitiveEuropeanCitiesWheredotheCoreCitiesStandFullReport_id1508129.doc http://www.ine.es/daco/daco42/cre00/cre0106u.xls http://www.oslo.technopole.no/cgi/wbch3.exe?p=1306
Flying distance between cities	GeoBytes and ETN	http://www.geobytes.com/CityDistanceTool.htm http://www.etn.nl/distanc4.htm
Country size	CIA World Factbook	CIA World Factbook
VAT	Absolute value of the difference in Country's VAT rates (in percent)	European Union
Bordering countries	CIA World Factbook	CIA World Factbook
Legal origin	Legal origin identifies the origin of the Company Law or Commercial Code in each country	CIA World Factbook
Trust	Trust is calculated by taking the average response to the following question: "I would like to ask you a question about how much trust you have in people from various countries. For each, please tell me whether you have a lot of trust, some trust, not very much trust or no trust at all". The answers are coded in the following way:=1 (no trust at all), = 2 (not very much trust), =3 (some trust), =4 (a lot of trust).	Guiso, Sapienza, and Zingales (2007)
Bilateral trade	Sum of Imports and Exports (in euro billion) between country i and country j	World Bank Development Indicators
Cultural Openess	The Cultural Openess index ranges from 0 to 10 and measures whether the national culture is open to foreign ideas, based on a survey conducted among business managers across the world.	IMD World Competitiveness Center

Appendix Table III. Variable Definitions and Sources

Variables used in the paper, definitions and sources