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ORIGINAL PAPER

Regional Mc parity: do common pricing points reduce deviations from the law of one price?

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Abstract This paper analyses price differences of *McDonald's* products in four different countries. I show that pricing at pricing points in different currencies may contribute to explaining deviations from the law of one price. Observing strictly equal prices is more probable if prices are set at psychological and fractional pricing points in a common currency. The latter is also found to reduce the size of price deviations. Additionally, price differences increase as transaction costs increase. Based on this data set there is no evidence that the euro has reduced price deviations.

Keywords Law of one price · Psychological and fractional prices · European monetary union

JEL Classification E31 · F41 · R11

1 Introduction

Much of the recent empirical evidence on the law of one price (LOP) and why it fails to hold is based on micro price studies. A very popular data set has proven to be the data set collected by the *Economist Intelligence Unit* (EIU),[1] which assembles individual prices in different major cities in the world for their worldwide cost of living index (Crucini and Shintani 2008; Rogers 2007; Parsley and Wei 2003). A large extent of the covered prices in the EIU survey consists of supermarket prices.

[1] For a description of the database see http://eiu.enumerate.com.

Opinions expressed in this paper are personal opinions of the author and do not necessarily reflect those of the Banque centrale du Luxembourg.

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Yet another very popular product has proved to be the *McDonald's Big Mac*, which has for example been studied by Cumby (1996), Pakko and Pollard (1996), Lutz (2001) and Parsley and Wei (2007, 2008). Both data sets share one common feature in that they refer to frequently bought and low priced consumer goods.

For low priced consumer goods one potential reason why the law of one price fails to hold may be linked to pricing at pricing points in different currencies. Prices set in different currencies are likely to differ as psychological or fractional pricing points differ in different currencies. In the case of a common currency, these pricing points are theoretically identical. Hence, we would a priori expect to observe more identical prices. This may particularly be the case if the cost and demand conditions are not too dissimilar in the compared locations, and if arbitrage is not impeded. Using individual supermarket prices Friberg and Mathä (2004) show that observing identical prices is indeed linked to such issues. The probability is larger if prices are both psychological and set in a common currency. However, no effect is found for the size of price deviations from the law of one price.

This issue has hitherto not received much attention, and I believe that it merits further enquiry. Firstly, consumer prices are very frequently set such that they appear attractive; they are set at pricing thresholds or pricing points. Secondly, a large share of prices collected by national statistical institutes consists of low priced consumer products. Thirdly, rounding effects have recently also been found to be important during the euro cash changeover. Prices of small price items, and in particular restaurant and catering services, were allegedly raised by relatively large percentage points (e.g. Hobijn et al. 2006).

In this respect, this paper addresses to what extent pricing at psychological and fractional pricing points in a common currency increases the probability of observing identical prices and decreases the size of deviations from the law of one price. In addition, does the probability of observing different prices and their size of deviation depend on transaction costs? For that purpose, I will use individual McDonald's prices in four different countries that I collected around the euro cash changeover period. Prices of McDonald's products may serve as a good case in point, as the products in their final (ready to consume form) are essentially non-tradable. Moreover, they can be characterised as low priced and highly standardised consumer products with a quasi-identical production technology (see also Parsley and Wei (2007)). Section 2 discusses the data source. Section 3 presents some descriptive statistics on price developments during the euro cash changeover period. Section 4 presents the empirical implementation and analysis, while Section 5 concludes.

2 Data collection

I collected data of individual *McDonald's* prices at six occasions, i.e. in mid-October 2001, mid-December 2001, mid-February 2002, mid-April 2002, mid-April 2003 and once more in mid-April 2004.[2] Prices were collected at four different locations in the surrounding region of Luxembourg. The cities concerned are

[2] They are always collected within the same week.

Table 1 Price developments (percentage)

Country	Loc.	No. of obs.	Oct. 01 Dec. 01	Dec. 01 Feb. 02	Feb. 02 Apr. 02	Apr. 02 Apr. 03	Apr. 03 Apr. 04
Price increases							
Lux	Lux.	26	0	73	8	92	88
Bel	Mess.	23	0	4	0	96	35
Fra	Metz	18	72	0	0	94	22
Ger	Trier	29	0	31	0	3	59
Price decreases							
Lux	Lux.	26	0	27	4	4	8
Bel	Mess.	23	4	52	0	4	9
Fra	Metz	18	17	0	0	0	0
Ger	Trier	29	0	41	0	17	7
Average percentage change							
Lux	Lux.	26	0.00	4.40	−0.77	10.02	3.75
Bel	Mess.	23	−0.72	−0.44	0.00	9.27	−0.13
Fra	Metz	18	0.92	0.00	0.00	5.43	4.59
Ger	Trier	29	0.00	−0.23	0.00	0.05	2.51

Products are only included if they were observed all six times at the respective locations. Calculations based on euro prices

Luxembourg, Trier (Rhine-Palatinate, Germany), Metz (Lorraine, France), and Messancy (near Arlon, Wallonia, Belgium). The respective location and the distances between them are presented in the Appendix. The approach was simply to copy the whole available menu. 32 different items remained after removing items that were not available in at least three restaurants. This is motivated by the pairwise estimations of deviations from the law of one price, as otherwise the cross-sectional variation thereof would have been entirely captured by the product-specific fixed effects. If the panel were fully balanced, we would obtain 1152 ($=32 \times 6 \times 6$) observations. Also, not all products were observed in identical quantities. We will, however, focus on identical quantities, as different packaging sizes introduce further unwanted product differentiation (Mathä 2006). This leaves us with about 760 valid observations for estimation. Detailed information on individual products included in the analysis can be found in Table 6.

3 Price developments during the euro cash changeover

Table 1 provides a brief account of the price developments at individual locations. In general, it seems that the price adjustments due to the cash changeover are limited to a very short time span. In addition, average price increases, if there are any at all, are relatively modest. In contrast to the caution that was applied between October 2001 and April 2002, a large fraction of prices were increased between April 2002 and April 2003. The price developments in individual McDonald's restaurants suggest that, with the exception of Luxembourg, prices have on average

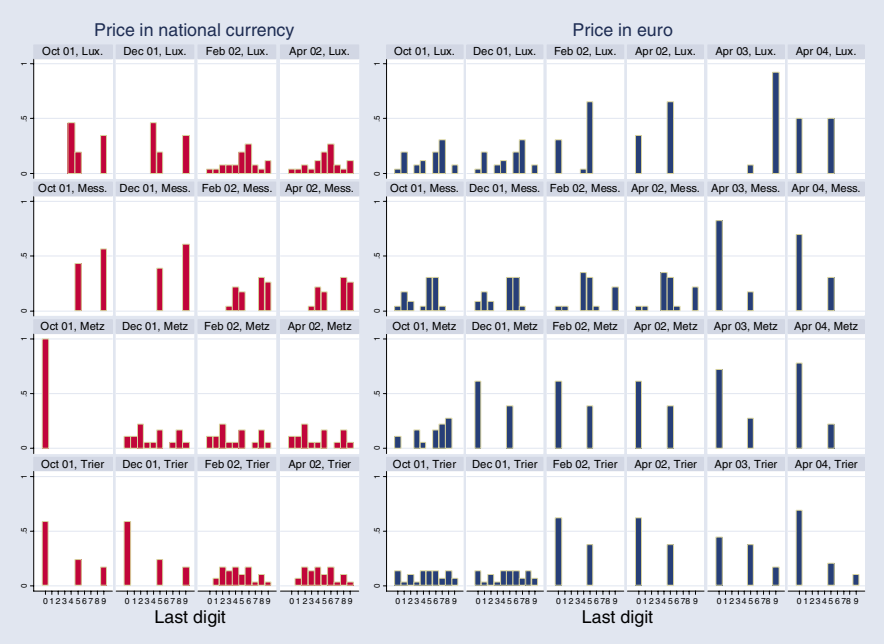

Fig. 1 Last digit of McDonald's prices by price collection place and date

not significantly increased during the immediate cash changeover period. However, with the exception of Trier, they have done so afterwards.

4 The quest for attractive prices

It is well known and documented that a large fraction of consumer prices are set at psychological or fractional pricing points so that they appear attractive for consumers.[3] In order to analyse the impact of this kind of price setting behaviour on deviations from the law of one price I define psychological prices as prices ending with the last digit '9' and fractional prices as prices ending with the last digit '0' or '5'. These definitions correspond closely to the observed distribution of the last digit presented in Fig. 1.

Figure 1 presents histograms of prices' last digit in national currency and in euro encountered in the each of the McDonald's restaurants visited. The prominence of the last digits associated with fractional and psychological prices is striking. Also, the histograms clearly reveal the timing of the adaptation to the single European currency. Prior to the euro cash changeover, the last digit of prices expressed in euro

[3] The issue of pricing at pricing points is mostly analysed in the retail and marketing literature. Schindler and Kibarian (1996) for example report that psychological pricing increases consumer spending. However, see Kashyap (1995) for an analysis of nominal price rigidities using catalogue prices and Basu (1997) for a theoretical explanation of why retailers and producers price in '9s'.

was distributed rather equally between the digits '0' to '9'; prices were still set in national currency, and none of euro prices' last digit '0', '5' and '9' shows the prominence it shows one year after the introduction of euro cash. The most prominent last digits in national currency prior to the introduction of euro cash are the digits '5' and '9'. This is particularly the case in Luxembourg and Messancy. In Metz, all prices encountered showed the last digit '0' in October 2001. A priori, one might have expected the presence of some prices with the last digit '5'; the lowest denominated French coin in use prior to the cash changeover was the 'five centime' coin. French consumers in Metz, thus, were not accustomed to other than encountering fractional prices (as defined in this paper). The adaptation to euro prices in terms of price adjustments was undertaken a couple months ahead of the official cash changeover and earlier than in the other three McDonald's restaurants visited. The histograms reveal the pointed differences in the distributions for October and December 2001. Looking across to euro prices, the distribution that existed in October 2001 vanishes and only the last digits '0' and '5' are encountered thereafter. In Trier, the timing is similar to the timing in Luxembourg and Messancy. In contrast to Luxembourg and Messancy, though, a majority of DEM prices contained the last digit '0', and thus were multiples of the 10-Pfennig coin.

Summarising, these histograms not only clearly reveal the actual timing, but also provide an idea of the astonishing fast speed of the adaptation to euro prices. In Metz, Trier and Luxembourg, prices were entirely set in fractional and psychological terms in euro already in December 2001, February 2002 and April 2002, respectively. In fact, prices displayed in LUF in February 2002 surprisingly contained decimals. This is noteworthy, as decimal prices could not exactly be paid for. When paying, they had to be rounded to the nearest Luxembourg Franc, as lower coin denominations, i.e. centimes, were not in circulation any more. Also, in April 2002, a mere 4 months after the introduction of euro cash, prices were not even displayed in LUF any more. National prices shown in the histogram for Luxembourg in April 2002 are based on reconverted prices from EUR into LUF. Another difference in Luxembourg regards the shares of psychological and fractional prices in April 2003 relative to those in April 2002 and April 2004. This is suggestive of a changed price setting behaviour in Luxembourg at the time of the price collection in 2003.

5 Price equality and deviations from LOP

5.1 Empirical implementation

First, we define $p_{ij,k,t} = |\ln(p_{i,k,t}) - \ln(p_{j,k,t})|$ as the absolute price difference of product k between two locations i and j at time t, where $p_{i,k,t}$ refers to the product price.[4] Key statistics at different collection dates are presented in Table 2. The mean absolute price difference, standard deviation and the maximum absolute price difference remain very similar between October 2001 and April 2002. In contrast, in

[4] I am only comparing prices in same quantities.

Table 2 Summary of absolute price differences (percentage)

Date	Mean	SD	Min.	Max.	No. of obs.
Oct. 2001	14.9	13.0	0	65.3	129
Dec. 2001	15.5	12.9	0	66.6	138
Feb. 2002	16.3	13.5	0	65.9	136
Apr. 2002	15.4	12.3	0	65.3	126
Apr. 2003	19.0	14.3	0	75.1	127
Apr. 2004	18.1	14.3	0	80.9	106
Overall	16.5	13.4	0	80.9	762

Includes price comparisons with identical packaging size only

Table 3 Share of identical prices (percentage)

Comparison between X and Y	Distance in km	October 2001	December 2001	February 2002	April 2002	April 2003	April 2004
Luxembourg–Messancy	30.9	24.0	24.0	4.2	4.3	0.0	5.6
Luxembourg–Trier	47.2	0.0	0.0	6.7	3.4	0.0	0.0
Luxembourg–Metz	72.8	5.6	0.0	5.0	0.0	0.0	28.6
Messancy–Metz	82.1	0.0	0.0	0.0	0.0	11.1	7.1
Messancy–Trier	82.2	0.0	0.0	0.0	0.0	9.5	11.1
Metz–Trier	112.0	0.0	4.8	4.8	5.6	10.5	7.1
All		5.4	5.1	3.7	2.4	4.7	8.5

Based on national prices converted into euro prior to 2002 and euro prices thereafter. Includes price comparisons with identical packaging size only

April 2003 and 2004, all three statistics are larger than before. The mean absolute price differences in April 2003 and 2004 are 3.6 and 2.7% points larger than in April 2002.

Table 3 gives an idea of how many pairwise compared prices are actually identical. Initially, the overwhelming share of identical prices was observed in Luxembourg and Messancy, the two locations visited in the former Belgo-Luxembourg currency association. This changed with the euro cash changeover, as price changes were made at different points in time and different price setting strategies were adopted thereafter. For example, in April 2003, 10% of the observed prices are of fractional nature in Luxembourg, while the corresponding share in Messancy was 100%, resulting in identical prices dropping to zero. As the distribution of the last digit in Metz and Trier is similar to that in Messancy, it is therefore not surprising that none of the prices encountered in Luxembourg in April 2003 is observed for the same product in any other of the locations visited. Noteworthy is nevertheless that in April 2003, a significant share of identical prices were observed for products at locations previously not sharing a common currency. In April 2004, the total share of identical prices in the sample was more than 3 percentage points higher than prior to the euro cash changeover, despite the fact that

the Luxembourg-Messancy pair contributed much less to this outcome. This can be thought of as anecdotal evidence that the presence of identical prices is linked to a common currency.

Next, we would like to know whether psychological and fractional prices affect the size of price deviations. As the observed price differences are censored at the lower end of the distribution, estimation with ordinary least squares (OLS) yields biased coefficient estimates. Therefore, we first estimate a random-effects Tobit model, which accounts for censoring at the lower tail. Consider the linear regression model $p^{*}_{ij,k,t} = \mathbf{x}_{ij,k,t}\beta + v_k + \varepsilon_{ij,k,t}$, where $p^{*}_{ij,k,t}$ is the underlying latent variable. Thus the observed price differences are $p_{ij,k,t} = p^{*}_{ij,k,t}$ if $p_{ij,k,t} > 0$ and $p_{ij,k,t} = 0$ otherwise. Further, let v_k be the panel identifier, in our case is the individual product collected, such as a Big Mac or small Milkshake. The random effects v_{ij} and the error term $\varepsilon_{ij,k,t}$ are assumed to be i.i.d. with $N(0, \sigma_v^2)$ and $N(0, \sigma_\varepsilon^2)$ and independently distributed of each other. As vector of explanatory variables we consider

$$\begin{aligned}\mathbf{x}_{ij,k,t}\beta =& \beta_1 Psycho\_Sam_{ij,k,t} + \beta_2 Psycho\_Dif_{ij,k,t} \\ &+ \beta_3 Fractional\_Sam_{ij,k,t} + \beta_4 Fractional\_Dif_{ij,k,t} \\ &+ \beta_5 \ln(dist)_{ij} \\ &+ \sum_{i=1}^{3}\sum_{j=i+1}^{4} \psi_{ij} Location\_pair \\ &+ \sum_{t=2}^{6} \gamma_t Date\end{aligned}$$

where *Psycho_Sam* equals 1 if prices in both locations are psychological and set in the same currency (EUR after January 2002 or in BEF/LUF before the introduction of the euro) and zero otherwise.[5] *Psycho_Dif* refers to both prices being psychological but set in different currencies. *Fract_Sam* and *Fract_Dif* are analogously defined but refer to both prices being fractional. Table 4 summarises the importance of psychological and fractional prices for identical prices. I conjecture that the size of the price deviations is linked to common pricing points in a common currency. In tradition with common practice, I include the logarithm of distance between the respective locations in order to proxy for transaction costs. Distance is frequently reported to be an important determinant for deviations from LOP (Engel and Rogers 1996; Parsley and Wei 1996, 2003, 2007). The inclusion of location-pair dummies are an alternative to the distance variable, as less structure is put on the distance effect. The included time dummies reflect the different price collection dates and capture the longitudinal changes of price deviations.

In a second step, we also analyse the size of individual product price differences. To this end we estimate a simple OLS regression with product-specific fixed effects.

[5] It is possible that two prices are identical for locations not participating in the Belgo-Luxembourg monetary association prior to January 2002. This is as national prices are divided by the respective irrevocably fixed exchange rates and rounded to the nearest decimal cent.

Table 4 Descriptive statistics on absolute price differences between locations (percentage)

Percentile	1	5	10	25	Med.	75	90	95	99	Ø identical observations	No. of obs.
Psycho_Sam = 0	0.0	0.7	2.1	6.2	13.5	24.1	32.8	42.4	65.3	4.4	746
Psycho_Sam = 1	0.0	0.0	0.0	7.4	17.3	28.9	40.9	45.7	45.7	25.0	16
Psycho_Dif = 0	0.0	0.3	1.9	6.2	13.6	24.1	33.1	42.7	65.3	4.9	754
Psycho_Dif = 1	4.5	4.5	4.5	5.7	11.7	27.2	30.2	30.2	30.2	0.0	8
Fract_Sam = 0	0.0	0.9	2.1	5.3	13.5	23.5	32.3	42.7	66.6	2.0	459
Fract_Sam = 1	0.0	0.0	1.9	6.9	14.1	26.2	33.3	40.5	61.5	9.2	303
Fract_Dif = 0	0.0	0.0	2.3	6.3	13.9	24.1	32.8	42.7	65.3	5.2	707
Fract_Dif = 1	1.6	1.6	1.8	4.3	12.7	27.6	34.4	41.4	58.5	0.0	55
All_Sam = 0	0.8	1.6	1.9	6.3	13.6	25.5	33.6	42.7	59.5	0.9	217
All_Sam = 1	0.0	0.0	2.1	6.1	13.6	23.9	32.6	41.6	65.9	6.4	545

Unconditional fixed-effects Tobit estimates are biased. In our data sample, the share of censored observations is rather low (i.e. 37/762). Thus, while the OLS fixed-effects estimates are expected to be somewhat smaller then those of the TOBIT model, they are not expected to differ by much.

5.2 Price equality and deviations from the law of one price

The apparent interaction between psychological and fractional prices and price deviations is presented in Table 4. More than 6% of all price comparisons in a common currency are identical (*All_Sam*). For psychological and fractional prices the share is larger. For prices that are both psychological and set in a common currency (*Psycho_Sam*) the share of identical prices is 25%, while the share is zero for prices that are psychological and set in different currencies (*Psycho_dif*). A similar pattern holds for *Fract_Sam* and *Fract_Dif*. Prices are identical in 9% of the comparisons for prices that are fractional and set in a common currency, while this is not the case for one single observation for fractional prices set in different currencies. Thus, prices are more likely to be identical if the are either fractional or psychological and set in a common currency.[6]

Table 5 presents the regression results. The presented Tobit estimates refer to marginal effects of the unconditional expected value of the dependent variable $p^{*}_{ij,k,t}$, where $p^{*}_{ij,k,t} = \max(0, p_{ij,k,t})$. As expected the coefficients in the OLS estimation (column (3)) are generally somewhat smaller than those in the Tobit estimation (column (2)). Price deviations are significantly smaller if prices are fractional and set in a common currency. The coefficient *Fract_Sam* is negatively significant at the 1% level. The coefficient size of *Fract_Sam* suggests that prices set at fractional pricing points and in the same currency reduce the unconditional expected deviation from the law of one price by between 2.3 and 4.0 percentage points on average. In

[6] This is also confirmed by a LOGIT random-effects regression analogous to the presented TOBIT regression.

Table 5 Estimation results

	RE Tobit marginal effects		FE OLS
	(1)	(2)	(3)
Psychological and same currency	0.013	0.008	0.009
	0.027	*0.026*	*0.034*
Psychological and diff. currency	−0.025	−0.015	−0.009
	0.033	*0.032*	*0.033*
Fractional and same currency	−0.023**	−0.040***	−0.028**
	0.010	*0.010*	*0.012*
Fractional and diff. currency	0.004	−0.007	−0.013
	0.016	*0.015*	*0.010*
Distance	0.084***		
	0.010		
Luxembourg–Metz		0.061***	0.054*
		0.014	*0.030*
Luxembourg–Trier		0.086***	0.080***
		0.012	*0.028*
Messancy–Metz		0.065***	0.058**
		0.014	*0.025*
Messancy–Trier		0.068***	0.061**
		0.013	*0.030*
Metz–Trier		0.191***	0.187***
		0.015	*0.039*
December 2001	0.006	0.004	0.004
	0.012	*0.012*	*0.003*
February 2002	0.026*	0.034**	0.024*
	0.014	*0.014*	*0.013*
April 2002	0.024*	0.032**	0.021*
	0.014	*0.014*	*0.011*
April 2003	0.048***	0.052***	0.048***
	0.014	*0.013*	*0.009*
April 2004	0.052***	0.061***	0.053**
	0.016	*0.015*	*0.024*
No. of obs.	762	762	762
No. of groups/clusters	32	32	32
Max./Avg./Min.	36/24/6	36/24/6	36/24/6
Log L	516.1***	562.5***	714.4
R^2			0.50
R^2 adj.			0.47
LR-test (pooled vs. RE)	229.5***	257.1***	
Rho	0.324	0.345	

The marginal coefficient estimates of the RE Tobit model are calculated under the assumption that $v_{ij} = 0$ and refer to the unconditional expected value of $p^*_{ij,k,t}$. Standard errors in italic font. FE OLS estimates with robust standard errors and clustered with regard the individual products. *, **, *** denote significance at the 10, 5, and 1% level, respectively. Location-pair and time effects expressed relative to Luxembourg–Messancy in October 2001 (i.e. overall constant)

Table 6 Coefficient estimates of individual McDonald's products (Model 3)

Product name	Unit	Observed quantities	Coefficient	SE	Sign. level
Big Mac	litre	1	0.025	0.022	
Beer		0.3, 0.33	−0.009	0.005	*
Chausson aux pommes (apple pie)	piece	1	0.035	0.002	***
Cheeseburger	piece	1	0.118	0.012	***
Chef salad	piece	1	0.143	0.003	***
Chicken McNuggets, large	piece	20	0.074	0.004	***
Chicken McNuggets, medium	piece	9	0.029	0.002	***
Chicken McNuggets, small	piece	6	0.021	0.002	***
Coca cola, large	litre	0.5	−0.019	0.001	***
Coca cola, medium	litre	0.4	−0.016	0.002	***
Coca cola, small	litre	0.3, 0.25	0.009	0.011	
Coffee	piece	1	−0.049	0.001	***
Egg McMuffin	piece	1	−0.100	0.009	***
Fish Mac	piece	1	0.022	0.001	***
French fries, large	piece	1	0.101	0.009	***
French fries, medium	piece	1	0.072	0.009	***
French fries, small	piece	1	0.058	0.008	***
Hamburger	piece	1	0.219	0.003	***
Happy meal	piece	1	0.044	0.002	***
McChicken	piece	1	0.031	0.012	**
McFlurry	piece	1	0.071	0.002	***
McRib	piece	1	0.034	0.011	***
McSundae, cornet	piece	1	0.175	0.005	***
McSundae, tub	piece	1	0.187	0.002	***
McVeggie	piece	1	0.125	0.011	***
Milkshake, large	litre	0.5	0.092	0.011	***
Milkshake, small	litre	0.25, 0.3, 0.33	0.079	0.017	***
Milk	litre	0.25	0.167	0.004	***
Mineral water, medium	litre	0.33	0.010	0.015	
Orange juice, large	litre	0.47, 0.5	−0.051	0.010	***
Orange juice, medium	litre	0.4	−0.045	0.010	***
Orange juice, small	litre	0.2, 0.25, 0.3	−0.036	0.017	**

The estimations include product-pairs with identical packaging size only. Coefficient estimates relative to overall constant Big Mac (October 2001 for Luxembourg–Messancy)

contrast, *Psycho_Sam* fails to be significant. Neither psychological nor fractional prices set in different currencies significantly contribute to either lowering or increasing the price deviations. All in all, these results provide some evidence in favour of attractive prices set in a common currency lowering the size of price deviations from LOP.

The distance variable has the expected sign, and is significant at the 10% level of confidence interval. The results suggest that doubling the distance between restaurants (i.e. about 62.4 km at the average) increases unconditional expected price deviations by 8.4 percentage points. The size of price deviations was smaller on average inside the former Belgium–Luxembourg monetary association. This can be inferred from the relative size of the location-pair coefficients, which are all positively significant, and owes much to the high share of identical prices prior to the euro cash changeover.

Another interesting finding is that estimated price deviations are on average about 2–3 percentage points larger in February and April 2002 compared to October 2001, and significantly so. The estimates for April 2003 and April 2004 are a further 2–3 percentage points larger. This may to some extent reflect differences in the timing of the euro adjustment and the adoption of a different pricing strategy in Luxembourg in April 2003 (with respect to the share of fractional and psychological prices).[7]

Turning to the product-specific fixed effects presented Table 6, we observe a tendency that price differences move with packaging size. They increase as you move from smaller portions to larger portions for French fries and Chicken McNuggets. In contrast for drinks the reverse seems to hold. The percentage point price difference seems to become smaller the larger the drink is. This is the case for Coca Cola, and Orange Juice, but not for milkshakes. The largest price differences are found for the Hamburger and milk and the smallest ones for the Egg McMuffin, Coffee, and Orange Juice.

6 Concluding remarks

This paper analyses individual *McDonald's* prices in four different countries and shows that prices are more likely to be identical if the prices are set at psychological or fractional pricing points and are set in a common currency. This confirms that a common currency is a vehicle to achieve price equalisation. This mechanism is also important in explaining the size of price deviations, in particular in the case of fractional prices. Hence, deviations from the law of one price may indeed be systematically related to pricing at pricing points in different currencies. This may be of particular relevance for low priced consumer products for which rounding to the next price threshold may result in large price changes in relative terms. Additionally, the absolute size of price deviations increases as distance increases. Finally, price deviations have increased rather than decreased after euro cash changeover.

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[7] Lutz (2003) also reports increasing price differences for Big Mac prices following the euro cash changeover.

Appendix

See Table 7

Table 7 Location of McDonald's restaurants and their distances to each other (km)

Country	Location	Location	Messancy	Metz	Trier
Lux	Luxembourg	Place d'Armes (City Centre)	30.9	72.8	47.2
Bel	Messancy	220, Rue d'Arlon (Cora Shopping Centre)		82.1	82.8
Fra	Metz	Place Saint-Jacques (City Centre)	82.1		112.0
Ger	Trier	Hauptmarkt (City Centre)	82.8	112.0	

Distances are based on the fastest way to reach respective destination
http://www.mappy.com

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