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ARTICLE (PEER-REVIEWED)

## Development of intuition in a new currency, the Euro: The Slovak experience

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### Abstract

Adaptation to an unfamiliar currency is required regularly of international travellers – and also of citizens of countries changing their currency, such as the 19 (to date) Eurozone members. We report on the currency adaptation process in the Slovak Republic during 2008–2011. We analyse its effects on citizens' development of price intuition in the euro. Our study draws on Hofmann et al.'s (2007) work, which proposed four different strategies for coping, ranging from direct numerical *conversion* to developing *intuition*. We conducted repeated cross-sectional surveys using structured questionnaires in realistic Slovak settings. We describe European and Slovak institutions' *supports* for the public, such as dual display of prices, and readily available conversion tables. We found that, whereas the numerical conversion strategy was used most frequently by respondents in the first year, within two years they were already developing intuition in the new currency, especially for frequently bought products. We also investigated the 'Euro Illusion', the extent to which Slovak citizens, in their evaluation of prices, may have been influenced to make decisions based on nominal values, whereby prices in euros seemed smaller than those in Slovak crowns. We summarise suggestions for promoting learning in situations of currency change, and briefly discuss the features of the Slovak process as a 'numerate environment'.

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## Keywords

**Price intuition; numeracy; learning; intuition strategy; marker value strategy; anchor strategy; numerical conversion strategy.**

## Introduction

When people travel to another country, they normally need to adapt to using a different currency. Insights as to how they might do this can be gleaned from the way that citizens of the 19 Eurozone countries responded to the introduction of the euro. The changeover required Eurozone citizens to adapt, in order to understand the value of the new currency and to accept the euro as their own. A sort of ‘national pedagogic project’ in what might be seen as a carefully created ‘numerate environment’ (Evans, Yasukawa, Mallows and Creese 2017) had to be developed in each country. The resulting supports were crucial to individual citizens’ experience of the process.

When a country changes its currency, citizens engage in currency conversion tasks to understand values in the new money. The value can be understood only by numerical conversion to the familiar currency or by comparing the prices of other products. However, to make a direct comparison to similar products, a certain level of price knowledge in the new currency is required, which may be lacking at the time of the changeover (Gamble, Gärling, Charlton and Ranyard 2002; Jonas, Greitemeyer, Frey, and Schulz-Hardt 2002). According to Dehaene and Marques (2002) price knowledge is not stored as an exact price for a product but rather as an approximate range of values.

When first developing intuition for prices in the new currency, the majority of people rely on direct currency conversion to make money related decisions, such as evaluating how much to pay for certain products and services, or just deciding how much money to withdraw from a cash machine. Based on these experiences people learn, thereby developing their numeracy, and they also form attitudes. Understanding attitudes and their social correlates is important, as they influence people’s decisions and practical actions (Kokkinaki 1998), including the ways that they convert prices. Some people may be emotionally attached to the national currency and, if the changeover is not handled sensitively, it can generate negative attitudes that can act as barriers to learning. Furthermore, Meier and Kirchler (1998) show that social knowledge communicated through media and discussions can affect attitudes. Individual perceptions and expectations of price changes and inflation (Ranyard, Missier, Bonini, Duxbury and Summers 2008), can also affect attitudes. Also crucial for the experience of individual citizens is the part played by the state in educating and supporting adults in the currency transaction process, assisting the public to access the available resources, and clarifying how the resources can meet learners’ needs.

Table 1 shows the exchange rate at the time that each of the 19 Eurozone members joined the currency. We can see that levels of difficulty with currency conversion would vary from country to country; for example, they were considerably less difficult in the case of the Slovak Republic (exchange rate about 30 to 1), Belgium (about 40 to 1), Germany (about 2 to 1) and Portugal (about 200 to 1) than in most other Eurozone countries.

Table 1 also shows that, in most cases, the unit of national currency was of a lower value than one euro, except for four of the 19 cases (Ireland, Cyprus, Malta, Latvia). This means that Eurozone citizens had different experiences with their development of price intuition, such

as differing perceptions as to whether prices displayed in the euro currency appeared to be cheaper or more expensive than in the domestic currency.

Table 1 Official currency conversion date and exchange rate by Eurozone countries

Euro Adoption Date	Country	Exchange rate 1€ =
1 January 1999*	Belgium	40.339
	Germany	1.955
	Ireland	0.787
	Spain	166.386
	France	6.559
	Italy	1936.270
	Luxembourg	40.339
	Netherlands	2.203
	Austria	13.760
	Portugal	200.482
	Finland	5.945
1 January 2001*	Greece	340.750
1 January 2007	Slovenia	239.640
1 January 2008	Cyprus	0.585
	Malta	0.429
1 January 2009	Slovak Republic	30.126
1 January 2011	Estonia	15.646
1 January 2014	Latvia	0.702
1 January 2015	Lithuania	3.452

\* Cash Changeover Date: 1 January 2002

Source: European Central Bank, Fixed euro conversion rates (2017)

We designed a repeated cross-sectional study to elicit responses from a total of 365 adults in Slovak Republic, carried out in four phases between April 2008 and January 2011. The samples were selected based on tightly designed quota sampling controlling for geographical region, age, and gender to ensure that samples were representative of the Slovak population and comparable over time (see Appendix A and [Kubascikova-Mullen 2013](#)). In each phase, the sample were asked a broadly similar set of questions, and asked to perform several realistic currency conversion tasks.

To provide background, we also focus on the part played by the state in educating/supporting adults in the currency conversion process. Using available documents, we describe how these resources helped people to adapt in various ways, for example to use different strategies for coping with the numerical demands, and to develop positive attitudes towards the euro. We consider examples of different programmes used in Slovak Republic to support formal, non-formal and informal learning.

## Development of price intuition after currency changeover

The literature related to the introduction of the euro focuses on several aspects of the changeover: (i) adaptation to the use of new bills and coins; (ii) adaptation to the value

system of the new currency; and (iii) support given by various state, financial, and civil society institutions. Developing intuition in a new currency is a lengthy process and studies from different Eurozone countries show that the adaptation process varies from country to country and from individual to individual. Various factors play an important part in the adaptation process such as people's prior knowledge, involvement and familiarity with the euro currency (e.g. Muller-Peters, Pepermans, Kiell, Battaglia, Beckmann, Burgoyne, and Wahlund 1998).

Before, during and after the euro changeover, citizens were bombarded with a great deal of information. Courses, leaflets and media advertisements were used to motivate citizens to learn about the new currency. The internet and other media made information more accessible. In the 'Background' section below, we illustrate the programmes available, to support numerate learning – formal, non-formal and informal – in the Slovak Republic during the conversion process.

The Eurobarometer Survey (e.g. European Commission May 2008a), regularly tracked how many respondents in non-euro countries had seen, or had used, euro bank notes/coins. It is of course an advantage to have the opportunity to become familiar with the euro before a national conversion is launched, something the first 12 Eurozone entrants in 2002 did not have. For example, Irish citizens reported confusion with bank notes and coins even a year after the transition (Ranyard, Routh, Burgoyne, and Saldanha 2007).

As early as 1998 the *Journal of Economic Psychology* (volume 19) published a number of articles on the euro changeover. These articles show national differences in people's attitudes which are affected by various factors including perceived advantages and disadvantages of the euro currency, and ideas of European identity and national identity. Attitudes influence citizens' economic behaviour. According to Meier-Pesti and Kirchler's (2003) study of Austria, positive attitudes encourage savings and investments in home countries; negative attitudes decrease citizens' trust in the economy and people start to invest abroad. Thus our first research question (RQ1) was: *What was the previous experience of the Slovak public with the euro and what were their attitudes towards it?*

The literature provides a conceptual framework to study and to understand how consumers learn the value of the euro and develop the intuitive price system. Marques (1999) and Ranyard, Burgoyne, Saldanha and Routh (2003) studied the general challenges for citizens during and after currency changeover. Marques and Dehaene (2004) investigated the adaptation process in Portugal and Austria after the euro introduction, as a way to investigate two conflicting hypotheses. The *rescaling hypothesis* expects that in a process of adaptation, 'all prices are being rescaled (i.e. transformed) at the same time' (p. 149). In contrast, the *relearning hypothesis* assumes a shift from 'an initial algorithm [...] (i.e. the mental calculation of the price in euros from the estimated price in the former national currency) to reliance on memory-based solutions (i.e. prices in euros)' (p. 149). They concluded that the results of their experiments were more in line with the relearning hypothesis, considering that price estimates became progressively more accurate 'by a process that is [...] faster for frequently bought items' (p. 148).

Hofmann, Kirchler and Kamleitner (2007) also considered the adaptation to euro values to focus above all on the development of price intuition, that is, 'to establish an intuitive value system for (understanding) the euro' (p. 372). Their research, using national surveys and focus groups, led to a conclusion that there were four strategies used by Austrian citizens, to convert values between Austrian schillings and euros; see Table 2.

Table 2 Adaptation Strategies

Strategy	Description
Conversion Strategy	Converting (by numerical calculation) each euro price into the old currency. The calculation can be exact or rule of thumb. A range of conversion tactics used by French respondents were identified by Lemaire and Lecacheur (2001).
Marker Value Strategy	Specific values are learned for example how much 5€, 10€, 20€ is worth in the familiar currency.
Anchor Strategy	This requires learning (remembering) prices, mostly the regularly bought products for price evaluation. For other (similar) products the remembered prices are used as an anchor, a basis for comparison.
Intuition Strategy	No conversion or comparison of the euro to the old currency. People rely on their developing intuition as they buy what they need.

Source: Based on Hofmann, et al. (2007:373).

Hofmann et al. (2007) also found that the adaptation process took a great deal of time: after almost three years of euro use in Austria, adaptation seemed to have progressed slowly: ‘the development of an intuitive system is still ongoing’ (p. 377). Crucially, and somewhat differently from Marques and Dehaene, they recorded that ‘most Austrians applied more than one strategy’ (p. 375) – although the set of strategies used changed over the course of the period they observed. Nevertheless, Hofmann et al. (2007) align the anchor strategy and the intuition strategy with Marques and Dehaene’s (2004) idea of relearning, and the conversion and marker value strategies with the idea of rescaling.

Lemaire and Lecacheur (2001) identified a range of responses to conversion tasks produced by French respondents; some could be executed faster with less effort than others. Their findings suggest that people can be helped to learn simpler and less effortful ways of converting. We re-conceptualised these as ‘tactics’ that respondents could use as part of the direct conversion strategy. Thus our second research question (RQ2) was: *How did people develop their price intuition over the period following conversion?*

This research was further developed to understand the influence of nominal values on price evaluation. In the majority of Eurozone countries, including the Slovak Republic, the transition to the euro meant that their national currencies were replaced by much lower nominal value currency; that is, a price of a given number of units in the original currency would equate to a smaller number of euros. A phenomenon, known as the ‘money illusion’ a tendency to think in the ‘nominal’ rather than the ‘real’ value of money, had been documented in other contexts (e.g. Shafir, Diamond and Tversky 1997). Citizens who are not familiar with the value of the new currency can be overly influenced by the nominal value, rather than by the real value of a given amount of money. For example, they may have thought a product was cheap if it cost 5 EUR; however, they may not have said it was cheap if it cost 150 Slovak Crowns (SKK). In fact 5 EUR was approximately 150 SKK in 2009. This can affect people’s purchasing decisions in the new currency.

In the context of the euro currency changeover [Gamble \(2007\)](#) outlines techniques adopted to investigate to what extent citizens are influenced by the nominal representation of prices rather than the 'real' value, something she called the 'Euro Illusion'. This effect is often investigated through interviews or laboratory experiments. [Gamble et al., \(2002\)](#) also investigated the effect of the euro illusion' on salaries. Some of the factors found to account for the 'euro illusion' by [Gamble \(2007\)](#) are: familiarity with the conversion technique, complexity of the conversion strategy and attitude towards the currency. This leads to RQ3, given below.

To summarise, this report investigates the following research questions:

RQ1 - What was the previous experience of the Slovak public with the euro and what were their attitudes towards it?

RQ2 - How did people develop their price intuition over the period following conversion?

RQ3 - What evidence is there that Slovak citizens were influenced by the nominal representation of prices rather than the 'real' value?

## Methodology

To investigate these Research Questions, structured face-to-face interviews were used. The literature reviewed for this study provided the primary sources of questions: in particular, the Eurobarometer survey and Ranyard's study (2007). To find out more about the learning process, we focused on the strategies identified by [Hofmann et al. \(2007\)](#), drawing on responses to questions which presented realistic conversion tasks, to see how people solved such problems and how comfortable they were in thinking in the new currency; see Questions 5 to 10 in the Selected Questions from the Questionnaire in Appendix B.

Translation and piloting followed, to test the reliability and validity of the questions. The full list of variables and their measurements can be found in [Kubascikova-Mullen \(2013\)](#). Respondents were selected using a tightly designed quota sampling method, informed by breakdowns in the 2001 Slovak census, and controlling for region, age and gender. Because of time and cost constraints, the data were collected in only two selected regions, Trenčín and Bratislava; these regions are important in terms of contribution to economic growth and competitiveness. The samples selected for successive phases of the survey used the same design in order to assure comparability of data, and the samples' characteristics matched those of the population to an acceptably close extent; see Appendix A. (Detailed results can be found in [Kubascikova-Mullen \(2013\)](#) under 'Sample Characteristics'.)

The data were collected using face to face street interviews in the two selected regions. They were collected at four different time points to capture changes in reported experiences, in attitudes, and in the development of relevant numeracy skills during and after the changeover; see [Table 3](#).

Table 3 Phases of cross-sectional surveys and sample size

Study	Time	Sample size (n)
Pilot Study (before the changeover)	April 2008	86
Phase 1 (during the dual circulation)	January 2009	102
Phase 2 (7 months after the changeover)	August 2009	89
Phase 3 (2 years after the changeover)	January 2011	88
Total		365

## Background: The euro conversion process in the Slovak Republic and adult learning

This section describes opportunities for learning created by the state and other agencies to support the changeover. They also used some judicious regulation. For example, to protect people from unjustified price rises, the government made dual display of prices compulsory from August 2008 until December 2010 and ordered strict price monitoring which worked well. The dual display of prices supported the comparison of prices and allowed for the gradual development of price intuition.

To find background information that illustrates the opportunities for learning that were created during the time of the currency conversion we reviewed the material made available by the government, European and national banks, European and national statistical offices, the European Commission, academia, newspapers and websites. These aimed to produce a positive attitude towards the euro, and to help people to prepare to adapt by learning. We describe the support available for learning about the euro (a) *in formal education programmes*; and (b) *in non-formal or informal learning environments*.

### LEARNING ABOUT THE EURO IN FORMAL EDUCATION PROGRAMMES

The Directorate-General for Economic and Financial Affairs [DG ECFIN] allocated resources to provide pedagogical material for teachers and pupils to help with euro integration (European Union 2010), considered the teaching curriculum in primary and secondary schools and identified relevant and existing subjects which had the potential to integrate teaching about the euro and the European Monetary Union (EMU) (see Table 4). They developed teaching materials that promoted a more positive perception of the euro. This study was carried out in the 27 EU member states using multiple methods, including desk study, online consultations, focus groups and interviews. The report considers subjects such as Citizenship/ Civics education, History, Geography and Social studies with some modest attention paid to Mathematics. It briefly mentioned that in mathematics pupils learned to understand and work with money, and at a higher educational level, were introduced to some economic or 'financial literacy' ideas such as inflation (European Union 2010). The range of topics displayed in Table 4 also show the attention paid in the curriculum to the background and aims of the euro, so that young people's attitudes would be based on information, rather than preconception, as far as possible.

Table 4 Educational Tool recommendations; Age Group: 14-18 year olds

Subject	Learning outcomes	Tool themes and formats
Economics Mathematics Citizenship	Compare the basic notions and milestones of the EMU Have discussions on basic notions relating to the euro Define the euro as a product of European cooperation/EU integration Evaluate the benefits of the euro and debate drawbacks	Section on the euro and EMU integrated into economics teaching. Section 1 (14 – 16): Home Economics - Pupils learn about managing money and personal finances. Pupils manage a family household. They have to make decisions on how to spend money. Pupils learn about the roles of banks and make calculations on interest rates and investment decisions. Section 2 (16-18 / Vocational schools): What is the EMU? Pupils learn about the different stages of the euro and the EMU, the conditions of joining the EMU and governance of the EMU. Governments and their budgets, and how they work together under the EMU. Section 3 (16-18): The economic crisis and Europe's management in the context of the EMU. Pupils are encouraged to research economic management in the press and identify the key actors in the management of the euro currency.

Source: European Union, (2010:69-72).

The Ministry of Education in Slovakia developed a special project for primary and secondary schools called 'Euro to schools'. Time was allocated in the curriculum for teachers to help students understand the new currency using learning tools such as games.

### LEARNING ABOUT THE EURO IN NONFORMAL OR INFORMAL LEARNING ENVIRONMENTS

The learning programmes described in the previous subsection were aimed at those still in formal education, most of them 18 years of age or younger; nonetheless, many of these had a role in helping adults, through informal learning, during the changeover (as well as being consumers themselves). There were also a number of nonformal and informal learning initiatives directed at adults of all ages. As already mentioned, the long period of dual display of prices for each good provided multiple illustrations of exact price conversion between Slovak crown and euro. They could also be useful in developing knowledge of prices of frequently bought goods that could act as 'anchors'.

Copies of conversion tables were also widely distributed nationally, and provided examples of conversion between 'round numbers' of euros and crowns. This would help with developing the 'marker value strategy' which allowed the citizen to memorise useful equivalences between the two currencies. Pre-programmed calculators provided support for those adults who wished to produce exact conversions at any stage. Some adults were given additional teaching / revision of 'times tables' which aimed to enable them to 'convert' more fluently.



Another support for nonformal learning provided by the state was the ‘Bundle of Shopping’ poster. These posters showed what items could be purchased for 10 euro, 20 euro and other amounts. This would help with developing the ‘anchor strategy’ which enabled adults to learn prices of regularly bought products such as bread, milk, newspapers.

Most local programmes were designed to help groups with limited access to information, such as the elderly, the visually or hearing impaired, and economically weaker groups, mainly the Roma population. The local authorities provided presentations for the elderly about the new currency, especially to pensioners’ clubs and retirement homes. Some pensioners received euro starting packs as a present. The Slovak Blind and Partially Sighted Union organised training in the use of specially designed tools such as brochures in Braille, and talking cards and calculators. DVDs using sign language were provided for the hearing impaired.

Special training was provided to teach the Roma how to convert between currencies.. The information campaign used further creative ways to attract the attention of the Roma population: TV programmes and DVDs, radio plays, and also theatre performances. A professional Roma theatre company was recruited to explain to the Roma population the adoption of the new currency in a humorous but informative way, using songs, dance and videos. Other research has shown that, in the learning of numeracy, drama can be a useful learning tool (Griffiths and Kaye 2011); it allows the learner to engage in an activity through performing arts and it allows for a range of cultural perspectives.

Given the large amount of information available, it was important for people with different backgrounds to be able to gain access to activities that suited their own learning style. In general, the Slovak Republic did well in targeting vulnerable groups in the population and designing materials to support their specific needs. However, the tools designed did not always suit users. For example, some Slovaks reported that the calculators supplied were too small to use conveniently.

We can compare Slovak efforts with what was tried in other European countries. In Greece calculators appeared to be very popular and supported everyday small-scale purchases; they were available in shops, cafes, on folding tables on street corners (Malaby 2002). In France, citizens were shown how to convert, using mental calculation, values expressed in French francs to euros and vice versa. As a result, people used fewer methods to convert and calculations became faster and more accurate (Lemaire 2007).

The provision of information is an important part of winning support for the conversion process. A study carried out in Austria showed that people who were informed about the changeover process had a more positive attitude towards the euro (Isengard and Schneider 2004). Nevertheless, there is also a danger of people feeling overwhelmed. A recent Eurobarometer survey in Lithuania (which converted to the euro in 2015) found that, although respondents were overall more likely to say they wanted more information, one quarter said that they had enough (European Commission 2015).

The next sections describe people’s experiences with the conversion and the strategies they used to cope in the Slovak Republic in 2008 - 2011.

## Results (1): Previous experiences with the euro and attitudes towards it

From January 2002 the euro had been in circulation in the first 12 euro countries giving the opportunity to citizens of other countries, such as the Slovak Republic, to familiarise

themselves with the new currency prior to their own national changeover. Before the Slovak changeover, in April 2008, we asked citizens whether they had seen and used euro coins and bank notes, in order to investigate their awareness and familiarity with the currency.

**Table 5** Responses to Questions: Have you seen/used euro (coins or notes)?

	*Slovakia April 2008 % Yes	**Slovakia May 2008 %Yes	***Slovenia September 2006 % Yes
Seen	88	77	95
Used	66	49	84

\* This survey

\*\* Source: European Commission (2008a).

\*\*\* Source: European Commission (2006).

The first column of [Table 5](#) shows our sample's results that 88% had already seen both the coins and notes, eight months prior to the euro conversion. According to the Eurobarometer survey ([European Commission 2008a](#)), conducted around the same time, 77% of Slovak respondents had seen euro bank notes/coins. Our figure is higher than the Eurobarometer's probably because our data were not collected in the remote areas where citizens were less likely to have seen the euro.

To put these findings in context we compared these results with those of another Eurozone entrant. The Eurobarometer survey ([European Commission 2006](#)) shows that the percentage of people who had already seen/used the euro coins and notes was much higher in Slovenia, four months before their currency change (in Jan. 2007), at 95% and 84%, respectively. The high percentage for Slovenians who had seen or used the euro could have been due to the fact that Slovenia is a frequent European tourist destination, bordering on Italy and Austria (Eurozone countries since 1999).

The Eurobarometer Survey compared respondents in Slovakia with the other Member States (Slovenia, Malta, Cyprus) that had introduced the euro in 2007 or 2008, concerning the ease of using euro coins and notes; see [Table 6](#).

**Table 6** Distinguishing and manipulating euro currency: percentages reporting difficulties

Country	Coins Rather/very difficult	Notes Rather/very difficult
Slovakia	31	14
Malta	21	9
Cyprus	17	3
Slovenia	26	5

Source: European Commission (2009).

The survey researchers concluded that ‘among the four countries, the Slovak public had greater-than-average difficulties with distinguishing and handling the new currency in the first few months after conversion’ (European Commission 2009:8). However, the differences were not great.

We investigated Slovak citizens’ more subjective experiences of satisfaction (or otherwise) with the euro currency, with Questions 3 and 4 presented in Appendix B. Question 3 asked respondents: *How happy/unhappy are you personally, that the euro has become our currency?* In January 2009, just two weeks after the euro introduction our survey showed that 45% of respondents were happy that the euro was introduced, with a slight increase to 49% in August 2009, seven months after the changeover. However, two years after the changeover in January 2011, the percentage of respondents who were happy that the euro was introduced decreased somewhat to 39%, the lowest level recorded.

When we conducted a series of chi-squared analyses of the relationship of a set of demographic variables with respondents’ reported levels of happiness towards the euro in August 2009, we found no significant relationship between ‘degree of happiness’ and gender, region, level of education or income level. However, those who claimed to be ‘rather unhappy’ were predominantly aged 60 plus. The German Institute for Economic Research had previously found that those who benefitted most from the currency had fewer concerns regarding the euro currency (Isengard and Schneider 2004). This could perhaps explain why elderly people were more likely to be unhappy about the introduction of the euro.

In order to further investigate changes in response to the euro over the transition, we used responses to Question 4, an open-ended question: *If I asked you to describe your personal experience using the euro nowadays, using one or more adjectives (descriptive words), what would you say?* Here respondents had the opportunity to mention as many terms as they wanted - though the majority mentioned only one or two; we coded each response into one of four categories; see Table 7.

Table 7 Responses to the question ‘If I asked you to describe the experience of using the euro nowadays, ...what would you say?’, for the 3 main phases of the survey

Phase	Positive	Ambivalent	Negative	No response
Phase 1 January 2009 n=102	Experience of using the euro described, for example, as ‘good’; or reports that the euro currency made them feel more European and proud (41).	Some ‘needed time’ to adapt to the new currency (12); and some did not have enough experience with the currency at the time of the interview (17).	Experience of using the euro described as ‘not good’, ‘chaotic’, ‘complicated’; complaints that they ‘had to convert’ (10).	(22)

Table 7 continued

Phase	Positive	Ambivalent	Negative	No response
Phase 2 August 2009 N=89	For example, as 'good', 'satisfying' and 'positive' (26).	Experience of using euro described in a rather ambivalent way by some; for example, as something 'that they need time to get used to', or that they had to convert; and also that they were spending euros much more quickly (30).	Experience of using euro described using words like 'complicated', 'angry', 'bad' and 'chaotic' (8).	(25)
Phase 3 January 2011 N=88	Some respondents mentioned the word 'European' (20). Others described the currency positively; e.g. 'good', 'better', 'easy to use', and claimed to be happy and satisfied (15).	Some said that the euro was something they still needed to get used to (4).	Some described their experience with the euro as 'bad', 'chaotic', 'confusing' or 'silly' (10). Others used the word 'expensive' (14). Some mentioned problems with budgeting (4) and others declared that they did not understand the currency at all (6).	(15)

Table 7a Summary of responses by phase

Response to question/phase	Jan-09	%	Aug-09	%	Jan-11	%
Positive	41	40	26	29	35	40
Ambivalent	29	28	30	34	4	5
Negative	10	10	8	9	34	39
No response	22	22	25	28	15	17
Total	102	100	89	100	88	100

Note: The small number of respondents who provided multiply coded responses were categorised in one of the three main categories; therefore totals in each period add to the number of respondents in that period.

The results generally show an increase in negative responses over time. In phase 3 (January 2011, two years after the changeover) we had many more negative comments about the new currency: 39%, in comparison with 10% and 9% in phase 1 and phase 2 respectively;

see [Table 7a](#). Further example, words which were not mentioned previously, were mentioned in Phase 3; for example, ‘difficulty in budgeting’; a feeling that prices in euros were cheaper or difficulty in discerning the real value of the euro; a perceived increase of prices in service sectors like plumbing and decorating. Sometimes respondents became aware of price increases only slowly; for example, one respondent said: ‘*It is only when I get home I realise the price has gone up*’. Some of these issues could be perhaps linked to ‘Euro Illusion’; see Results (3) below. It was expected that two years after the changeover the concerns that citizens had would slowly decrease, but what appears to have happened is that they actually increased over time.

## Results (2): Development of Price Intuition after the Conversion Date

To investigate which strategy people used after the changeover, the four strategies identified by [Hofmann et al. \(2007\)](#) were used to shed light on the learning process. To investigate which ‘adaptation strategy’ people were actually using, we asked them how they performed the conversion tasks; see Questions 9 and 10 in Appendix B.

Respondents were presented with photographs of two products priced in Slovak crowns (bread and DVD player) and two priced in euros (milk and mobile phone). Two items were classed as regularly bought products of small value (bread and milk) and two as ‘exceptional purchases’ (not frequently bought) of higher value (DVD player and mobile phone). Earlier, a number of shops had been visited to ensure that the prices used in the tasks were realistic.

Table 8 Adaptation Strategies applied when solving tasks: classification of respondents’ reports of strategy used for particular tasks

Adaptation Strategy	Frequency August 09	Percent August 09	Frequency Jan 11	Percent Jan 11
Conversion	156	44	67	19
Marker value Strategy	61	17	102	29
Anchor Strategy	3	1	29	8
Intuition Strategy	80	22	146	42
Total Valid Responses	300	84	344	97
No Response	56	16	8	2
Total	356*	100	352**	100

\* $n = 89 \times 4 \text{ tasks} = 356$

\*\* $n = 88 \times 4 \text{ tasks} = 352$

It can be seen from [Table 8](#) that in Slovakia citizens used all four adaptation strategies; however, the frequency of usage of each varied over time. In August 2009, close to a majority of respondents used the ‘conversion’ strategy (44%), decreasing to 19% two years after the changeover. Over the same period the ‘intuition’ strategy increased in frequency from 22% to 42%. Overall these changes suggest respondents were developing a more flexible use of more than one strategy, rather than a preponderant use of simple numerical conversion.

The literature suggests ([Marques and Dehaene 2004](#)) that the use of strategies may depend on the type of purchases involved. Therefore, we divided the four products used in these tasks into ‘frequently bought’ and ‘exceptional purchases’; see [Table 9](#).

Table 9 Two types of conversion tasks: percentage of respondents using each strategy

Strategy	Frequently Bought Products		Exceptional Purchases	
	Aug 2009	Jan 2011	Aug 2009	Jan 2011
Conversion strategy	48	18	56	21
Marker value strategy	17	24	24	36
Anchor strategy	1	10	1	6
Intuition strategy	34	48	19	37
Total	100	100	100	100

Note: This Table includes only 'Valid responses', and excludes responses coded as 'No Response' in Table 8. Thus the percentages presented here have a smaller base than those in Table 8.

The results in Table 9 show that for frequently bought purchases, half of purchases in August 2009 used the conversion strategy (48%); however, in January 2011, this proportion had decreased to 18%, while the intuition strategy had increased from 34% to 48%. For exceptional purchases again in August 2009 conversion was the most frequently used strategy, but by January 2011 the intuition and marker value strategies were more often used.

### Results (3): Evidence that Slovak citizens were influenced by the nominal representation of prices rather than the 'real' value?

This study also sought to explore ideas from research reviewed above on the 'Euro Illusion', more specifically the way that prices expressed in the euro currency are perceived as less expensive than those in the original domestic currency. In order to begin to investigate this in the context of the Slovak changeover we asked respondents whether they spent less or more in euros than they would have done, if they had been using the Slovak crown; see Table 10.

Table 10 'Are you spending less/more money in euros than you would have done, if you had been using Slovak Crowns?': percentages giving each response over 3 phases of survey

	Phase 1 Jan 09	Phase 2 Aug 09	Phase 3 Jan 11
Always less	0	2	2
Most often less	10	7	3
The same	72	45	16
Most often more	16	38	47
Always more	2	6	31
DK	0	2	1
Total	100.0	100.0	100.0

In January 2009, the start of full transition to the euro, the majority of respondents (72%) reported that they were spending the same amount that they would be spending in crowns, and only 18% believed they most often or always spent more than if they had been using Slovak crowns. In August 2009, the percentages were 45% and 44% respectively. By January 2011, the percentage of respondents who reported that they often/always spent more than they would have if they had been using the Slovak crown had increased sharply to 78%, with only 16% responding 'the same'.

We can attempt to explain these changes. In January 2009 the euro was already known as a currency of strong value, and people took care when using it. However, by 2011, the increase in the number of people who thought that they were spending more than under the old currency (18% to 78%) was striking. It may have more than one explanation. People appeared to report above that prices for their purchases had increased; the explanation for this belief may have been that *there actually had been general price inflation across the economy*, and / or that they may have been spending more freely in euros than they were aware because *prices in euros appeared to be lower*. To the extent that the latter was the case it would provide support for the hypothesised 'Euro Illusion' in the Slovak Republic.

## Discussion

The data for this study was collected from just before the international economic and financial crisis starting in 2008, in turn followed by the euro crisis, beginning in 2010. This was not an easy time to convert to the euro – but Slovak citizens engaged in learning, including numerate learning, in order to cope with the demands of the change. In so doing, they were supported by the state and other agencies as we describe above. This was part of a national effort to accomplish something that offered hope for a better future.

We consider here our conclusions relevant to RQ1: *What was the previous experience of the Slovak public with the euro and what were their attitudes towards it?* Slovak citizens had had the opportunity in their travels (to 2002 euro-adopters) to see and to use the euro before it was introduced in their country in 2009. The Eurobarometer did report slightly more difficulty at the outset with distinguishing and manipulating the currency in Slovakia, compared with other 'second-wave' adopters of the euro, Slovenia, Cyprus and Malta; however, these differences were small and may simply have reflected the greater tourist traffic in those other countries.

When respondents were asked for more subjective reactions, our survey found a slight decrease in the percentage of respondents who claimed to be happy that the euro was introduced, from 45% in January 2009 to 39% in January 2011. More strikingly, when asked to describe their experiences with the euro, the majority of respondents at the beginning gave either positive or at least ambivalent responses, but by January 2011, the level of negative response had risen from 10 % to 39%. Thus, it appears that respondents' reactions to the euro experience had actually become more negative over time.

There may be a variety of explanations for this, rather than the idea that there was something inherent in the experience of using the euro that put people off. Slovak consumers may have had a developing perception of growing inflation, which may or may not have been caused by the introduction of the euro; we discuss this further in connection with RQ3, below. Or a general sense of unease with the developing economic and euro crises may have influenced the increasingly negative responses. We cannot be sure from the data we have, but we think it likely that all these factors may have been in play.

We turn to RQ2: *How did people develop their price intuition over the period following conversion?* For this study the development of price intuition was assessed by the frequency of use of adaptation strategies (Hofmann *et al.* 2007) in the four tasks we presented; see Questions 9 and 10 in Appendix B. After seven months of the changeover, in August 2009 the direct conversion strategy was the most frequently used for all purchases (44% of all responses, or 52 % of *valid responses*, in Table 8), and none of the other strategies were used nearly as often. Similar results were found by researchers in other Eurozone countries (Hofmann *et al.* 2007; Marques and Dehaene 2004; Ranyard 2007). However, two years after the changeover the intuition strategy was the most frequently applied overall.

Results for regular and exceptional purchases show that the learning process was related to frequency of purchase by January 2011. Respondents were less likely to convert prices via numerical calculation, or approximately (using the marker value strategy), for regular purchases than they were for exceptional purchases (42% vs 57%, combining conversion and marker value strategies in Table 9). We infer that, through the repeated engagement with the new currency, drawing on their developing price intuition, and, where needed, on supports provided in nonformal and informal settings (see above), citizens have learned to become more flexible in the numeracy practices required to cope with the unfamiliar currency.

People who persist in numerical conversion (re-calculating euro prices into Slovak crowns) increase the cognitive demands of everyday financial decision making. This may lead to a range of undesirable consequences: fear of being cheated; disenchantment with the new currency; less identification with national goals, due to inability to adapt to the changed system. In addition, previous literature (Ranyard *et al.* 2008) shows that people who use the conversion strategy for many years after the changeover may perceive there to be ‘unfair’ price increases as it is difficult to adjust prices for inflation. According to Ranyard (2007) neither the intuition nor the anchor strategies involve reference to the former currency; therefore, there is no need to retrieve prices from long-term memory and adjust them for inflation. Thus, these two strategies do not require mental calculation, and are less time consuming, hence putting less strain on cognitive capacity. Their use also helps the person to develop price intuition over the longer term.

Finally, we summarise our conclusions related to RQ3: *What evidence is there that Slovak citizens were influenced by the nominal representation of prices rather than the ‘real’ value?* As reported above, the data could be interpreted as showing that Slovak citizens correctly perceived there to have been price inflation – and / or that they were spending more freely in 2011 than in 2009, possibly because of a ‘Euro Illusion’.

Slovak citizens had similar perceptions to citizens of other countries, namely that there had been price increases following the currency changeover. The euro changeover in the first 12 Eurozone countries had triggered perceptions in almost all countries that the currency changeover itself had led to increased prices (Hüfner and Koske 2008).

From the psychological point of view the transition to the euro currency was associated with fear of ‘unjustified’ price increases. For example, in September 2008, 65% of Slovak citizens feared an increase of prices after the euro transition (European Commission, 2008b). However, it is difficult for consumers to understand whether price rises they notice are ‘justified’, in the sense of being caused by general economic factors, or ‘unjustified’, perhaps perpetrated by unscrupulous sellers taking advantage of people’s temporary confusion resulting from the changeover.



To put these findings into a broader context we considered official statistics on actual inflation levels (Worldwide inflation data, 2016); see Figure 1. At the start of the Slovak currency changeover through 2009, there was very low inflation recorded in the Eurozone (including Slovakia). However, by 2011, inflation had increased. Thus, people's beliefs about general price increases, reported in Table 10, were well founded. They may also have been subject to the 'Euro Illusion', but it is not possible to decide from the data which of these two interpretations is correct.

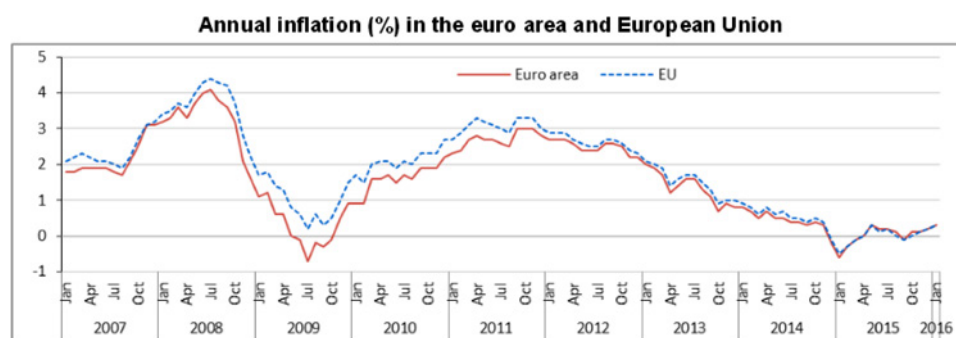


Figure 1: Annual Inflation 2007-2016. Source: Eurostat Press Office (2016). Eurostat news release euro indicators.

## Conclusions

Such 'natural experiments' of national currency changes are relatively rare, and we were fortunate to have the opportunity to study one of them. Since this study was conducted the euro has been introduced in Estonia, Latvia and Lithuania and seven more current members of the EU are expected to follow, in due course. The Slovak case may offer interesting lessons for some of these countries – related to some of the supports for the changeover process described, and to the challenges facing participation in numeracy practices, including citizens' reactions to the change. The Slovak Republic is of special interest as the first member of the Visegrad Group of relatively powerful Central European economies, also including the Czech Republic, Poland and Hungary, to join the euro. Slovakia is also the first country with a large Roma minority to introduce the euro, and other countries with similar minorities, such as Romania and Bulgaria, are among those expected to follow.

Along with much previous research, this study suggests the value of anticipating the 'Euro Illusion', in countries where one euro is worth rather more than one unit of the local currency, as in Slovakia. In general, research is needed into pedagogic methods of countering potential 'money illusions' in countries in the process of converting their currencies. Such learning might also be useful for citizens of any country about to undergo a period of working or living abroad.

The research reported here on cognitive strategies, following Hofmann *et al.* (2007) and others, may be used to support formal and non-formal learning that could help individuals, or groups of adults (or children), to cope with the challenges posed by a change in the currency system. The strategy of *direct numerical conversion* provides a rich focus for numeracy development programmes, for all those who aspire to travel abroad, and can be extended to the use – and design – of calculation methods such as those used in France by Lemaire and Lecacheur (2001). The *marker value strategy* can be seen as the learning of a structure of values that would require, and eventually support, facility in the approximate calculation of currency

equivalences, which may be all that many adults will need. The latter two strategies were characterised by Hofmann *et al.* (2007, following Marques and Dehaene 2004) as ‘rescaling’, whereas we see the other two Hofmann strategies as ‘relearning’, and hence facilitating the *expansion of the adult’s numeracy*. Thus the *anchor strategy* requires the learning (memorisation) of prices of key goods in the new currency and using these to estimate other prices, and the emergence of *price intuition* requires the development of ever more nuanced (memory-based) systems of price ranges of goods in euros.

Evans, *et al.* (2017) developed the idea of a ‘numerate environment’, suggested by the ‘literate environment’ described by the EU High Level Group of Experts on Literacy (2012). Instead of focussing on individual adults’ ‘numeracy scores’- which may reflect an educational and cultural life that is impoverished in numeracy terms, Evans *et al.*, direct attention towards features of the numerate environment that might be faced by groups of adults in a particular setting. They critically consider life in market economies such as the UK – in terms of whether such societies provide *opportunities, supports* and *demands* for adults to develop their numeracy, or alternatively pose *barriers*.

Certainly, Slovak society during 2008–2011 produced *demands* for adaptation to the euro that required learning from the typical adult, including developing participation in the required numeracy practices (Yasukawa, Rogers, Jackson and Street 2018). Given their border with Austria, and occasions to visit other countries already using the euro, Slovaks had plentiful *opportunities* to get to know and to use the euro. Additionally, a range of European and Slovak agencies put great effort and resources into providing *supports* to help citizens – especially those with limited access to information or unusual needs – to cope with the substantial changes underway.

Future research could consider in more detail the extent to which Slovak society during the period of conversion to the euro could be considered to exhibit key characteristics of a ‘numerate environment’. It should also seize opportunities to study national currency conversion processes, when the opportunities arise.

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## Appendix A

Study (controlling variables)  
Samples socio-demographic characteristics

Study	Controlling Variables							Education			Annual Income in Euro 000's				
	Region		Age			Gender		Basic	Secondary	Secondary with Matura (equivalent A levels)	Uni	0-4	4-10	10-20	20+
	Bratislava	Trencin	15-29	30-59	60+	Male	Female								
Pilot study April 2008 n=86	35	51	30	40	16	40	46	0	8	44	34	25	33	21	7
%	41	59	35	47	18	47	53	0	9	51	40	29	38	24	9
Phase 1 January 2009 n=102	41	61	35	48	19	46	56	11	35	39	17	46	40	13	3
%	40	60	34	47	19	45	55	11	34	38	17	45	39	13	3
Phase 2 August 2009 n=89	38	51	31	45	13	40	49	15	15	46	13	46	35	5	3
%	43	57	35	51	14	45	55	17	17	51	15	52	39	6	3
Phase 3 January 2011 n=88	41	47	44	31	13	39	49	10	9	54	15	47	26	11	4
%	47	53	50	35	15	44	56	12	10	61	17	54	29	12	5

## Appendix B

### SELECTED QUESTIONS FROM THE QUESTIONNAIRE USED (TRANSLATED FROM SLOVAK)

1. Have you already seen (a) euro coins? (b) euro notes?
2. Have you already used (a) euro coins? (b.) notes?
3. How happy/unhappy are you, personally: that the euro has become our currency?
4. If I asked you to describe the experience using the euro nowadays, using one or more adjectives (descriptive words), what would you say?

**COULD YOU PLEASE TELL ME TO WHAT EXTENT OR IF AT ALL THE 4 FOLLOWING STATEMENTS DESCRIBE HOW YOU ARE TODAY COPING WITH THE NEW VALUE OF THE EURO CURRENCY:**

5. I know the conversion rate and I use the exact or approximate conversion to evaluate prices.  Always  Often  Sometimes  Rarely  Never
6. I know some specific values for example how much 5, 10, 20 euro is worth in Slovak crown and I use these values to evaluate prices.  Always  Often  Sometimes  Rarely  Never
7. I know some prices of regularly bought products and I use the remembered prices to evaluate prices.  Always  Often  Sometimes  Rarely  Never
8. I know the value of the euro currency and I do not refer back to Slovak crown to evaluate prices.  Always  Often  Sometimes  Rarely  Never
9. Here is an item which was priced in SKK; about how much should it be in euros now, if the proper exchange rate is used?
  - White Bread 1kg            31.50 SKK            \_\_\_\_\_ €    How did you get the result?  
[Record] \_\_\_\_\_
  - DVD                                499 SKK            \_\_\_\_\_ €    How did you get the result?  
[Record] \_\_\_\_\_
10. Here is an item priced in euro; about how much should it be in Slovak crown at the fixed exchange rate?
  - Semi Skimmed Milk 1L            €0.83            \_\_\_\_\_ SKK    How did you get the result? [Record] \_\_\_\_\_
  - Mobile phone                                €183            \_\_\_\_\_ SKK    How did you get the result? [Record] \_\_\_\_\_
11. Do you spend less/more in euro than you would have done, if you had been using Slovak crown?