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ONE CURRENCY, ONE PRICE?

EURO CHANGEOVER-RELATED INFLATION IN ESTONIA

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In 2014 all ECB publications feature a motif taken from the €20 banknote.

GROCERY PRICES IN THE EURO AREA:
FINDINGS FROM INFORMAL ESCB EXPERT GROUP
SET-UP TO ANALYSE A DISAGGREGATED PRICE DATASET

Grocery prices in the euro area: Findings from informal ESCN expert group to analsyse a disaggregated price dataset

This paper was prepared as part of a Eurosystem project group established to analyse a large-scale disaggregated dataset on grocery prices in the euro area. This proprietary dataset was obtained as a follow up to the 2011 Eurosystem Structural Issues Report (SIR) entitled "Structural features of the distributive trades and their impact on prices in the euro area". The main motivation for obtaining these data was to enable the analysis of a variety of issues that was previously not possible owing to data limitations. More specifically (i) analysis of Single Market issues and quantification of border effects (ii) measuring the impact of competition – both at the producer and retail level – on consumer price levels and (iii) consider potential implications for inflation measurement arising from structural changes in retail sector such as the growing importance of discounters and private label brands.

The data were obtained from Nielsen, an international market information and measurement company. The dataset is multi-dimensional with approximately 3.5 million observations each for the price, value and volume variables across a number of dimensions (13 countries; approximately 45 product categories; approximately 70 regions; approximately 10 store types on average per country; 4 brands per product category and 3 stock-keeping units - skus - per brand). The data are generally collected from barcode scanners. These cross country data are unique in a number of respects, in particular in that (a) there are data on average price levels across regions within countries, (b) there is information on both prices and volumes, and (c) there are data on aggregated private label sales and prices. The data have been cross-checked against HICP and PPP data and found to be highly congruent.

The expert group was chaired by Bob Anderton (ECB) and Aidan Meyler (ECB) acted as Secretary. We are also grateful to Stefanos Dimitrakopoulos (Warwick University) who, whilst at the ECB as a trainee, provided invaluable assistance in compiling and working with the database.

Preliminary results from the project group were initially presented at an informal Eurosystem workshop which took place in Frankfurt on 22 November 2013. Apart from the members of the expert group a small number of external participants were invited to the workshop. The following participants acted as discussants: Mario Crucini (Professor of Economics, Vanderbilt University, and Senior Fellow, Globalization and Monetary Policy Institute, Dallas Fed); Daniel S Hosken, US Federal Trade Commission (Deputy Assistant Director); Jarko Pasanen, Eurostat (Team Leader: Price Statistics, Purchasing Power Parities, Housing Statistics) and Thomas Westermann, European Central Bank (Head of Section: Prices and Costs). The refereeing process for the papers from this project was coordinated by the Secretary of the expert group (Aidan Meyler).

As the dataset is proprietary, it cannot be made available to outside researchers. Thus this paper is released in order to make the working papers and accompanying research carried out by the expert group publicly available. Additional papers from the project group will be published as they are finalised. Any queries regarding the project may be addressed to Aidan Meyler (aidan.meyler@ecb.europa.eu).

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Abstract
This paper studies euro changeover-related inflation using disaggregated price level data. The difference-in-differences approach is used and the control group for the treatment country, Estonia, is built from 12 euro area countries. The Nielsen Company disaggregated price data are employed at product, brand and shop-type level. The results indicate that while the overall inflationary effect of euro adoption was modest, the effects were significantly different across various market segments. Changeover-related inflation was higher for products that were relatively cheaper than the euro area average. Inflationary effects were stronger in smaller shops.

Keywords: euro, currency changeovers, market concentration, consumer behaviour
JEL codes: D49, P46, E58

Non-Technical Summary

The inflationary effects of the first euro changeover in 2002 have been widely analysed. It has been found that despite the strong growth in perceived inflation (Ehrmann (2010)), the actual inflationary effects were modest (Sturm et al (2009), Hüfner and Koske (2008)). There is evidence that price increases were concentrated in services (Hüfner and Koske (2008)) and that cheaper products experienced faster inflation (Dziuda and Mastrobuoni (2009)).

The aim of this paper is to analyse changeover-related inflation using disaggregated *price-level* data. We use the case of Estonia, which was the 17th country to join the euro area in 2011. We study the inflationary effects for relatively cheaper products compared to the prices of other euro area countries and analyse brand-level data across different shop types. The monthly data for 13 euro area countries, 45 products, five brand categories and seven shop types from November 2008 to September 2011 are taken from the Nielsen Company. Product categories mostly cover food products, but also alcohol and tobacco, non-durable household goods, personal care products and other products.

The difference-in-differences approach is used where the euro changeover-related inflationary effects are identified by comparing the inflation dynamics in a country that adopted the euro to those in countries that already had the euro. In other words, the inflation in the treatment group, Estonia, is compared to inflation in the 12 other euro area countries. The euro changeover in Estonia overlapped with the recovery from the economic recession, which challenges the identification of changeover-related inflation. We seek to alleviate this problem by controlling for monthly production volumes and unemployment growth. In addition we run a robustness test where the control group consists only of Slovakia, the sample country whose business cycle dynamics are closest to those of Estonia.

The results indicate that the overall effect of the euro changeover on inflation was modest. The strongest inflationary effects were observed for food products half a year before the changeover. This is probably related to menu costs and the policies applied to ensure price transparency during the changeover. Dual pricing in euros and kroons was mandatory for half a year before and half a year after the changeover. This means that the inflationary effects caused by menu costs may already have occurred half a year before the adoption of the new currency. Most of the larger retailers voluntarily joined the campaign "the € will not increase

the price” in which they committed themselves not to increase prices during the half a year period after the changeover. This campaign could also be one of the reasons why price increases were mostly observed in advance of the euro adoption.

Changeover-related inflation differed substantially across market segments. First, we find that products which were relatively cheaper in Estonia than in other euro area countries experienced higher changeover-related inflation. This result implies that international price dispersion has decreased after the changeover. There are many studies in the literature that have sought to find this effect but only a minority of them have reached the same conclusion (e.g. Friberg and Mathä (2004), Allington et al. (2005)).

Second, changeover-related inflation was strongest in smaller shops, while the largest shops, hypermarkets, did not experience any or experienced only very low changeover-related inflation. Larger shops are likely to be more concerned about the negative publicity from raising prices during the period when price transparency is lower for consumers. The smallest category of shops, superettes, small groceries and other small retailers, experienced high changeover-related inflation half a year before the changeover. Smaller shops change prices less frequently and probably timed their price changes for the period when dual pricing was introduced.

It was also tested whether the changeover-related inflation differs across products with different levels of concentration. The Herfindahl concentration index of market shares of five observed brand categories was calculated. We did not find any evidence that more concentrated products experienced stronger changeover-related inflation; in fact products with a concentration level close to the median experienced the strongest effects.

1. Introduction and related literature

Currency changeovers have always been accompanied by a lively public debate about their inflationary effect, and they have motivated many research papers. The perceived changeover-related inflation has been reported to be high despite the modest effects on actual inflation (Ehrmann (2010)). This paper contributes to the literature by analysing how the euro changeover has affected consumer prices in Estonia using brand-level price data.

The empirical literature analysing the episodes of the euro changeover[1] indicates that the impact of the adoption of a new currency on aggregate inflation has been modest. In most of the countries the estimated effects ranged from insignificant to 0.6 percentage points (Sturm et al (2009); Hüfner and Koske (2008)). The inflationary impact has differed across sectors and price level increases tended to be seen most in some service areas such as hairdressing, restaurants and catering, cinemas, and dry-cleaning (Hüfner and Koske (2008)).

A number of factors explaining changeover-related inflation have been put forward by the existing literature. First, and most straightforwardly, the introduction of a new currency is costly and firms need to raise prices to compensate for this (Hobijn, Ravenna and Tambalotti (2006); Gaiotti and Lippi (2005)). Costs include menu costs, which arise from the replacement of price labels, and IT-related costs. As the direct costs apply for a limited period of time, it follows that they should lead to only temporary increases in prices.

Upward pressure on prices can also be caused by rounding to "attractive prices" i.e. prices that end with the numbers 0, 5, or 9. This effect should be symmetric, i.e. firms should be equally likely to round prices up or down. However, given that price levels increase gradually most of the time as deflationary periods tend to be very rare, and given the menu costs, rational firms that are minimising costs in the longer term should opt to round prices up rather than down, within reasonable limits. The empirical evidence indicates that rounding is indeed asymmetric (Aucremanne and Cornille (2001); Folkertsma et al (2002)).

[1] The first round of the euro cash changeover took place on 1 January 2002 and involved the following 12 countries: Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal and Spain. Slovenia joined the Eurozone on 1 January 2007, Cyprus and Malta on 1 January 2008 and Slovakia on 1 January 2009. Estonia adopted the euro on 1 January 2011.

An often-cited reason for the inflationary effect of a currency changeover is the “rational inattention” of consumers (Ehrmann, 2006). The adoption of a new currency temporarily increases the costs of information processing for consumers, for whom it becomes more costly to make decisions related to purchases of goods and services. Therefore they tend to rely on rules of thumb rather than exact calculations and tend to be less aware of the equivalent prices of goods and services in the old currency than companies are. This type of rational inattention from the side of consumers may induce firms to increase prices. Ehrmann (2006) presents evidence in favour of this hypothesis.

The current paper employs the Nielsen Company data on disaggregated prices to analyse the inflationary impact of the euro adoption in Estonia. The dataset covers 45 product categories from November 2008 to September 2011 for 13 euro area countries – Austria, Belgium, Germany, Estonia, Spain, France, Greece, Ireland, Italy, the Netherlands, Portugal, Slovenia and Slovakia. Like the results for previous episodes of the euro changeover, our empirical estimations indicate that the inflationary impact of this event was modest. We apply the difference-in-differences (DID) method, where the treatment group is Estonia and the control group consists of 12 other euro area countries. The estimated DID effects are of the same magnitude as the findings of the study by Rõõm and Urke (2014), which analysed the inflationary impact of the euro adoption in Estonia using the time series of the Harmonised Indices of Consumer Prices (HICP).

The literature related to this topic mostly focuses on the various reasons why inflation accelerates, as it is mostly believed that firms will try to take advantage of the currency changeover to raise prices. However, with the euro adoption it is also possible that elevated public concern about changeover-related inflation may lead to the opposite effect and induce firms to skip price increases (Eife, 2006). This is more relevant for large companies with extended sales networks since they are more likely to be subject to negative publicity if they attempt to raise prices. Thus, it can be expected that larger retailers would be less likely to increase prices around the time of the euro adoption.

It is documented by Dhyne et al (2006) that price-setting behaviour is dependent on retailer size as smaller shops change prices significantly less often than supermarkets and hypermarkets do. All else being equal, this would also imply that the inflationary effects around the time of the euro adoption would be less pronounced for larger retailers. We test this implication in the current study and find supportive evidence for it.

The euro changeover-related effects are assessed across retailers of different sizes. Our estimates yield the result that the size of the store is negatively related to the extent of inflationary impact. For the largest group of vendors, hypermarkets with a store size of more than 2500 square metres, the estimated DID effects are insignificant, implying that the euro changeover was not accompanied by excessive price increases in these stores.[2]

Several studies have investigated the role played by the level of competition in determining the extent of changeover-related price increases. Most of them reached the conclusion that weaker competition or stronger market concentration was associated with a higher inflationary impact from the euro changeover (Folkertsma et al. (2006); Gaiotti and Lippi (2005); Hüfner and Koske (2008)). The analysis by Dziuda and Mastrobuoni (2009) yielded the opposite result. They looked at the relationship between changeover-related inflation and food market concentration across countries that changed over to the euro cash in 2002 and found that they were negatively correlated.

Using the Nielsen data lets us evaluate market concentration at the brand level. Our analysis indicates that products in markets with a medium level of concentration experienced stronger changeover-related acceleration of inflation. We obtain insignificant results for the market segment with the highest level of concentration (the highest quartile on the basis of the Herfinthal index). This evidence implies that there exists a non-monotonous relationship between changeover-related inflation and product market competition.

Since the Nielsen data include the information on price levels, we are able to study the relationship between changeover-related inflation and the structure of prices. We assess whether we obtain differentiated results of the euro adoption for products with varying relative price levels by comparing the prices in Estonia with the cross-country averages. The estimated results imply that price structure matters: the inflationary effects are stronger for

[2] Ehrmann (2010) also distinguishes in his study between supermarkets and mid-priced stores, but the focus of his analysis is different. He tests whether the differences in inflationary impact across countries with more and less complicated exchange rates are dependent on the store size.

products that are relatively cheaper than in other countries. This indicates that the changeover to the euro lowered price dispersion, although the estimated effects were small in magnitude.

There are only distantly related studies that analyse changeover-related inflation for different levels of prices. Dziuda and Mastrobouni (2009) demonstrate higher price increases for cheaper goods after the euro changeover in 2002. They claim that price transparency decreased with the new currency and this had an effect especially on cheaper goods. However, they do not study cross-country differences in price levels. Another line of literature analyses the effect of the euro changeover on price dispersion. Engel and Rogers (2004) find that the euro changeover in 2002 did not reduce the price dispersion of countries that shifted to the common currency. They claim that price transparency had already improved in the 1990s due to policy efforts to integrate consumer markets. Most of the related studies confirm this finding (Goldberg and Verboven (2005), Wolszczak-Derlacz (2008); Parsley and Wei (2008); Fisher (2012)), while there are also studies that find negative significant effects of the euro changeover on price dispersion (Friberg and Mathä (2004); Allington et al. (2005)).

The layout of the paper is as follows: Section 2 gives an overview of the background information related to the current study. Section 3 provides a description of the data and the empirical methodology. The empirical results are presented in Section 4. Section 5 concludes.

2. Background of the study

Estonia was the 17th country to join the euro area, on 1 January 2011. The "big bang" strategy was applied for the currency changeover meaning that there was no transitional period and the dual circulation period of the Estonian kroon and the euro lasted for only two weeks. The government took a number of initiatives to ensure price transparency after the changeover and to minimise the inflationary effects. First, all retailers were required to display prices in both currencies for six months before and after the changeover. Second, the Estonian Chamber of Commerce and Industry launched a campaign "the € will not increase the price" for traders, and more than 400 traders voluntarily joined up to indicate that they were committed to fair price setting. These traders could distinguish themselves by using the official logo of the campaign and all the major retailers (retailer chains and supermarkets) joined the campaign.[3] Third, public price comparison was started on a monthly basis and the prices of the most common products and services were reported in a newspaper of national circulation and on the web. Fourth, kroon-euro calculators were distributed to all the households in the country shortly before the changeover day (National changeover plan (2010)).

Ehrmann (2010) discussed that countries with complex exchange rates experienced lower changeover-related inflation. The nominal exchange rate between the Estonian kroon and the euro was one euro to 15.6466 kroons. Applying the classification by Ehrmann (2010) this conversion rate classifies as a complex one, which according to his analysis should result in lower inflationary effects as the complexity of the conversion rate meant that consumers would mainly not rely on a rule of thumb but would calculate exact prices in the old currency. Ehrmann (2010) also demonstrates that dual pricing contributed to lower inflationary effects for the euro changeover in 2002. Since dual pricing was mandatory in Estonia, it should have tamed inflationary pressures. A third regularity that Ehrmann (2010) discusses is that conversion from high to low nominal value results in larger price hikes for cheaper products. Consequently, a conversion into a nominally stronger currency, as was the case in Estonia, might have caused some underestimation of actual prices by consumers and contributed to higher inflation.

There was only one notable regulatory change in Estonia that could have affected inflation shortly after the euro changeover. There were no changes in value added tax rates and alcohol excise taxes, but the excise tax on tobacco was increased in January 2011.[4] We subtract VAT and excise taxes from the price data in the following analysis to take account of possible changes in taxation in the treatment and control groups. There is no reason to believe that the change in the currency regime had any inflationary effect. Estonia had adopted the currency board as far back as 1992. The exchange rate was initially fixed to the German mark and thereafter to the euro from 2002. Estonia experienced a higher inflation rate than the euro area average for most of the time. The main factors that contributed to higher inflation in Estonia were price convergence and high growth rates fed by strong capital inflows (Staehr 2010).

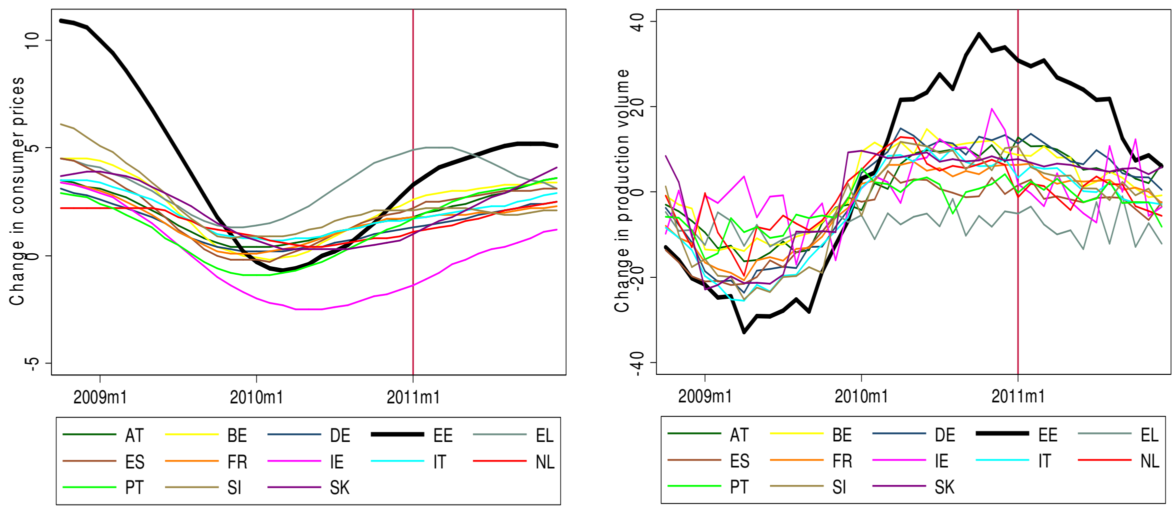
[3] More information about the documentation and campaigns related to the euro changeover is available at: http://www.euro.eesti.ee/EU/Prod/Euroveeb/application/controllers/handleSessions32e5.html?lang=en&oid=3248

[4] The specific tax increased by 14% and ad valorem excise was unchanged, as a result the average price per pack increased from €2.15 in 2010 to €2.32 in 2011.

The country experienced a strong boom-bust cycle with growth rates reaching double digits before the global economic crisis and a sharp economic downturn in 2009. The euro was adopted during the economic recovery, when Estonia experienced higher growth rates than those in the rest of the euro area.

We employ the difference-in-differences method to estimate the inflationary effect of the euro changeover, where Estonia is the treated group. Disaggregated price data from the 12 euro area countries are employed to build the control group. Figure 1 illustrates the dynamics of aggregated consumer prices and industry production volumes in these countries. The overall dynamics of production volume in Estonia differ from those in the control group countries as the amplitude of the cyclical developments has been larger. There is no noticeable change in Estonian aggregated inflation dynamics around the time of the euro adoption in January 2011 as prices had already started to increase in the second half of 2010. The ECOFIN decision on the adoption of the euro in 2011 was announced on 13 July 2010 (National changeover plan (2010)). Since price setting decisions depend on expectations, it is likely that firms already started adapting prices in the second half of 2010.

Figure 1. Growth in the harmonized index of consumer prices (HICP) and volume index of production in percent, monthly data 2008m8-2011m12.



Note: HICP - moving 12 months average rate of change; volume index – 12 months rate of chance of seasonally adjusted production of industry (mining and quarrying; manufacturing; electricity, gas, steam and air conditioning supply).
Source: Eurostat series prc_hicp_mv12r and sts_inpr_m.

The volatile macro developments in the treatment country challenge the construction of a control group. We control for differences in the macro dynamics of treatment and control group countries by adding the unemployment rate and production volume growth as explanatory variables in the empirical specification. Two control group countries – Ireland and Greece – stand out from the rest of the group for their different inflation dynamics. In Greece the inflation rate exceeds that of other countries in 2010-2011, and in Ireland inflation is lower than in the rest of the countries for the same time period.

3. The data and the empirical specification

3.1. Disaggregated price data from the Nielsen Company.

The disaggregated price data come from the Nielsen Company. The dataset covers 45 product categories from October 2008 to December 2011 for 13 euro area countries – Austria, Belgium, Germany, Estonia, Spain, France, Greece, Ireland, Italy, the Netherlands, Portugal, Slovenia and Slovakia. The time-span and products covered differ somewhat across countries, but for most of the countries the data are available from November 2008 to September 2011. Appendix 1 provides an overview of the 45 products that the dataset covers together with their corresponding COICOP definitions. The forthcoming sections provide analysis on three grouped categories of goods: food; alcohol and tobacco; and other goods.

The most disaggregated level of the data in the Nielsen database is at the country, region, product, brand, pack size and store type level. The regional level is not analysed in this paper as it is difficult to build a control group for Estonian regions using the regions of other countries. Analysis at the pack size level is not carried out as it was often not possible to match brands with the same size category across countries. We employ price per unit, where it is defined as a quantitative unit (litre, kilogram or piece). There could be differences in the consumer preferences over pack sizes across countries, which in turn could have an effect on the average price per unit. However, these differences in the structure of quantities consumed should not affect our results as the structure should be stable over the relatively short time-span of the study and we include country fixed effects which control for the time-invariant level effects.

The information about the rest of the disaggregation levels is employed in the paper. The brand level data is grouped into five categories: two leading pan-European brands; two other leading brands within a product category in a country (based on market shares); and the rest of the private label sales. If pan-European brands were not available for a product, four leading brands were chosen instead. Among the four leading brand categories slightly more than 40% of brands are present in only one country, 50% of the brands are available in at least two countries and 10% of brands are available for all 13 countries. In total there are around 1200 brands in the final analysis; this includes the fifth brand category that covers all the remaining private label brands.

The data about store types are not harmonised across countries. For most of the countries the size of the store is determined from its area in square metres. The shop type, like food store, supermarket or kiosk, is also often specified. Using these characteristics the following seven store types are defined: hypermarkets (more than 2500 square metres); large supermarkets (1000-2500 square metres); small supermarkets (400-1000 square metres); superettes (100-400 square metres); groceries (traditional stores or groceries with less than 100 square metres); convenience stores or petrol stations; and drug stores. In addition, store types like discounters, kiosks, tobacco stores and alcohol stores are distinguished in the dataset, but these store types are not available for Estonia and are therefore left out of the analysis.

Appendix 2 presents the number of brands available across countries and store types. The most common type of shop in the database is the small supermarket. There was only one country, Slovakia, where it was not possible to distinguish between large and small supermarkets and all the supermarkets were classified as small supermarkets. The store type structure varies somewhat across countries, as data on hypermarkets are not available for Ireland and Belgium for example, and for some countries it is not possible to distinguish between groceries and superettes.

Changes in tax rates (VAT and excise taxes) are also taken into account to clean the data from other regulatory changes during the period analysed. Due to accumulation of stocks before an expected change in excise tax, the increase in excise tax may not be fully realised in prices right away after the tax hike. For example if the excise tax is increased from January, stocks may have been accumulated in advance and from January these stocks are sold at a lower retail price than would be feasible with the new level of excise taxes. So after an increase in excise taxes the net price of the product (net of taxes) often falls temporarily. Alcohol and tobacco are always shown as a separate category in the analysis to avoid these effects being mimicked in the euro changeover effect.

3.2. Empirical estimation strategy

The difference-in-differences approach with fixed effects is employed. It is sought to meet the common trend condition in inflation dynamics in the treatment country and control group countries by including macro level control variables (unemployment rate and volume index of production). It can be assumed that unemployment and the production volume of industry were not affected by the changeover to the euro in the short run, and so they are taken as suitable controls for the analysis. Around two thirds of foreign trade transactions were made in euros even before the euro adoption (National changeover plan (2010)), which limits the immediate growth effects from a reduction in transaction costs. The price level data are converted into inflation rates with monthly frequency and autoregressive terms are included to control for possible persistence in the series. The empirical specification is the following:

$$\pi_{it} = \alpha_i + \sum_{k=1}^{3} \beta_{1k}\pi_{it-k} + \delta(Estonia \times d_t) + \sum_{k=1}^{3} \beta_{2k}\Delta Prod_{ct-k} + \sum_{k=1}^{3} \beta_{3k}\Delta U_{ct-k} + \tau_t + \varepsilon_{it} \tag{1}$$

where π_{it} is monthly inflation derived from the Nielsen disaggregated price-level data; $\Delta Prod_{ct\text{-}k}$ is the change in the monthly production volume of industry; $\Delta U_{ct\text{-}k}$ is the change in the monthly unemployment rate (see macro variable definitions in Table 1) and τ_t indicates time trend dummies. $T=1, .., 35$ denotes time periods from November 2008 to September 2011, c denotes countries, and i various brands at country and shop-type level. Autoregressive terms with up to three lags are added to control for possible persistence in inflation and macro controls with up to three lags are added to control flexibly for the dynamics of business cycles. The fixed effects estimation is used where the fixed effects are determined at the level of country, brand and shop type. The euro changeover effect is captured by the difference-in-differences term δ. Several different treatment periods, d_t, are applied in the study, spanning various periods before and after the euro changeover. The treatment country is Estonia.

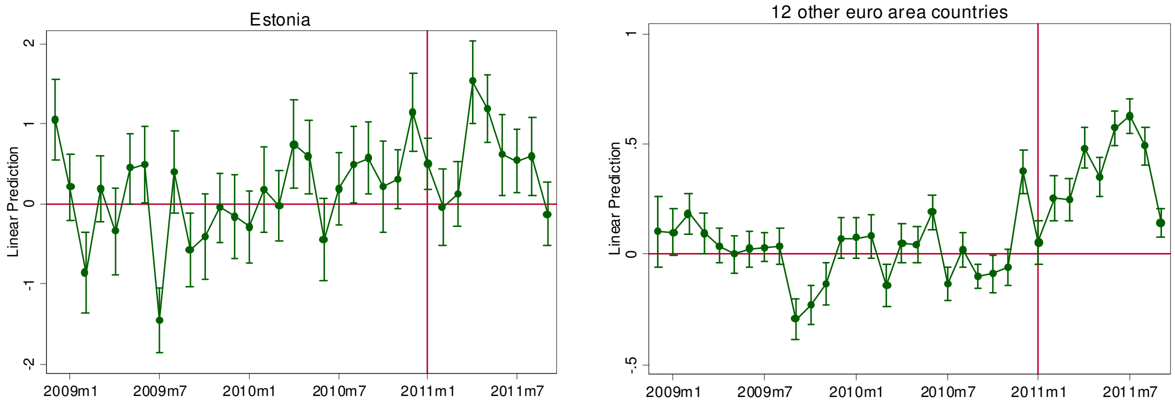
Table 1. Variable definitions

Variable	Definition
Inflation	Monthly growth in price level of average price per unit (unit: litre, kilogram or piece), in %. Source: Nielsen data.
Change in production volume	Monthly rate of chance of seasonally adjusted production volume index of industry, in %. Source: Eurostat series sts_inpr_m.
Unemployment rate	Monthly rate of change of seasonally adjusted unemployment rate, in %. Source: Eurostat series une_rt_m.

An important assumption of the difference-in-differences analysis is that the dependent variable follows similar trends for the treatment and control groups. As was discussed in the previous section and plotted in Figure 1, the macro-level dynamics in inflation have been similar in the treatment country and in most of the control group countries, though the amplitude of the cycle has been much wider in the treatment country and might not be fully controllable by production volume and unemployment growth. We may not be able to identify fully the magnitude of the euro changeover effect. First, the effect could be overestimated due to coincidence of the economic recovery period with the euro adoption period. Second, the 45 products analysed cover only a limited number of all the items in the consumer basket. The main contribution of this paper is to study the prevalence of changeover-related inflation in different market segments and products. The emphasis is on the comparative aspect and it can be assumed that in the short run there was no concentration of recovery in the market segments or products considered in this study.

In order to test the validity of the common trend assumption in the data, we run a simple regression of monthly inflation as described by equation (1), but without macro controls, production volume and unemployment, and with monthly treatment dummies. Figure 2 presents the results. The figure uncovers high volatility and seasonality in monthly inflation data. The overall trends in price-level changes and seasonality patterns are similar in the treatment and control groups. Prices are always systematically higher in December and lower in January, whereas summer always has lower prices. There are noticeable differences in the size of the average price changes in Estonia where the price growth varies by +/-2%, whereas in other countries on average it varies by +/-1%. Despite the differences in the magnitude of price changes in the treatment and control groups, both groups experienced lower growth rates in 2009 and higher growth rates in 2011.

Figure 2. Linear prediction of monthly inflation in Estonia and in the control group, 2008m11-2011m9.



Note: The following descriptive model at country, brand and shop type level is used: $\pi_{it} = \alpha_i + \beta_1 \pi_{it-1} + Estonia * \tau_t + \tau_t + \varepsilon_{it}$, where π_{it} denotes monthly inflation and τ_t monthly time dummies. Fixed effects at country, brand and shop type level are applied. The figures show predictive margins with 95% confidence intervals.

4. Results of the empirical estimation

4.1. Results across all product categories

The specification (1) is estimated using disaggregated price-level data at product, brand and shop-type level. Various "placebo" treatment periods are specified in addition to the time period spanning the year from the end of 2010 to the beginning of 2011 to test whether Estonian inflation differed from that of the control group countries in the years preceding the euro changeover. We also test whether the effects related to the euro changeover are concentrated in a shorter time-span than a year by assessing them over the last two quarters of 2010 and the first two quarters of 2011. Table 2 presents the results.

Several regularities can be identified from the estimation results. First, the assumption that Estonian inflationary trends did not differ systematically from the control group is not valid for food products nor for alcohol and tobacco, as Estonian prices fell substantially more in 2009 than those of the control group countries did. The estimated effects are significantly negative, although the model includes control variables which should capture cyclical dynamics (production volume, unemployment rate).[5] Only the miscellaneous goods category did not experience significantly lower inflation than the control group. This effect can be

[5] Appendix 2 reports the coefficients of control variables. It is evident that the disaggregated price data inflation is not always well correlated with the country level business cycle.

explained by the fact that miscellaneous products are dominated by pan-European brands, which were not produced in Estonia and whose price did not decrease in a magnitude corresponding to the Estonian economic decline in 2009. In the miscellaneous goods category 26% of the brands are available only for one country, while 56% of brands in the food products category are available only for one country.

Table 2. Difference-in-differences estimation results with various treatment periods, November 2008-September 2011.

	Treatment period					
	2009	2010	2011	2010: q3-q4	2011: q1-q2	2010q3-2011q2
All products	-0.420***	0.272***	0.054	0.416***	0.230**	0.481***
	(0.106)	(0.089)	(0.085)	(0.111)	(0.102)	(0.093)
Food	-0.267**	0.372***	-0.204*	0.419***	0.003	0.310***
	(0.129)	(0.106)	(0.106)	(0.130)	(0.134)	(0.112)
Alcohol and tobacco	-1.925***	0.950***	0.367*	1.516***	1.039***	2.098***
	(0.349)	(0.293)	(0.212)	(0.314)	(0.255)	(0.250)
Miscellaneous goods	0.038	-0.295*	0.324*	-0.098	0.222	0.097
	(0.196)	(0.176)	(0.185)	(0.249)	(0.181)	(0.184)
Descriptive statistics of dependent variable						
Average price growth in Estonia	-0.153	0.325	0.476	0.506	0.587	0.547
Average price growth in euro12	-0.002	0.038	0.321	0.015	0.297	0.157

Notes: Table presents estimation results for equation (1), the estimated difference-in-differences effects δ are shown. ***, **, * denote statistical significance at 1, 5 and 10% respectively. Clustered robust standard errors are applied. Appendix 4 reports other coefficients and model statistics for the treatment period 2010q3-2011q2.

The country in the control group that experienced an economic cycle most similar to that of Estonia in 2009-2011 was Slovakia. The results in Table 2 are replicated with Slovakia as the control group and the results are presented in Appendix 5. The difference-in-differences effects are of the same magnitude in this two-country analysis: Estonian inflation was on average 0.48 percentage points higher during the period half a year before and half a year after the euro changeover.

Second, prices increased significantly more in Estonia than in the control group countries in 2010 and 2011. The price increase is concentrated in the second half of 2010 and the first half of 2011, which may be associated with the euro changeover but may also have been caused by the turn of the economic cycle. The average monthly inflation in our data is around 0.55% per month in Estonia and around 0.16% in other countries from the third quarter of 2010 to the second quarter of 2011. This means the unconditional difference in price growth is around 0.39 pp per month. The conditional difference in price growth, after the dynamics in macro variables are taken into account, is around 0.48 pp per month in the brand-level data. The conditional difference is somewhat higher than the unconditional one, indicating that developments in Estonian macro variables were more modest than would have been expected from the rapid price growth.

Third, the higher inflation close to the period of the euro changeover is concentrated in food products. The prices of food products increased significantly half a year before the euro changeover. This result is in accordance with the findings of Rõõm and Urke (2014) on the inflationary effects of the euro changeover in Estonia that are based on the HICP series. The results from the disaggregated price level data on food products are also similar to the HICP based estimates in quantitative terms. This paper finds that the price growth was on average 0.42 pp higher each month half a year before the changeover; Rõõm and Urke (2014) find that the quarterly inflation was 1.10 pp higher during the two quarters before the changeover, which corresponds to 0.37 pp monthly growth. The average monthly CPI growth of food products was 1.12% during the half year before the changeover (Statistics Estonia), hence our estimations indicate that the inflationary effects of the changeover accounted for roughly one third of the actual inflation.

Alcohol and tobacco products also show strong inflationary effects. However, given that there are only four products in this category and these products may have different short-run dynamics because of excise taxes, the estimated effects should be interpreted with caution. Although we deduct excise taxes from our price-level data, the pass-through of tax changes to consumer prices occurs gradually and can take several months. This introduces disinflationary effects in the data cleaned of excise taxes.

4.2. Relative prices

The introduction of the paper noted that a number of studies have found that the euro changeover in 2002 did not result in lower price dispersion, though there have also been some papers with the opposite result. This section tests whether products with a relatively lower price level than the average for the 12 euro area countries experienced higher inflation after the euro changeover. (Relative price levels are calculated as averages across the years before the euro adoption in 2011.) A similar specification to equation (1) is estimated where an additional interaction term for the relative price level and the treatment period is added:

$$\pi_{it} = \alpha_i + \sum_{k=1}^{3} \beta_{1k}\pi_{it-k} + \delta_1(Estonia \times d_t) + \delta_2(RelPrice_p \times Estonia \times d_t) + \sum_{k=1}^{3} \beta_{2k}\Delta Prod_{ct-k} + \sum_{k=1}^{3} \beta_{3k}\Delta U_{ct-k} + \tau_t + \varepsilon_{it} \tag{2}$$

where $RelPrice_p$ denotes the relative price level of a product in Estonia against the average for the 12 euro area countries before 2011; d_t indicates the treatment period as before; and p indicates products, $p = 1, \ldots, 35$.[6] The fixed effects estimation is used where the fixed effects are determined at the level of country, brand and shop type. $T=1, .., 35$ denotes time periods from November 2008 to September 2011, c denotes countries, and i various brands at country and shop-type level. The difference-in-differences effect splits into two parts in this specification. The whole effect equals the sum of δ_1 and δ_2 if the relative prices equal one, meaning that the price level of a product in Estonia and in the other 12 euro area countries is the same. We expect that the coefficient of δ_2 is negative, i.e. the price growth of more expensive products was slower and there was a reduction in price dispersion after the euro changeover.

Appendix 3 demonstrates the value of the relative prices of products in Estonia before 2011. Food products were usually cheaper in Estonia and miscellaneous products more expensive than the average for the 12 euro area countries. There is also a lot of variation in the relative price level, for example olive oil and refrigerated milk are around half as expensive in Estonia while bouillon and uht milk are around 80% more expensive. The separate estimates for alcohol and tobacco are not presented as there are only four products in this category and this is not enough to allow for identification of the effect of relative prices. It should also be noted that relative prices are calculated using price level data from which the value added taxes and excise taxes have been deducted, so differences in the level of taxes do not affect our results.

Table 3 presents the results of equation (2) estimations showing only the coefficients of δ_1 and δ_2. The sum of these two should be around the same as the difference-in-differences effect

[6] The total number of products in the database is 45, but the total number of products available for Estonia is 38 and three products are excluded due to data cleaning as the price increased or decreased by more than 20% in a month.

reported in Table 2. The relative price level has a statistically significant negative effect on the price growth of food products, while the effect is insignificant for miscellaneous goods. The effects are also economically sizeable, for example food products that are 30% cheaper in Estonia had 0.59 pp higher monthly inflation half a year before the changeover, while food products with the same price level had on average 0.47 pp higher inflation. These results are in accordance with the findings of Dziuda and Mastrobuoni (2009) who found that cheaper goods experienced faster growth after the euro changeover. In our sample food products are usually the cheapest products in nominal value. The findings also indicate that the euro changeover has contributed to lower price dispersion for food products in Estonia, which is in line with the empirical evidence from the studies by Friberg and Mathä (2004) and Allington et al. (2005).

Table 3. Difference-in-differences estimation results with various treatment periods, the effect of relative prices, November 2008-September 2011.

	Treatment period					
	2009	2010	2011	2010: q3-q4	2011: q1-q2	2010q3-2011q2
All products						
…difference-in-differences, δ_1	-1.619***	0.841**	0.705**	0.841**	1.113***	1.337***
	(0.352)	(0.332)	(0.293)	(0.363)	(0.352)	(0.262)
…relative prices × difference-in-differences, δ_2	1.227***	-0.568*	-0.700**	-0.391	-0.982***	-0.890***
	(0.326)	(0.309)	(0.291)	(0.370)	(0.363)	(0.246)
Food						
…difference-in-differences, δ_1	-1.287***	0.960**	0.236	0.888**	0.717*	1.084***
	(0.412)	(0.385)	(0.339)	(0.390)	(0.410)	(0.289)
…relative prices × difference-in-differences, δ_2	1.128***	-0.627*	-0.509	-0.419	-0.821**	-0.809***
	(0.362)	(0.344)	(0.327)	(0.386)	(0.415)	(0.253)
Miscellaneous goods						
…difference-in-differences, δ_1	-0.814	-0.633	1.663**	-0.951	0.939	-0.028
	(0.645)	(0.715)	(0.648)	(1.029)	(0.720)	(0.684)
…relative prices × difference-in-differences, δ_2	0.735	0.409	-1.320**	0.840	-0.846	0.021
	(0.616)	(0.689)	(0.610)	(1.013)	(0.736)	(0.670)

Notes: Table presents estimation results for equation (2), the estimated difference-in-differences effects δ_1 and δ_2 are shown. ***, **, * denote statistical significance at 1, 5 and 10% respectively. Clustered robust standard errors are applied.

4.3. Shop types

This section analyses whether the euro changeover-related inflation differs across shop types. As discussed in the data section, our data enable us to differentiate between shop types by looking at the square metres and the general type of a shop, such as whether it is a grocery store or a petrol station. We estimate equation (1) on the subsamples of four major shop types:

hypermarkets, large supermarkets, small supermarkets, and other smaller shops. Table 4 reports the results.

Table 4. Difference-in-differences estimation results with various treatment periods, the effect on different shop types, November 2008-September 2011.

	Treatment period					
	2009	2010	2011	2010: q3-q4	2011: q1-q2	2010q3-2011q2
All sample countries						
…hypermarkets	-0.541**	0.421**	-0.049	0.376	0.084	0.357*
	(0.216)	(0.208)	(0.207)	(0.254)	(0.241)	(0.206)
…large supermarkets	-0.297	0.191	0.052	0.431	0.126	0.396*
	(0.259)	(0.242)	(0.207)	(0.279)	(0.274)	(0.219)
…small supermarkets	-0.903***	0.482**	0.256	0.465*	0.587***	0.777***
	(0.262)	(0.214)	(0.193)	(0.240)	(0.217)	(0.189)
… all smaller shops together [a)]	-0.207	0.144	0.013	0.398**	0.153	0.415***
	(0.156)	(0.121)	(0.124)	(0.167)	(0.148)	(0.147)
Subset of eight countries where hypermarkets, small and large supermarkets and superettes data are available [b)]						
…hypermarkets	-0.484**	0.359*	-0.049	0.325	0.028	0.284
	(0.233)	(0.218)	(0.220)	(0.262)	(0.253)	(0.220)
…large supermarkets	-0.563**	0.316	0.110	0.552*	0.130	0.513**
	(0.275)	(0.253)	(0.226)	(0.290)	(0.294)	(0.236)
…small supermarkets	-0.862***	0.508**	0.119	0.499**	0.424*	0.723***
	(0.288)	(0.223)	(0.209)	(0.251)	(0.233)	(0.207)
…all smaller shops together [a)]	-0.334*	0.204	0.022	0.511***	0.166	0.552***
	(0.172)	(0.128)	(0.133)	(0.175)	(0.157)	(0.160)

Notes: Table presents the estimated results for equation (1) which is estimated on subsamples of four major shop types. Difference-in-differences effects are presented. [a)] All smaller shops together include superettes, groceries, drug stores and gas stations. [b)] The control group of seven countries includes Austria, Germany, Spain, Greece, Italy, the Netherlands and Slovenia. ***, **, * denote statistical significance at 1, 5 and 10%, respectively. Clustered robust standard errors are applied.

The results indicate that the inflationary effects related to the euro changeover were stronger in smaller shops. The effects on hypermarkets and large supermarkets are mostly insignificant and are also smaller than those of the whole sample (see Table 2). The strongest effects are observed in small supermarkets. It is also noticeable that the remaining category of other small shops experienced strong inflationary effects half a year before the changeover.

As the four major shop types are not available in all the sample countries, additional estimations are performed where the control group consists of countries that have data available for the four specified shop types. There are in addition to Estonia seven countries in the database that have data available about hypermarkets, large and small supermarkets, and superettes (please refer to Appendix 2). This exercise enables us to validate our results and ensure that the stronger effects for smaller shops are not caused by variation in the control group countries. The lower part of Table 4 provides estimates on this smaller sample and confirms the result that smaller shops experienced stronger inflationary effects during the euro changeover.

4.4. Market concentration

The next exercise is to test whether products with relatively higher market concentration of brands experienced different effects from those of less concentrated brands. The estimation strategy is similar to the previous section on shop types as brands with a certain concentration in Estonia are compared to brands with a similar concentration in other countries. The concentration of brands is measured as the Herfindahl index of brand shares in the total sales of five brands in the sample.[7] Please see Appendix 3, Figure 2 for the overview of brand concentration in Estonia.

Table 5. Difference-in-differences estimation results with various treatment periods, the effect on products with different concentration of brands, November 2008-September 2011.

	Treatment period					
	2009	2010	2011	2010: q3-q4	2011: q1-q2	2010q3-2011q2
First quartile of Herfindahl index	-0.533**	0.274	0.167	0.306	0.324	0.466***
(<= 0.291)	(0.225)	(0.223)	(0.163)	(0.256)	(0.214)	(0.173)
Second quartile of Herfindahl	-0.739***	0.436*	0.158	0.420*	0.472**	0.668***
index (>0.291 and <=0.360)	(0.252)	(0.226)	(0.187)	(0.248)	(0.232)	(0.200)
Third quartile of Herfindahl	-0.433**	0.367***	-0.044	0.716***	0.156	0.638***
index (>0.360 and <=0.459)	(0.193)	(0.134)	(0.145)	(0.192)	(0.206)	(0.198)
Fourth quartile of Herfindahl	0.012	0.038	-0.056	0.183	-0.016	0.124
index (>0.459)	(0.183)	(0.135)	(0.179)	(0.196)	(0.166)	(0.164)

Notes: Table presents the estimated results for equation (1) which is estimated across quartiles of Herfindahl index. The estimated difference-in-differences effects are shown. ***, **, * denote statistical significance at 1, 5 and 10% respectively. Clustered robust standard errors are reported.

Table 5 reports the results for quartiles of the Herfindahl index based on the average concentration of brands' market shares over the three years analysed. The euro changeover-related inflationary effects do not change much from the sample average effect for the first

[7] The Herfindahl index is calculated as the sum of squares of market shares. The Nielsen data also include information about the brands' market share in total sales of the market and not only the market share of the five brands reported. This information is not used as it is sometimes not comparable across products (e.g. for chocolate the data on chocolate tablets were used, though tablets take only a small fraction of the total chocolate market and would end up showing extremely low concentration in the chocolate market). This paper uses the authors' own calculations of market shares based on the sales volumes of the five reported brands.

quartile of concentration (see Table 2 for the sample average estimates). The second and the third quartile are the ones where the euro changeover-related inflationary effects are the strongest, being roughly one third higher than the sample average. It is also noticeable that for relatively more concentrated brands in the third quartile, the effect is remarkably stronger half a year before the changeover (0.72 pp in Table 5 compared to 0.42 pp of the average changeover related inflation reported in Table 2). However, the relationship between inflationary effects and brand concentration is not monotonous since the highest quartile shows no statistically significant effects.

In sum, this unique brand-level data does not indicate that relatively more concentrated markets with presumably higher mark-ups experienced higher changeover-related inflation. The effects are the strongest for products with a medium level of concentration.

5. Conclusions

The aim of this paper is to assess the inflationary effects of the euro changeover in Estonia. We employ the Nielsen Company disaggregated data, which contain information on prices at the brand and shop-type level. We are not able to identify fully the magnitude of the euro changeover effect. First, the effect could be overestimated due to the coincidence of the economic recovery with the adoption of the euro. Second, the 45 products analysed cover only a limited number of all the items in the consumer basket. The main contribution of this paper is to study the prevalence of changeover-related inflation in various market segments and across different products. The emphasis is on the comparative aspect.

The information on price levels lets us study the inflationary effects of the new currency adoption on the structure of prices. Our estimations indicate that the prices of products that were cheaper relative to the average of the other euro area countries increased by more around the time of the euro changeover. These findings indicate that the adoption of the new currency brought about a decrease in price dispersion vis-à-vis other countries.

We assess the inflationary pressure across stores of different sizes. Our estimations imply that hypermarkets did not experience higher inflation around the time of the euro changeover, whereas the estimated effects for smaller stores were significantly positive. This finding may stem from different price-changing frequencies: larger retailers change prices more often than smaller vendors do. Thus, the menu costs related to the changeover to the new currency were more relevant for smaller shops, who reacted by raising prices. It is also possible that larger retailers were more likely to be subject to negative publicity and therefore avoided price increases in relation to the euro adoption.

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Appendix 1. Product categories covered by Nielsen data.

Product	COICOP category
Food and non-alcoholic beverages	
Cereal	CP0111
Dry pasta spaghetti	CP0111
Rice	CP0111
Frozen fish	CP0113
Tinned tuna	CP0113
Refrigerated milk	CP0114
Uht milk	CP0114
Margarine	CP0115
Olive oil	CP0115
Butter	CP0115
Frozen peas	CP0117
Tinned peas	CP0117
Chewing gum	CP0118
Chocolate tablets	CP0118
Ice cream	CP0118
Strawberry jam	CP0118
Sugar	CP0118
Baby food	CP0119
Bouillon	CP0119
Wet soups	CP0119
Ground coffee	CP0121
Instant coffee	CP0121
Carbonated soft drinks	CP0122
Juice 100%	CP0122
Sparkling water	CP0122
Still water	CP0122
Alcoholic beverages and tobacco	
Whiskey	CP0211
Vodka	CP0211
Beer	CP0213
Cigarettes	CP0220
Other goods (non-durable household goods, other medical products, pets and related products, products for personal care)	
All-purpose cleaners	CP0561
Auto dishwashing detergent	CP0561
Fabric softener	CP0561
Laundry detergent	CP0561
Paper towels	CP0561
Condoms	CP0612
Cat food	CP0934
Dog food	CP0934
Shave preps	CP1213
Deodorant	CP1213
Diapers	CP1213
Panty liners	CP1213
Shampoo	CP1213
Toilet tissue	CP1213
Toothpaste	CP1213

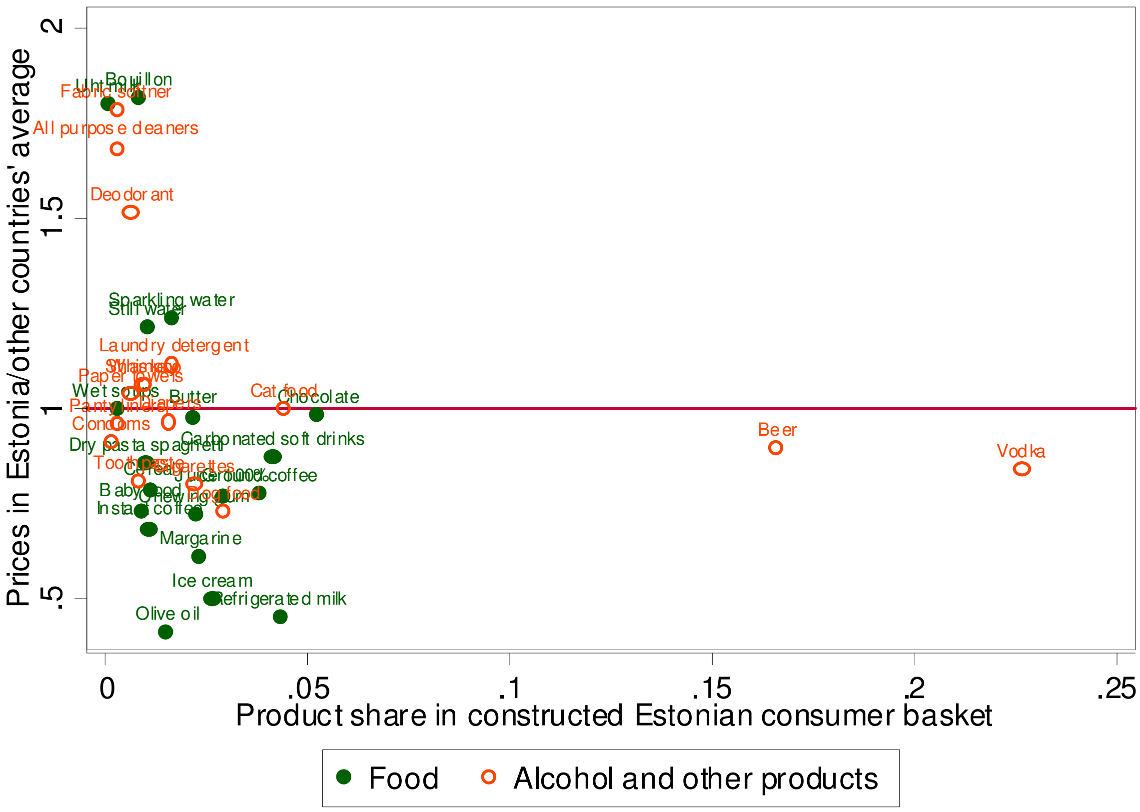
Appendix 2. Covered store type categories, frequency in November 2008-September 2011.

Store type	AT	BE	DE	EE	ES	FR	GR	IE	IT	NL	PT	SI	SK	Total
Drug stores	1487	0	2888	320	826	0	0	0	385	0	124	822	1381	8233
Gas stations	0	0	773	1164	124	0	0	2246	0	0	87	128	332	4854
Groceries	3113	0	0	1482	510	0	0	0	3255	1309	2987	2918	3000	18574
Hypermarkets	2347	0	4733	2364	3456	4116	3231	0	769	818	3687	2741	2480	30742
Large supermarkets	2737	4380	4794	1757	3805	4084	3688	1890	3239	1134	3602	1471	0	36581
Small supermarkets	3395	4395	4664	2426	3680	3981	3739	0	3126	1130	4054	3285	3420	41295
Superettes	3175	4283	4076	2167	3703	0	3767	2321	261	879	0	3146	2806	30584
Total	16254	13058	21928	11680	16104	12181	14425	6457	11035	5270	14541	14511	13419	170863

Note: In case of missing information about supermarket size, the store type is defined as small supermarket.

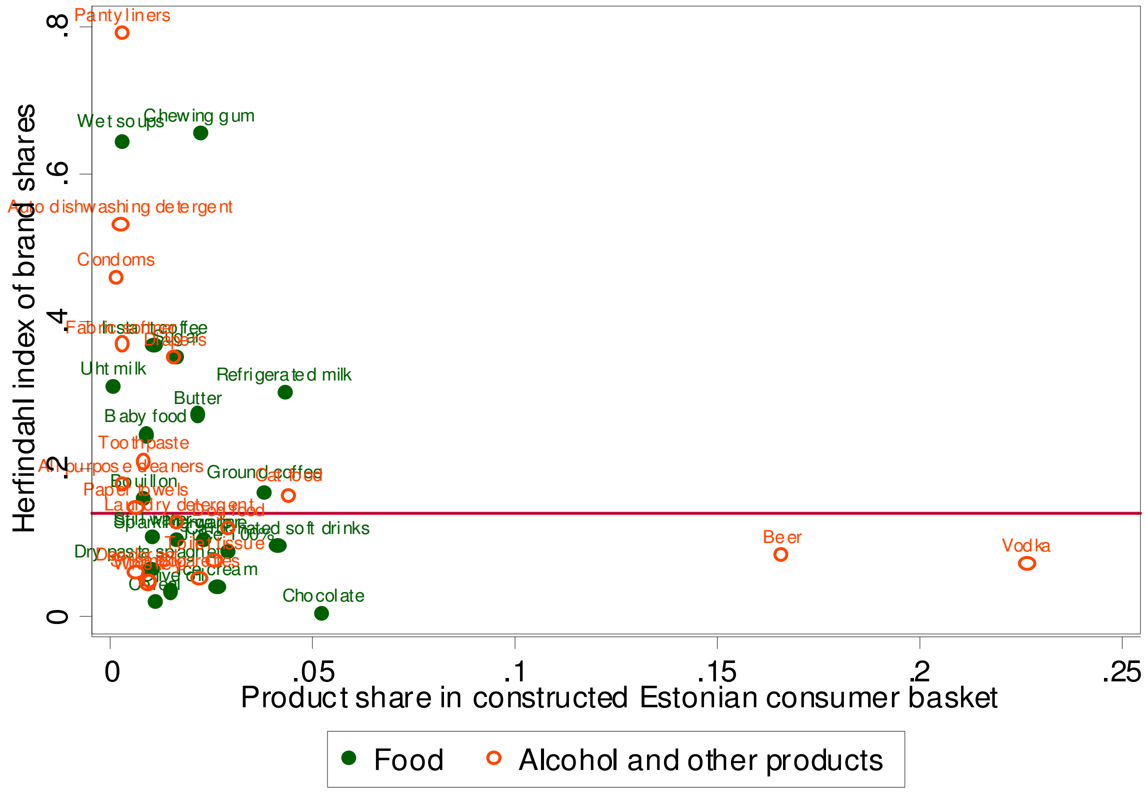
Appendix 3. Estonian relative price-level of selected products, Nielsen data

Figure 1. Estonian relative prices of sample products, 2008m10-2010m12.



Notes: Relative prices are calculated as a ratio of average product prices net of VAT and excise taxes in Estonia before 2011 to weighted average product prices net of VAT and excise taxes in the rest of the sample euro area countries before 2011.
Each product's weight in the constructed consumer basket is calculated as a ratio of given product's sales value with taxes before 2011 to total sales value with taxes before 2011.

Figure 2. Concentration of brands in sample products in Estonia, 2008m10-2010m12.



Notes: Concentration is measured by Herfindahl index, the sum of squared value shares of brands per product. The database covers five brands, which value shares must not equal to 100%, please see the data section for the overview of brand coverage. Concentration index is calculated for each period in each month and averaged over all the months before 2011.

Each product's weight in the constructed consumer basket is calculated as a ratio of given product's sales value with taxes before 2011 to total sales value with taxes before 2011.

Appendix 4. Difference-in-differences estimation results, fixed effects estimation, November 2008-September 2011.

Dependent: monthly inflation	Treatment period 2010q3-2011q2			
	All products	Food and non-alcoholic beverages	Alcoholic beverages and tobacco	Other goods
Inflation (t-1)	-0.167***	-0.159***	-0.227***	-0.171***
	(0.005)	(0.007)	(0.017)	(0.008)
Inflation (t-2)	-0.161***	-0.152***	-0.202***	-0.170***
	(0.004)	(0.005)	(0.014)	(0.006)
Inflation (t-3)	-0.090***	-0.090***	-0.104***	-0.092***
	(0.003)	(0.004)	(0.011)	(0.005)
Estonia*treatment period dummy	0.481***	0.310***	2.098***	0.097
	(0.093)	(0.112)	(0.250)	(0.184)
Production volume growth (t-1)	-0.002	0.008	-0.020	-0.018**
	(0.004)	(0.005)	(0.017)	(0.008)
Production volume growth (t-2)	0.000	0.013**	-0.067***	-0.011
	(0.005)	(0.005)	(0.019)	(0.009)
Production volume growth (t-3)	0.004	0.012**	0.013	-0.013*
	(0.004)	(0.005)	(0.016)	(0.008)
Unemployment rate growth (t-1)	0.004	0.015**	-0.107***	0.001
	(0.005)	(0.006)	(0.017)	(0.010)
Unemployment rate growth (t-1)	-0.012**	-0.016***	0.011	-0.007
	(0.005)	(0.006)	(0.016)	(0.009)
Unemployment rate growth (t-1)	-0.011**	-0.027***	0.083***	-0.003
	(0.005)	(0.006)	(0.019)	(0.009)
Dummies for each month	yes	yes	yes	yes
# of obs.	209238	122617	14834	71787
# of groups	7120	4216	501	2403
Mean gr.	29.387	29.084	29.609	29.874
Rho	0.038	0.039	0.034	0.036
Within R^2	0.051	0.050	0.093	0.056

Note: Clustered robust standard errors in parenthesis; ***, **, * denote statistical significance at 1, 5 and 10% respectively.

Appendix 5. The estimations with one control group country, Slovakia.

Table 1. Difference-in-differences estimation results with various treatment periods and at different levels of aggregation, November 2008-September 2011.

	Treatment period					
	2009	2010	2011	2010: q3-q4	2011: q1-q2	2010q3-2011q2
All products	-0.404**	0.157	0.048	0.352**	0.161	0.477***
	(0.199)	(0.131)	(0.132)	(0.154)	(0.149)	(0.147)
Food	-0.218	0.483***	-0.366*	0.337*	-0.218	0.080
	(0.256)	(0.169)	(0.190)	(0.190)	(0.212)	(0.191)
Alcohol and tobacco	-1.340**	0.392	0.281	1.058**	0.617*	1.569***
	(0.594)	(0.378)	(0.283)	(0.408)	(0.339)	(0.320)
Miscellaneous goods	-0.100	-0.371	0.419*	0.086	0.346	0.439
	(0.393)	(0.250)	(0.254)	(0.327)	(0.257)	(0.294)
Descriptive statistics of dependent variable						
Average price growth in Estonia	-0.153	0.325	0.476	0.506	0.587	0.547
Average price growth in Slovakia	-0.249	0.026	0.293	0.084	0.204	0.144

Note: The table presents only difference-in-differences term coefficients where ***, **, * denote statistical significance at 1, 5 and 10% respectively. Clustered robust standard errors are applied.