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Impact of permanent sales discounts on value added tax revenues: Case of basic food in the Czech Republic

Mikhail Krivko
Department of Economics,
Czech University of Life Sciences Prague,
Czech Republic
krivko@pef.czu.cz
ORCID 0000-0003-2261-8154

Lukaš Moravec
Department of Trade and Finance,
Czech University of Life Sciences Prague,
Czech Republic
moravec@pef.czu.cz
ORCID 0000-0002-7713-4221

Daniela Šálková
Department of Trade and Finance,
Czech University of Life Sciences Prague,
Czech Republic
salkova@pef.czu.cz
ORCID 0000-0002-9930-8595

Luboš Smutka
Department of Trade and Finance,
Czech University of Life Sciences Prague,
Czech Republic
smutka@pef.czu.cz
ORCID 0000-0001-5385-1333

Gabriela Kukalová
Department of Trade and Finance,
Czech University of Life Sciences Prague,
Czech Republic
kukalova@pef.czu.cz
ORCID 0000-0002-1495-525X

Abstract. The study examines frequent price discounts in retail chains in the Czech Republic for a selected range of products (milk, eggs and poultry). Combined with sub-purchase or sub-cost prices, such frequent promotional activities might lead to a decrease in the tax base for VAT payments to the state budget and to a potential loss of VAT. The study introduces an original methodology for estimation of the potential loss of VAT for the state budget due to the use of sub-purchase and sub-cost prices within frequent price discounts (promotional sales). The proposed methodology is used to estimate the VAT loss for milk, eggs and poultry in the Czech Republic in different ways. Most of the results suggest that the loss of VAT revenue for the budget is dependent on the share of promotional sales in the total production of the goods in question. The presence of frequent price discounts might lead to a loss in VAT revenues of up to EUR 74 million in the case of milk, EUR 9.2 million in the case of eggs and EUR 4.6 million in the case of poultry. In comparison to the Czech Republic state budget surplus in 2018, these losses might have a potential to increase the budget surplus by up to 21.73%.

Keywords: consumer prices, tax losses, competition, consumer market, price policy, value added tax, Czech Republic.

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1. INTRODUCTION

Sub-purchase price arises in the retail chain when a retailer sells goods at a price lower than the purchase price. Sub-cost price might be considered a specific type of the sub-purchase price, set when a retailer sells goods at a price lower than the production cost of the good. Both types of prices lead to a decrease in value added tax (VAT) paid by the retailer at the end of the supply chain. In such cases, albeit the actual added value does exist, it is not expressed in monetary terms, as the input VAT for such goods is higher than the VAT payable by the retailer. Practices of selling at sub-purchase and sub-cost prices might be difficult to track for regulators, however they can lead to a decrease in VAT obtained by the state budget. Combined with frequent price discounts, sub-purchase and sub-cost prices might lead to significant losses in VAT tax revenues. In this paper, we propose a way to estimate the effect of frequent and permanent retail price discounts on VAT revenues obtained by state budget. This approach can be applied to estimate VAT effect of frequent price discounts on the Czech Republic state budget for the case of selected basic food products (milk, eggs, poultry). All in all, we argue that frequent price discounts might have a negative effect on state budget VAT revenues, however elimination of this effect might entail adverse externalities on specific groups in society (Nikulin, 2020). The paper is structured as follows. Literature review provides a summary of existing scientific research on the topic of frequent price discounts, sub-purchase and sub-cost pricing, and vertical price transmission. Methodology section presents original estimation methods of the effect frequent price discounts have on VAT. Empirical results and discussion section outlines application of proposed methodology for the case of selected basic food products in the Czech Republic (milk, eggs, poultry). Conclusions section summarizes the findings and empirical results, outlines limitations of proposed methodology and outcomes, and proposes directions for future research on the topic.

2. LITERATURE REVIEW

The presence of sub-purchase and sub-cost prices is closely connected with the topic of retail market concentration and buyer purchasing power, both are widely discussed in the literature (Reardon et al., 2003; Wrigley and Lowe, 2010; Vermont and Cotterill, 1986; Newmark, 1990; OECD, 2014; Digal and Ahmadi-Esfahani, 2002; Villas-Boas, 2007; OECD, 1998; Chen, 2007; OECD, 2013). Frequent discounts on some products have become one of the remarkable features of retail chains. Hawkes (2009) concluded that price promotions lead to a substantial short-term increase in sales of the promoted product and, if applied systematically, can affect consumer purchasing patterns. According to a study by van Heerde et al. (2008a) a direct impact on increasing the sensitivity of customers to promotional pricing occurs. Consumer price sensitivity increases with each new wave of price reductions, as has been shown by van Heerde et al. (2008b). This leads to a further split of price competition of retail chains - if customers decide to purchase goods largely on the basis of price, it is an impulse for sellers to continue undercutting further (Guiltinan and Gundlach 1996). Kopalle et al. (1999), Dekimpe and Hanssens (1999), and van Heerde et al. (2000) state that price promotions often lead to more and more waves of price promotions. Under the pressure of competitors and consumers who expect frequent price discounts, retailers have fallen into a price promotional trap (Bolton et al., 2006). Discounts are most often granted to products popular with customers or products that are profitable in terms of retail margin (Besanko et al., 2014; Kovač, Naletina, & Brezović, 2018). Loy (2020), Empen et al. (2015) has focused on determining which sub-brands of product lines are more often used for effective price promotions. Most of the current scientific literature is focused on the research of price competition from the perspective of retail chains as initiators. Very few studies focus on the impacts on other stakeholders such as suppliers and the state.

It is very difficult to get specific information about retailers' margin values. In the case of margin, it is therefore possible to rely on independent studies based mainly on expert estimates. Based on a survey conducted at the beginning of 2018 by CBA, which compared the prices of 500 dairy products and spirits in foreign retail chains and traditional market outlets, the margin level in traditional market outlets was around 35%. The Czech Confederation of Commerce and Tourism asked the Ministry of Finance of the Czech Republic to provide the survey data and then calculated trade margins for eight products based on the average purchase and sale price ascertained. In six cases, traders had a higher margin for foreign food. Only for packaged butter (250 grams) and long-life semi-skimmed milk with a fat content of 1.5 percent, were the margins higher for domestic products. However, in five cases the price was lower for EU products (butter, edam 30% fat, chicken, pork shoulder, pork leg), only in two cases was it lower for domestic food (milk, pork neck) and in one case it was the same (egg). According to the Czech Confederation of Commerce and Tourism (2017), the trade mark-up for foodstuffs in Czech shops is much lower than the Food Chamber of the Czech Republic claims. The Chamber published the results of an investigation according to which the average mark-up of the retail chain after deduction of all discounts is 80 to 90% of the supplier's price. For milk, on average, about 60%. The better position of processors on the market, in relation to concentrated retail in the Czech Republic, is also confirmed by Blažková and Dvouletý (2017). This study develops an approach of VAT loss estimation due to frequent price promotion activities connected with sub-purchase and sub-cost prices and applies this approach to assess the loss of VAT revenues to the Czech state budget in the case of one product, i.e. milk. Several scenarios are evaluated, including sub-purchase and sub-cost prices. The aim of the research is to estimate the potential loss of VAT revenues for the state budget as a result of frequent price discounts, sub-purchase and sub-cost prices and to determine which of the scenarios represents the highest loss of VAT and what are the differences in VAT loss in accordance to considered scenarios.

3. METHODOLOGY

One of the most straightforward approaches to estimate the potential loss of VAT for the state budget is in calculating the difference between VAT received from the whole supply chain for each goods item by the state budget both in reality (actual situation) and a so-called "should-be" situation (ideal situation, as mentioned further). As the structure of supply chain differs for individual types of products or commodities, the loss of VAT for each of the goods should be considered separately. This study focuses on the case of frequent price discounts for milk, eggs and poultry in the retail chain in the Czech Republic. The supply chain for milk and poultry in the Czech Republic has three main participants (or stages): producer (farmer), dairy plant (industrial producer) and retailer. The supply chain for eggs has two main stages: producer and retailer.

In a general case, the loss of VAT for the state budget is calculated as follows:

$$\Delta_{VAT} = \sum_{i=1}^{n} \Delta_{VATi} \quad (1)$$

where Δ_{VAT} ΔVAT- loss of VAT for the state budget; Δ_{VATi} - loss of VAT for the state budget for a specific product i; n - number of the products that are sold under frequent price discounts.

Potential VAT loss for state budget for a specific product i can be calculated as follows:

$$\Delta_{VATi} = c_i r_0 q_{1i} r_{11} r_{12} r_{13} - c_i r_0 q_{2i} r_{21} r_{22} r_{23} = c_i r_0 (r_{11} r_{12} r_{13} q_{1i} - r_{21} r_{22} r_{23} q_{2i}) \quad (2)$$

where c_i - production cost of the unit of the product i; r_0 - VAT rate for the product i; q_{1i} - number of units of product i actually sold in real terms on the market within frequent price discounts; q_{2i} - number of units of product i sold in an ideal situation on the market; r_{11}, r_{12}, r_{13} - mark-up rates on each stage of supply chain, actually sold on the market; r_{21}, r_{22}, r_{23} - mark-up rates on each stage of supply chain, in an ideal situation on the market (in the situation of the highest possible VAT collected by the state).

In terms of this study, we employ the term mark-up rate denoted by r_{1i} and r_{2i} to illustrate the following relationship:

$$r_{1i} = 1 + \mu_{1i};\ r_{2i} = 1 + \mu_{2i} \quad (3)$$

where μ_{1i}, μ_{2i} - mark-ups in each of the stages of supply chain and in each of the situations on the market respectively.

The number of units actually sold on the market within frequent price discounts can be estimated from the market size of the product:

$$q_{1i} = \alpha_i \times Q_i \quad (4)$$

where Q_i – market size for the product in respective units; α_i – coefficient, showing how many units of product i was sold within frequent price discounts.

The first option is to consider the elasticity of demand for milk to be zero, therefore:

$$q_{2i} = q_{1i} \quad (5)$$

Mark-up rates can be expressed in a shorter format:

$$R_{1i} = r_{11}r_{12}r_{13};\ R_{2i} = r_{21}r_{22}r_{23} \tag{6}$$

In this case the VAT loss formula takes the form of:

$$\Delta_{VATi} = c_i r_0 q_{1i} R_{1i} - c_i r_0 q_{1i} R_{2i} \tag{7}$$

Taking into consideration a one-year period, variables c_i, r_0 and q_{1i} are constants. Therefore, a potential VAT loss is dependent on the difference between R_{1i} and R_{2i}. It is important to mention, that in this case, the elasticity of demand is considered to be equal to zero.

The second option is to consider elasticity of demand to be non-zero. In terms of current models, it is equivalent to estimate the amount q_{2i} as follows:

$$q_{2i} = q_{1i}k_{pi} = q_{1i} - \Delta Q_{1i} \tag{8}$$

$$k_{pi} = \frac{q_{1i} - \Delta Q_{1i}}{q_{1i}} \tag{9}$$

Using the point-price elasticity formula (Sloman et al., 2018):

$$E_d = \frac{dQ_d}{dP} \times \frac{P}{Q_d} \tag{10}$$

$$\Delta Q_{1i} = \frac{E_d \Delta P Q_d}{P} \tag{11}$$

$$q_{2i} = q_{1i} - \frac{E_d \Delta P Q_d}{P} \tag{12}$$

Therefore, the formula for VAT loss takes the following form (keeping in mind, that $q_{1i} = Q_d$):

$$\begin{aligned} \Delta_{VATi} &= c_i r_0 \left(r_{11}r_{12}r_{13}q_{1i} - r_{21}r_{22}r_{23}\left(q_{1i} - \frac{E_d \Delta P Q_d}{P}\right)\right) \\ &= c_i r_0 \left(r_{11}r_{12}r_{13}q_{1i} - r_{21}r_{22}r_{23}q_{1i} + r_{21}r_{22}r_{23}q_{1i}\frac{E_d \Delta P}{P}\right) \end{aligned} \tag{13}$$

Change in price can be expressed as:

$$\Delta P = c_i r_0 r_{11}r_{12}r_{13} - c_i r_0 r_{21}r_{22}r_{23} = c_i r_0 (r_{11}r_{12}r_{13} - r_{21}r_{22}r_{23}) \tag{14}$$

While the price can be expressed as:

$$P = c_i r_0 r_{11}r_{12}r_{13} \tag{15}$$

Putting a change in price and the price into the previous equation and performing several algebraic transformations leads to:

$$\begin{aligned}\Delta_{VATi} &= c_i r_0 q_{1i}\left(R_{1i} - R_{2i} + \frac{E_d R_{1i} R_{2i} c_i r_0 - E_d R_{2i} R_{2i} c_i r_0}{c_i r_0 R_{1i}}\right) \\ &= c_i r_0 q_{1i}\left(R_{1i} - R_{2i} + E_d R_{2i} - \frac{E_d R_{2i}^2}{R_{1i}}\right) \\ &= c_i r_0 q_{1i}\left(R_{1i} - R_{2i} + E_d R_{2i}\left(1 - \frac{R_{2i}}{R_{1i}}\right)\right)\end{aligned} \quad (18)$$

Finally, the VAT loss equation takes the following form:

$$\begin{aligned}\Delta_{VATi} &= c_i r_0 q_{1i}\left(R_{1i} - R_{2i} + E_d R_{2i}\left(1 - \frac{R_{2i}}{R_{1i}}\right)\right) = \\ &= c_i r_0 q_{1i} R_{1i} - c_i r_0 q_{1i} R_{2i} + c_i r_0 q_{1i} E_d R_{2i}\left(1 - \frac{R_{2i}}{R_{1i}}\right)\end{aligned} \quad (19)$$

Comparing equation (19) to (7), it is obvious that the price elasticity of demand forms an additional component of the VAT loss, combined with mark-up rates in an actual and an ideal situation, while production costs, production volume and VAT rate form the magnitude part of the additional component. In general terms, equation (7) is a special case of equation (19) provided $E_d = 0$. It is important to notice the non-linear relationship between R_{1i} and Δ_{VATi} and quadratic relationship between R_{2i} and Δ_{VATi}. Since production costs, VAT tax rate and production volumes Q_i can be considered constant for the period of one year, loss of VAT might be expressed as a function of following variables:

$$\Delta_{VATi} = f(E_d, R_{1i}, R_{2i}, \alpha_i) \quad (20)$$

It is important to consider the cross-price elasticity of products, as increase in price of the product within frequent price discounts might lead to shift of demand to another brand or category. Current study considers basic food, such as milk and eggs, and there is an evidence in literature that such products usually show inelastic demand when the whole product category is considered (Andreyeva et al., 2010; Sano et al., 2014), therefore there is no impact on VAT loss. In case of poultry, price increase might lead to shift of demand to other meat product categories, such as pork or beef. Cross-price elasticity and own price elasticity are connected through diversion rate, therefore own price elasticity formula can be written as follows:

$$E_{di} = \frac{E_{xdij}}{D_{ij}} \times \frac{Q_{dj}}{Q_{di}} \quad (21)$$

where E_{di} – own price elasticity of demand of product i; E_{xdij} – cross-price elasticity of demand of product i in respect to product j; D_{ij} – diversion rate of demand from product i to product j; Q_{di} and Q_{dj} – demand quantities for products i and j respectively.

Taking into consideration (21), equation (19) can be rewritten as follows:

$$\Delta_{VATi} = c_i r_0 q_{1i} R_{1i} - c_i r_0 q_{1i} R_{2i} + c_i r_0 q_{1i} R_{2i}\left(1 - \frac{R_{2i}}{R_{1i}}\right) \times \frac{E_{xdij}}{D_{ij}} \times \frac{q_{2j}}{q_{2i}} \quad (22)$$

This work considers the loss of VAT for the state budget in the special case when $E_d = 0$, therefore the loss of VAT can be considered as a function:

$$\Delta_{VATi} = f(R_{1i}, R_{2i}, \alpha_i) \tag{23}$$

Returning to the coefficient α_i, it is difficult to determine exactly, since it depends on many factors influencing decisions of all retailers on the market to a apply price discount to a specific product i. However, it can be estimated based on the market share of top retail chains in the country, subject to several realistic assumptions. The top of the retail chains in the Czech Republic can be chosen, as it is highly unlikely for other retailers to apply sub-purchase or sub-cost prices in terms of frequent price discounts.

The Czech Republic is a price-sensitive market where promotional sales are very important. The Czech Republic ranks among countries with the highest proportion of promotional sales. Promotional purchases reach 47% of total FMCG value spent incl. fresh (FAS Europe, 2019). As this estimation of coefficient α_i is not supported by other sources, we perform several scenario estimates, where each of the scenarios considers different values of α_i. Effectively, we calculate the values of the function (24) for different values of α_i in order to see the dependence of VAT loss on the coefficient.

$$\Delta_{VATi} = f(\alpha_i) \tag{24}$$

In the current estimate, mark-up rates from the first group (r_{1i}) are set up in such a way that the final price of the product (including VAT) is equal to the authors' data on prices in terms of frequent price discounts in the Czech Republic. Mark-up rates from the second group (r_{2i}) are set up in accordance to farmers', producers' and consumers' prices obtained from the Czech Statistical Office (CZSO) for the year 2018. The summary of final prices used in actual and ideal scenarios is shown in Table 1.

Table 1

Prices of products per estimated scenarios (including VAT)

Product	Price in ideal situation	Price in actual situation
Milk	0.8 EUR per litre	0.39 EUR per litre
Eggs	0.15 EUR per piece	0.07 EUR per piece
Poultry	2.71 EUR per kg	2.34 EUR per kg

Source: CZSO (2018), authors' data.

Four estimated scenarios differ in terms of coefficient α_i, which takes the values of 5%, 10%, 25% and 50%. Calculations are shown in euros (EUR) employing the average daily exchange rate of 2018 equal to 25.643 CZK per EUR, based on the exchange rates published by the Czech National Bank (2019).

4. EMPIRICAL RESULTS AND DISCUSSION

The estimated loss of VAT is calculated as a difference between two situations: the ideal situation and the actual situation, with the data of 2018. The calculation of the final VAT received by the state is based on the final price of the product on supermarket shelves under so-called frequent discounts, when a retail chain conducts price promotions at relatively long intervals. The final price is derived from the cost of production of the goods (farmers' costs) by applying a mark-up (greater than or less than 0) at each stage of the supply chain. If the sales price (excluding VAT) at the current stage is lower than the purchase price at the current stage, this means that the seller applies a negative mark-up at the current stage of the supply chain.

From this standpoint, the loss of VAT depends on two factors: the cost of production of the goods (the cost of the farmer) and the mark-up rates at each stage of the supply chain. Milk, egg and poultry production costs are given according to the information from the Institute of Agricultural Economics and Information (IAEI), selling prices within permanent discount events are shown according to observations

in the largest retail chains in the Czech Republic, such as Albert, Globus, Tesco. The mark-up rates are estimated according to the prices of farmers, industrial producers and consumers, published by the Czech Statistical Office (CZSO).

Table 2

VAT received by state budget per unit (litre), actual situation and ideal situation (in italic), milk

Supply chain stage	Indicator	Value	VAT asset	VAT liability	VAT to pay/to return	VAT revenue cumulative for state budget
Producer (farmer)	Cost	0.32 EUR *0.32 EUR*		0.05 EUR *0.06 EUR*	0.05 EUR *0.06 EUR*	0.05 EUR *0.06 EUR*
	Mark-up	5.30% *30.00%*				
	VAT rate	15.00%				
	VAT	0.05 EUR *0.06 EUR*				
	Price without VAT	0.33 EUR *0.41 EUR*				
	Price including VAT	0.38 EUR *0.47 EUR*				
Dairy plant	Purchase price	0.38 EUR *0.47 EUR*	0.05 EUR *0.06 EUR*	0.04 EUR *0.09 EUR*	-0.01 EUR *0.03 EUR*	0.04 EUR *0.09 EUR*
	Mark-up	-22.60% *30.00%*				
	VAT rate	15.00%				
	VAT	0.04 EUR *0.09 EUR*				
	Price without VAT	0.26 EUR *0.54 EUR*				
	Price including VAT	0.3 EUR *0.63 EUR*				
Retailer	Purchase price	0.3 EUR *0.63 EUR*	0.04 EUR *0.09 EUR*	0.05 EUR *0.1 EUR*	0.01 EUR *0.01 EUR*	0.05 EUR *0.1 EUR*
	Mark-up	30.00% *30.00%*				
	VAT rate	15.00%				
	VAT	0.05 EUR *0.1 EUR*				
	Price without VAT	0.34 EUR *0.7 EUR*				
	Price including VAT	0.39 EUR *0.8 EUR*				

Source: CZSO (2018), authors' data, own calculations.

The supply chain stage at which the negative mark-up happens, is irrelevant for the calculation of cumulative VAT revenue for the state. Therefore, current estimation places negative mark-up in the stage of dairy plant, as this participant of the supply chain has a direct relationship to the retailers. As can be seen from the values in Table 2, VAT finally received by the state budget (0.05 EUR per litre) does not significantly differ from VAT received by the state budget at the beginning of the supply chain (0.05 EUR per litre). It is important to notice, that despite the created added value in each of the stages of the supply chain (industrial processing of milk, retail distribution of milk), the final VAT revenue for the state budget does not significantly differ from the VAT received at the first stage – production of milk in the farms.

The ideal scenario considers the prices obtained from CZSO for each of the stages of supply chain. According to the CZSO methodology, these prices already include prices in terms of frequent discounts,

which means that these prices are lower than they would be if it was not for frequent discounts. Therefore, the estimated loss of VAT in this work is a minimal loss for the state budget.

The difference between the ideal and the actual situation is 0.1 EUR / litre - 0.05 EUR / litre = 0.05 EUR / litre, which is the loss to the state in VAT per litre of milk, which is sold under permanent discounts. The estimate of annual loss can be made based on CZSO data on the volume of milk consumed in the Czech Republic. The input parameter is the share of milk (in percent), which was then sold as a part of frequent discounts (coefficient α_i in terms of this study). The total VAT loss for the state budget in the situation, wherein 50% of all milk consumed in the Czech Republic is sold in terms of frequent price discounts, totalled to 74 million EUR.

In the same way, it is possible to estimate the theoretical VAT loss for eggs and poultry. Table 3 shows estimates of the theoretical annual loss of VAT for the state budget in the case of eggs for consumption. From a methodological standpoint, the estimation for eggs consists of two stages of the supply chain: producer (farmer) and retailer.

Table 3

VAT received by state budget per unit (piece), actual situation and ideal situation (in italic), eggs.

Supply chain stage	Indicator	Value	VAT asset	VAT liability	VAT to pay/(to return)	VAT revenue cumulative for state budget
Producer (farmer)	Cost	0.07 EUR *0.07 EUR*		0.01 EUR *0.01 EUR*	0.01 EUR *0.01 EUR*	0.01 EUR *0.01 EUR*
	Mark-up	-6.50% *30.00%*				
	VAT rate	15.00%				
	VAT	0.01 EUR *0.01 EUR*				
	Price without VAT	0.06 EUR *0.09 EUR*				
	Price including VAT	0.07 EUR *0.1 EUR*				
Retailer	Purchase price	0.07 EUR *0.1 EUR*	0.01 EUR *0.01 EUR*	0.01 EUR *0.02 EUR*	0 EUR *0 EUR*	0.01 EUR *0.02 EUR*
	Mark-up	-3.00% *30.00%*				
	VAT rate	15.00%				
	VAT	0.01 EUR *0.02 EUR*				
	Price without VAT	0.06 EUR *0.13 EUR*				
	Price including VAT	0.07 EUR *0.15 EUR*				

Source: CZSO (2018), authors' data, own calculations.

As it can be seen from Table 3, negative mark-ups have been allocated to both stages of the supply chain. It is important to mention, that this allocation is irrelevant to the calculation of VAT loss and has been shown here as a reference. Producer price of eggs of 0.06 EUR (without VAT) is set according to the public data on producer prices originating from CZSO. In terms of eggs, VAT loss per piece in the presence of frequent price discounts totalled to 0.01 EUR. The value of annual VAT loss in the case of eggs is significantly lower than for milk, which is mainly due to lower VAT loss per unit (0.01 EUR).

Table 4 shows estimates of the theoretical annual VAT loss for the state budget in the case of poultry. Prices of whole chilled chicken and the volume of poultry production in the Czech Republic in 2018 are

used to estimate the loss of VAT. The production volume of poultry is converted from the production volume of animals for slaughter according to the CZSO information using the coefficient 0.734.

Table 4

VAT received by the state budget per unit (piece), actual situation and ideal situation (in italic), poultry

Supply chain stage	Indicator	Value	VAT asset	VAT liability	VAT to pay/(to return)	VAT revenue cumulative for state budget
Producer (farmer)	Cost	0.91 EUR *0.91 EUR*		0.14 EUR *0.19 EUR*	0.14 EUR *0.19 EUR*	0.14 EUR *0.19 EUR*
	Mark-up	3.50% *36.22%*				
	VAT rate	15.00%				
	VAT	0.14 EUR *0.19 EUR*				
	Price without VAT	0.94 EUR *1.24 EUR*				
	Price including VAT	1.08 EUR *1.42 EUR*				
Industrial producer	Purchase price	1.08 EUR *1.42 EUR (cost)*	0.14 EUR *0.19 EUR*	0.24 EUR *0.27 EUR*	0.1 EUR *0.09 EUR*	0.24 EUR *0.27 EUR*
	Mark-up	68.00% *46.20%*				
	VAT rate	15.00%				
	VAT	0.24 EUR *0.27 EUR*				
	Price without VAT	1.58 EUR *1.81 EUR*				
	Price including VAT	1.81 EUR *2.08 EUR*				
Retailer	Purchase price	1.81 EUR *2.08 EUR (cost)*	0.24 EUR *0.27 EUR*	0.3 EUR *0.35 EUR*	0.07 EUR *0.08 EUR*	0.3 EUR *0.35 EUR*
	Mark-up	28.72% *30.00%*				
	VAT rate	15.00%				
	VAT	0.3 EUR *0.35 EUR*				
	Price without VAT	2.03 EUR *2.35 EUR*				
	Price including VAT	2.34 EUR *2.71 EUR*				

Source: CZSO (2018), authors' data, own calculations.

A comparison to the ideal situation (which for the purposes of current analysis assumes equal mark-ups of 30% in each stage of the supply chain) shows, that current market mark-ups are not in the favour of farmers. The cost to produce 1kg of poultry totals to 0.91 EUR, while the purchase price of the industrial producer is 1.08 EUR, which is equal to the mark-up of 3.5% (excluding VAT). At the same time, the mark-up of the industrial producer is 68%, which is calculated to reach the price in terms of frequent price discounts in the retail stage (2.34 EUR). This fact correlates with findings of Srinivasan et al. (2004), who pointed out the fact that producers benefit more from price promotions than retailers. However, this conclusion was made based on different empirical material. In comparison to milk, the possible loss of VAT is lower in the case of poultry, both in total and on a per unit level (0.048 EUR/kg in the case of poultry and 0.05 EUR/litre in case of milk).

Table 5
Summary of potential annual VAT loss estimates for state budget of the Czech Republic for the year 2018

Indicator	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Share of products sold in frequent price discounts, %	5%	10%	25%	50%
Annual VAT loss for the state budget, milk, EUR	6,023,211.37 EUR	12,046,422.73 EUR	30,116,056.83 EUR	60,232,113.66 EUR
Annual VAT loss for the state budget, eggs, EUR	920 427.67 EUR	1 840 855.34 EUR	4 602 138.35 EUR	9 204 276.71 EUR
Annual VAT loss for the state budget, poultry, EUR	460 369.01 EUR	920 738.03 EUR	2 301 845.08 EUR	4 603 690.15 EUR
Total, EUR	7,404,008.05 EUR	14,808,016.10 EUR	37,020,040.26 EUR	74,040,080.52 EUR
Share in budget surplus of 2018 (340.677 million EUR), %	2.17%	4.35%	10.87%	21.73%

Source: own calculations.

Among three selected products, milk seems to be the product with the largest share of potential VAT losses for the state budget (Table 5). At the same time, losses of VAT tax revenue are comparable between eggs and poultry and are 8-10 times lower. The reason behind that is two-fold. Firstly, VAT loss per unit of product in the case of milk is higher than for eggs and poultry. Secondly, as calculations included production volumes of the products, these volumes magnify the per unit loss, so products with higher production volumes have more potential to generate losses of VAT tax revenues in the presence of frequent price discounts.

Estimated VAT losses has direct connection with policy making, however specific government policies focused on limitation of VAT loss for state budget due to constant price discounts deserve separate inquiry. The reason behind is that such policies, although targeting VAT loss, might have other externalities, such as quicker rise of prices for specific groups of society. There is a clear trade-off between higher tax revenues for state budget and higher consumers' surplus. VAT loss due to constant price discounts decrease potential income of state budget, that could have been spent as government expenditures, while increase surplus for specific parts of population. For policy making, it is a question of balance and priorities of government and society in general. It is important to mention, that it is even impossible to advise about whether any policy measures should be applied to address the VAT loss due to frequent price discounts based on current results.

5. CONCLUSION

As was shown during the analysis, the magnitude of VAT loss is dependent on the number of supply chain participants employing sub-purchase and sub-cost prices, represented by negative mark-up rates in terms of the current study. The order in which the mark-ups are applied is not relevant in terms of the current analysis, as VAT revenue loss for the state budget is only dependent on the final multiplication of mark-up rates in the supply chain. However, the identification of specific stages of the supply chain, where the loss of VAT is generated, might be useful for the purposes of policy analysis.

Assuming that half of the milk consumed in the Czech Republic is sold via frequent price discount, the state budget losses total to 74 million EUR annually. In 2018, the budget surplus of the Czech Republic totalled 340 million EUR. Within the assumption of zero price elasticity of the demand for milk in the Czech Republic and zero additional tax administration costs, closing the VAT loss only in the case of milk (74 million EUR) might have a potential to increase the budget surplus by 21.73% (Table 5).

VAT loss due to frequent price discounts can be classified as tax avoidance, as retail mark-ups and prices are not directly regulated in Member States. The topic of decreasing the so-called VAT Gap in the European Union has been discussed in scientific literature, however the focus was mostly on tax fraud and tax evasion (Prosper-Almagro, 2019). Due to its ambiguous nature, the VAT Gap originating from frequent price discounts is not included in current estimates (Center for Social and Economic Research, 2018), because they are based on actual a household expenditure country statistic. The estimation of VAT loss (or in other words VAT Gap) in the current paper represents an additional source of VAT Gap, not previously covered in estimations.

There is a wide variety of topics, that might positively contribute to the results of current research by improving the estimate of annual VAT loss. Calculations of annual VAT loss contained two main assumptions, that might be criticized. The first is the assumption of zero price elasticity of the Czech consumer, which was proved wrong in the literature. The second are the assumptions of mark ups in the ideal scenario, as this study assumes a 30% mark-up in an ideal scenario for all three products. Naturally, this cannot be true in the real world. Also, the question of externalities that might arise after policy measures to regulate retail markets, should be addressed in detail. Despite these weak points of the current research, the study proposes a specific method to estimate potential annual loss of VAT for the state budget, and provides a unique estimate of it, in order to support the on-going academic and expert discussion on retail prices, buyer power and market concentration. Further research should be focused on improving this estimate, as well as answering the question of what policy measures (if any) might be effective to address it.

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