The effect of VAT rate on inflation in the United Kingdom (2008-2012)

By

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Abstract

This paper estimates and compares the inflation effects of the two VAT increases in January 2010 and January 2011 using the United Kingdom Consumer Price Index (CPI) microdata from October 2008 to December 2012. I compute the average frequency and magnitude of the consumer price changes and use the inflation decomposition to quantify the inflation effects of the VAT reforms. I find that although the two reforms in Value Added Tax rate (VAT) have the same size, the inflation effect of the VAT increase in 2011 is greater than the inflation effect in 2010. The results remain robust in the time series regression model and the dynamic selection model. The finding suggests that the level of VAT pass-through is higher when there is no restriction in consumer demand and the reform is not announced a long time beforehand.

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I would like to express my sincere gratitude to my supervisor Professor. Ádám Reiff for his patient guidance, enthusiasm, encouragement and insightful advice he has provided throughout my time as his student. I have been extremely lucky to have a supervisor who always cared about my work and answered my questions promptly.

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1. Introduction

The financial crisis 2007-2008 sparked a global recession. Governments around the world introduced different measures to boost economic growth. In the United Kingdom, a temporary cut in Value Added Tax rate (VAT) was made as part of fiscal stimulus to counteract the recession. The standard VAT was reduced to 15% in December 2008 and returned to the previous level of 17.5% in January 2010. After one year, in January 2011, the United Kingdom government continued to raise the tax rate to 20% in efforts to tackle the size of public deficit.

The focus of this thesis is the inflation effect of these two consecutive VAT increases, which are similar in size (2.5 percentage points), and they are also similar in the set of goods and services that they affected. Based on these similarities, one could expect that their inflation effects were of the same magnitude. However, there are two important aspects according to which these seemingly similar VAT increases were quite different.

First, the VAT increase of January 2010 was simply a reversal of the previous VAT cut of December 2008. Importantly, this reversal – together with its exact timing – was announced at the time of the initial VAT cut, so that price setters knew in advance that the VAT cut was only temporary. The information might have convinced some stores that they should not cut their prices as a response to the VAT decrease, as they would have to raise their prices back relatively soon. They might also respond to the temporary tax cut in December 2008, but not wait until the reversal of the tax cut to raise their prices back. Crossley et al. (2014) and Pike et al. (2009) share this argument. Consequently, the price response to this first VAT increase (the one that was a pure reversal) might have been relatively small.

The second difference between the two seemingly similar VAT increases is that they were introduced in periods when the cyclical position of the UK economy was quite different. In January 2010, when the first VAT increase took effect, the UK economy was in the middle of a severe recession, which might have prevented many stores – in the fear of insufficient demand – from substantially increasing their prices. According to the Inflation Report by Bank of England, the UK consumer spending at the beginning of 2010 was well below the pre-crisis level. The consumption continued to fall as household chose to save more during this time, which is reflected in a higher saving ratio. In contrast, the second VAT increase in January 2011 took place in a period when the UK economy was in a recovery phase. The household spending in the beginning of 2011 experienced positive growth. The economic conditions in the United Kingdom were also improved due to the expansionary monetary policy and the recovery of global demand. Under these relatively better demand conditions, stores might have decided to pass through a larger part of this VAT shock to their customers.

The main hypothesis of this thesis is that the inflation effect of the second VAT increase in January 2011 was actually larger, as both of the above mentioned differences imply that this

could be the case. This paper aims to examine the difference in effects of the VAT reform in January 2010 and January 2011.

For this purpose, I use a large and comprehensive sample of consumer microdata underpinning the UK CPI from October 2008 to December 2012. There is substantial variation in responses to VAT change among the different sectors and different goods and services. The microdata allows me to analyze the price-setting behaviors in the United Kingdom and using these to quantify the effect of the VAT changes for each product and service in the CPI basket. This approach would improve the preciseness of the estimates as it takes into account the heterogeneity among the goods and services.

In this paper, I find that the average frequency of price changes during 2008-2012 in the United Kingdom is 20%, meaning the UK consumer prices are slightly less flexible than the US prices during 1998-2005 period (20.9%) (Nakamura and Steinsson, 2008) and change more frequently than prices in the UK in 1996-2006 (Bunn and Ellis, 2011). The average magnitude of price changes is 14.11%, which is higher than the ones of the US and Euro area, 13% and 9% respectively (Dhyne et al. (2006)).

Using item-level panel data on stores and prices set over time, I find that the overall effect of the 2.5 percentage point increase in January 2010 is 0.24% and the overall effect of the 2.5 percentage point increase in January 2011 is 1.26%. These estimates confirm the central hypothesis of this paper that the overall inflation effect of the latter VAT increase is larger than the one of the former. The same conclusion does hold for most consumption categories in the CPI basket. The results remain robust in the item-level time series regression models and in a panel model that also takes into account the possibility of delayed price responses.

This paper is primarily related to two different lines of literature. First, my work connects to the recent empirical studies that aim to quantify the pass-through of VAT rates. Benedek et al. (2015) estimates the pass-through of VAT changes to consumer prices for 17 Eurozone countries over 1999-2003, suggesting full pass-through for changes in standard VAT rates and around 30% for changes in reduced VAT rates. Crossley et al. (2014) and Pike et al. (2009) estimate the pass-through of the temporary tax cut in the United Kingdom in December 2008 using aggregated data, they cannot reject the full pass-through of the tax cut and conclude that the cut is partly reversed after several months. Second, this paper is related to the literature on examining price-setting behaviors using microdata. Dhyne et al. (2006) uses in the Euro area data, Bils and Klenow (2004), Nakamura and Steinsson (2008) and Klenow and Kryvtsov (2008) analyze the US practice and Bun and Ellis (2011) employ the UK microdata from 1996 to 2006. My work connects most closely to Gabriel and Reiff (2010), who report the Hungarian price-setting behavior and estimate the effect of three general VAT rate changes between 2001 and 2007. In line with their results, I find incomplete pass-through of three VAT changes from 2008 to 2012.

The rest of the paper is organized as follows. Section 2 discusses in detail the dataset used in this analysis and data cleaning procedure. Section 3 presents some stylized facts on average frequency and magnitude of price changes in the United Kingdom. Section 4 discusses methodology of VAT effect estimation and the results. Section 5 concludes.

2. Microdata on Consumer prices

2.1. Description of the sources

The empirical analysis of this thesis is based on store-level consumer price microdata collected by the UK Office for National Statistics (ONS) for the construction of the UK Consumer Price Index (CPI). Each month, prices of approximately 700 representative items in the CPI basket of goods and services are collected. There are two types of price collection for consumer price indices: local collection which involves prices collected from shops in various locations in the country and central collection which involves prices collected from public digital sources. Prices of centrally collected representative items are excluded from the available dataset. For the local collection, more than 100,000 price quotes are obtained monthly from 141 locations around 13 regions of the UK. There are two types of outlets that are selected in each location: multiples (with more than 10 outlets countrywide) and independent (less than 10 outlets). To assure the precision of consumer price indices, ONS carries out a number of validation checks, both at the collection points and the head office. Price quotes that fail at any stage of validation process are flagged by ONS and only valid price quotes are used to construct consumer price indices.

Each price quote in the dataset is identified by the combination of region code, shop code, item code and quote date. Due to the confidentiality agreement between ONS and stores, the information on location is not revealed. For this reason, some price quotes are not uniquely identified as some outlets belonging to the same chain within the same region can have different prices for a given item. By way of illustration, consider the example of item Vodka (per nip): in October 2008, using the combination of item-id (310302), shop code (25) and region (2), one can find 3 different price quotes: 2.55 £, 2.2 £ and 2.4 £. To separate these price quotes, one needs to consider the so-called “base prices”, which are also reported by ONS. In general, the base price is the price of a given item in January and it is updated in February each year. ONS also adjusts the base price of an item if there are any changes in quantity or quality of an item. The way of using base prices to separate price trajectories is discussed in detail in the next section.

2.2. Sample coverage

In this paper, the sample covers the period of 51 months between October 2008 and December 2012. As a first step of data cleaning, I include only those price quotes that are marked as valid by ONS. Any missing, non-comparable or unavailable quotes are removed. I also removed the observations that are not put into any Classification of Individual Consumption by Purpose (COICOP) divisions.

Table 1 Coverage of the dataset by years

	Number of observations	Number of items	CPI weight
2008	310,604	553	61.81
2009	1,180,796	579	58.92
2010	1,251,146	575	57.42
2011	1,312,157	577	57.92
2012	1,329,454	571	56.77
Total	**5,384,157**	**636**	

Table 1 reports the number of observations, number of representative items and CPI weight of the sample by years. The sample consists of more than one million price quotes of around 570 representative items yearly, accounting for nearly 60% of CPI basket. The total number of distinct representative items in the whole sample is 636. The best coverage in terms of number of items is in 2009 with 579 different items. As the basket and the weight system are updated yearly to account for changes in the consumption behavior of UK consumers, a larger number of items does not automatically imply a better coverage in terms of the total CPI weight. The highest CPI weight is achieved in October 2008. Table 2 compares the coverage of sample to the full CPI basket 2008.

Table 2 Coverage of October 2008 by COICOP division

COICOP division	Description	Full CPI 2008 basket		Oct 2008 sample		
		Number of items	CPI weight	Number of items	CPI weight	Coverage of CPI weight
1	Food and non-alcoholic beverages	148	10.9	147	10.85	99.54%
2	Alcoholic beverages, tobacco and narcotics	26	4.2	26	4.2	100.00%
3	Clothing and footwear	78	6.3	75	6.05	96.03%
4	Housing, water, electricity, gas and other fuels	38	11.5	24	4.39	38.17%
5	Furnishings, household equipment and routine household maintenance	73	6.7	70	6.58	98.21%
6	Health	19	2.16	14	1.45	67.13%
7	Transport	42	15.2	22	3.66	24.08%
8	Information and communication	9	2.3	1	0.13	5.65%
9	Recreation, sport and culture	113	15.2	71	6.58	43.29%
10	Education services	5	1.9	0	0	0.00%
11	Restaurants and accommodation services	55	13.7	51	12.25	89.42%
12	Miscellaneous goods and services	75	9.9	49	5.74	57.98%
	Total	**676**	**100**	**550**	**61.88**	**61.88%**

The sample, in general, has a good coverage of all COICOP divisions except for the COICOP 8 and COICOP 10. These groups both represent 5% or less in weight of the full CPI basket while the COICOP 1, COICOP2, COICOP 3, COICOP 5 and COICOP 11 have almost perfect coverage.

On average, there are more than 105,000 price quotes per month and 8,431 observations per item. For each observation, I have the following variables: quote date (the month-year where a the price quote is collected), item id (unique identifier for each representative item), shop code, region code, price, base price, indicator box (which indicates that the price quote is sale price, recovery price from a sale) and CPI weight.

Following the existing literature (see, e.g. Dhyne et al., 2004, Bils and Klenow, 2004, Gagnon, 2009, and Klenow and Malin, 2010), I define a price trajectory as an uninterrupted sequence of price quotes of the same product in the same outlet. I use the combination of item id, shop code, region code and base price to identify price trajectories. The base price, according to ONS, precisely indicates whether the price quotes are comparable. The base prices also serve as a flag of substitution as the base prices are adjusted whenever changes in quantity or quality of products happen. Conditioning on base price allows to distinguish the stores with the same code within the same region as well as to interrupt the price trajectories when they encounter substitutions. However, in principle ONS replaces base prices in every February. I assume that all the changes of base prices taking place in February do not involve any substitution or changes in representative items, so that the price quotes can be chained over years. If this assumption does not hold true, this may bias the number of price

trajectories downward and bias the frequency and size estimates upward. Adjustment of base prices is the main tool of ONS staff to fix any irregularities in prices and to produce reliable consumer price indices. Inevitably, this imputation procedure might sometimes provide imprecise information. If this is the case, it is hard to estimate the sign as well as the magnitude of the bias. Using the above definition, there are 296,371 different price trajectories in the sample with an average duration of 15.69 months.

The ONS dataset includes both regular and sale prices. The indicator box variable signals whether a price quote is a sale price, a recovery price from a sale or just a regular price. Nakamura and Steinsson (2008) shows that the sale prices act differently from the regular prices. In this analysis, following the standard practice in the empirical price setting literature, if a price quote is flagged as a sale price, I carry the last regular price forward. Formally, if the price of item i in month t, $P_{i,t}$ is a sale price and $P_{i,t-1}$ is a regular price, then I replace $P_{i,t} = P_{i,t-1}$. I consider the recovery prices as regular prices. The frequency and size estimates of price changes will still be correct under the assumption that prices would remain unchanged if sales did not happen. If the assumption does not hold, this procedure can bias the estimates downward.

Finally, I define the price change of item i at time t as the following:

$$\Delta p_{it} = \log(P_{i,t}) - \log(P_{i,t-1})$$

To avoid the bias caused by outliers, following Gagnon (2009), I drop all price changes larger than $\log(5)$.

After this data cleaning process, I removed any remaining duplicates to ensure that the price trajectories are uniquely identified. The final sample has 5,362,066 observations for 636 representative items over 51 months.

The weight system is updated each year by ONS to capture the spending patterns of UK consumers. However, employing different weight systems can make it difficult to compare results across years. To ensure the comparability of the aggregate results, in this analysis, for each representative item, I compute the average weight and use this unique weight system to produce all estimates at aggregate levels.

3. Stylized facts

This section presents the key statistics on frequency and magnitude of price changes in the United Kingdom.

3.1. Frequency of price changes

To compute the frequency of price change, following Baudry et al. (2004), I create indicators for price change, price increase and price decrease

$$I_{i,t} = \begin{cases} 1 & if\ P_{i,t} \neq P_{i,t-1} \\ 0 & if\ P_{i,t} = P_{i,t-1} \end{cases}$$

$$INC_{i,t} = \begin{cases} 1 & if\ P_{i,t} > P_{i,t-1} \\ 0 & if\ P_{i,t} \leq P_{i,t-1} \end{cases}$$

$$DEC_{i,t} = \begin{cases} 1 & if\ P_{i,t} < P_{i,t-1} \\ 0 & if\ P_{i,t} \geq P_{i,t-1} \end{cases}$$

Then the frequency of price change for item i at date t is:

$$F_{i,t} = \frac{1}{J}\sum_{j=1}^{J} I_{i,t}$$

where J is number of price change observations of item i at date t.

Using the above formula, I compute the frequency of price change for each item at each date and aggregate them using average CPI weights. The same procedure applies for the frequency of price increase and decrease.

The average frequency of monthly price increases and decreases in the UK is 11.91%, and 8.11%, respectively, which means that on average 20.02% of consumer prices change in each month. The difference in CPI basket, weight system as well as data filters makes it hard to compare my results to other papers. But comparing to the results with the same sale prices treatment in Nakamura and Steinsson (2008), these estimates approximately equals to the mean frequency of the US during 1998-2005 period (20.9%). Also using UK microdata, Bunn and Ellis (2011) finds an average frequency of 18.8% price change over the period 1996-2006, with similar frequency of price increases (11.1%) and slightly lower frequency of decreases (7.7%).

Table 3 shows the weighted average frequency of price changes by COICOP groups over the whole period of interest. There is significant heterogeneity in the frequency of price changes between the different components of UK CPI. Prices of goods components such as food and beverage products seem to be much more flexible than the one of services. Except information and communication services, less than 16% of services prices (COICOP 6,7,11 and 12) change monthly.

The information and communication service prices change more frequently than other services (29.44%) and the probability of price increase and decrease for these services are

approximately the same. This is likely to be related to the persistently negative inflation rates of this component during the period 2000-2015. In other COICOP categories, one can see that the frequency of price decreases is always lower than the frequency of price increases.

Table 3 Frequency of price changes by COICOP division

COICOP division	Description	Increase	Decrease	All
1	Food and non-alcoholic beverages	13.32%	10.35%	23.67%
2	Alcoholic beverages, tobacco and narcotics	24.84%	10.06%	34.90%
3	Clothing and footwear	11.90%	11.02%	22.92%
4	Housing, water, electricity, gas and other fuels	12.92%	8.57%	21.49%
5	Furnishings, household equipment and routine household maintenance	12.61%	10.23%	22.84%
6	Health	6.33%	4.39%	10.73%
7	Transport	7.38%	4.18%	11.56%
8	Information and communication	14.73%	14.71%	29.44%
9	Recreation, sport and culture	12.07%	11.30%	23.37%
11	Restaurants and accommodation services	8.71%	3.39%	12.10%
12	Miscellaneous goods and services	9.04%	6.14%	15.18%

Figure 1 plots the monthly frequency of UK consumer price changes from late 2008 to 2012. The positive co-movement between frequency of price changes and frequency of price increase is clearly visible in the figure. There are three noticeable upsurges in the frequency of price changes in December 2008, January 2010 and January 2011, exactly when the VAT changes took place. The first one is caused by a hike in the number of price decreases. The hikes in January 2010 and 2011 are driven by the growth in number of price increases. This observation suggests that UK consumer prices respond immediately to the VAT changes.

The figure also shows that the frequency of price changes in December 2008 and January 2011 are approximately of the same size, both are significantly higher than the one in January 2010. This suggests that my hypothesis that the inflation effect of the 2011 VAT reform is larger than of the one in 2010 might be true.

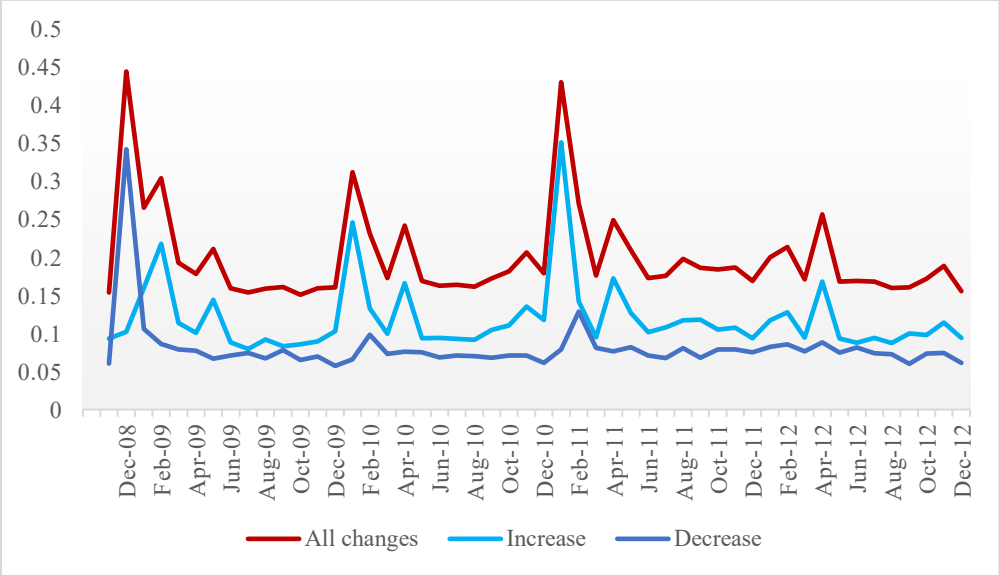

Figure 1 Frequency of price changes

3.2. Magnitude of price changes

I compute the average absolute size of price change for each representative item at each date and use the CPI average weight to obtain the aggregate estimates.

The average magnitude of price increases, decreases and all changes are 13.18 %, 15.48 % and 14.11%, respectively, in the whole sample. Compared to other countries, these numbers are quite high. Gabriel and Reiff (2010) finds an average size of Hungarian consumer prices of 12.3% for the period 2001-2007. Dhyne et al. (2006) reports the estimates for the IPN-standardized subsample of the US and Euro area being 13% and 9% respectively. Petrella et al. (2019) uses the UK CPI dataset (1996-2017) and shows slightly smaller estimates for the magnitude of the price changes. The discrepancy in my estimates and Petrella et al. (2009) may be due to the difference in sales filters, as Petrella et al. drop all sales, recovery prices flagged by ONS and also implementing a symmetric V-shaped filter (defined by Nakamura and Steinsson (2010b)) for further sale detection.

Table 4 shows the magnitude estimates of price changes in the sample by CPI components. There is a substantial variation in size of changes between the groups. The alcoholic beverages products have the smallest mean of price changes. This may indicate that small price adjustments are frequently observed in these types of goods. Clothing and footwear prices change by largest size. This is probably related with seasonality of these products. For instance, prices of winter clothes are often reduced once the weather gets warmer.

Figure 2 shows the monthly average size of price changes over time. The sharp changes around the month of VAT changes are observable. In December 2008, there is a large drop in

size of price decrease, driving the size of all price changes lower. In January 2010 and 2011, the size of price increases falls considerably. This observation is consistent with all other empirical studies that are reporting the average size of price changes around major VAT reforms (see Gabriel & Reiff, 2010, Konstantins, & Ludmila, 2014). One possible explanation is that VAT reform can only reduce or raise prices by a modest amount as the size of VAT change is relatively small compared to usual price changes. So, the surge in the number of extra small adjustments is likely to offset the larger price changes, resulting in a lower average size. Looking at the figure, one can see that the average price changes in January 2011 is smaller than in January 2010. This may indicate that more firms responded to the VAT increase in 2011 than in 2010.

Table 4 Magnitude of price changes by COICOP divisions

COICOP division	Description	Increase	Decrease	All
1	Food and non-alcoholic beverages	12.37	13.03	12.66
2	Alcoholic beverages, tobacco and narcotics	6.39	7.36	6.67
3	Clothing and footwear	24.62	26.60	25.57
4	Housing, water, electricity, gas and other fuels	10.38	12.91	11.39
5	Furnishings, household equipment and routine household maintenance	17.35	19.90	18.49
6	Health	10.85	14.26	12.25
7	Transport	10.65	13.96	11.85
8	Information and communication	17.30	17.93	17.62
9	Recreation, sport and culture	16.78	18.74	17.73
11	Restaurants and accommodation services	8.03	11.68	9.05
12	Miscellaneous goods and services	13.00	15.57	14.04

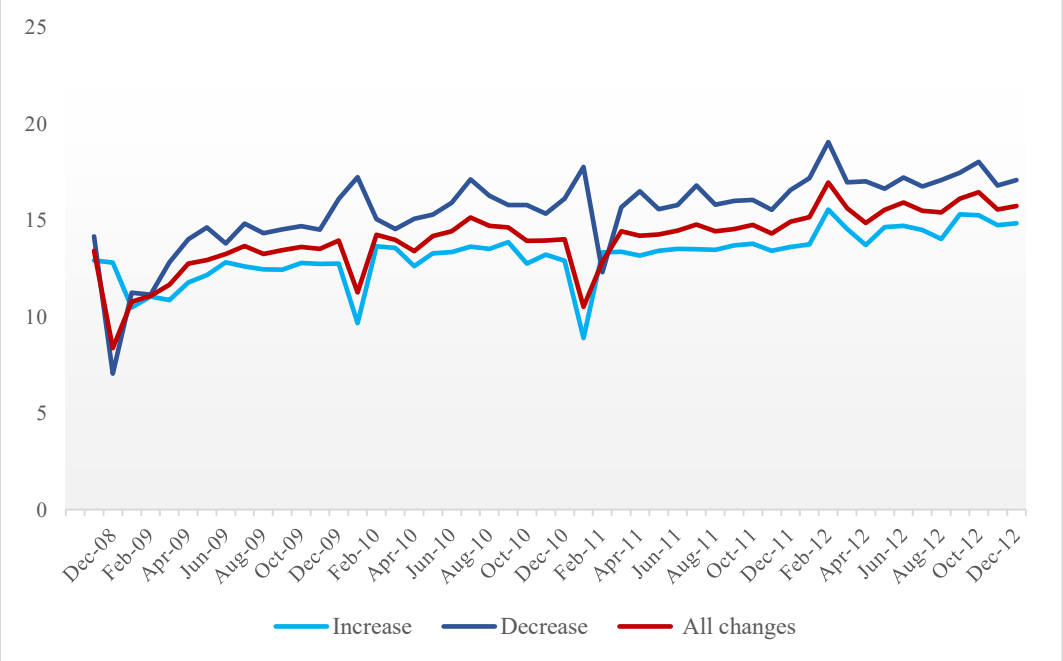

Figure 2 Magnitude of price changes

4. Inflation effects of Valued Added Tax changes

Changes to VAT rates are useful events from which we can infer how the economy reacts to cost-push shocks. Between 2008 and 2013 in the United Kingdom, there are three episodes of changes in standard VAT rate: one reduction from 17.5% to 15% in December 2008, and two hikes in January 2010 and 2011: from 15 to 17.5% and from 17.5% to 20%, respectively. Thus, these VAT changes are of the same magnitude and affect the same subset of items. In December 2008, the UK government introduced a temporary VAT cut for 13 months. Thus, the public could anticipate the VAT increase in January 2010 long before it actually took effect. This long period allowed firms and households to gradually adjust their behaviors to maximize their utility. This is not the case for the VAT increase in 2011 when it was announced only 5 months in advance. Furthermore, the macroeconomic context in 2010 and 2011 were different. In beginning of 2010, the UK economy recovered slowly as economic accounts remained below pre-crisis level whereas in beginning of 2011, there was positive growth in many aspects of the economy. The CPI inflation rate in January 2011 (3.4%) was substantially higher than in January 2010 (2.6%) (see Figure 7 in appendix).

In this section, I analyze the inflation effects of these VAT changes in the UK and investigate whether the second VAT change had larger inflation effect, as I suspect.

4.1. Frequency and magnitude of changes by VAT rates

In the United Kingdom, there are four levels of VAT rates: Standard rate (applies to most goods and services), reduced rate (applies to some goods and services related to children and home energy), zero-rate (applied to food and children clothes) and exempt from VAT (applied to postage stamps and financial & property transaction). Using the HM Revenue and Customs guidelines, I split the representative items into VAT-affected (items are subject to standard VAT rate and affected by the VAT reforms of interest) and VAT non-affected (items are exempted from VAT or subject to reduced/zero tax rate).

As a first step of the VAT effects analysis, I plot the time series of the frequency and magnitude of price changes for the VAT affected and VAT non-affected subsamples separately.

Looking at Figures 3 and 4, a difference in frequency of price changes is discernible. The prices of representative items subject to standard VAT are characterized by three jumps in the frequency of changes in December 2008, January 2010 and 2011. This pattern is not visible in the subsample of VAT-exempted or VAT-reduced items. For these items, the frequency of price changes has seasonality but shows no reaction to the three VAT changes. In "normal" time, the prices of non-affected VAT goods are more volatile than affected goods' prices. This is primarily because most of non-affected items, which include fresh foods (zero-rate) and energy supplies (reduced rate), are more sensitive to commodity price shocks.

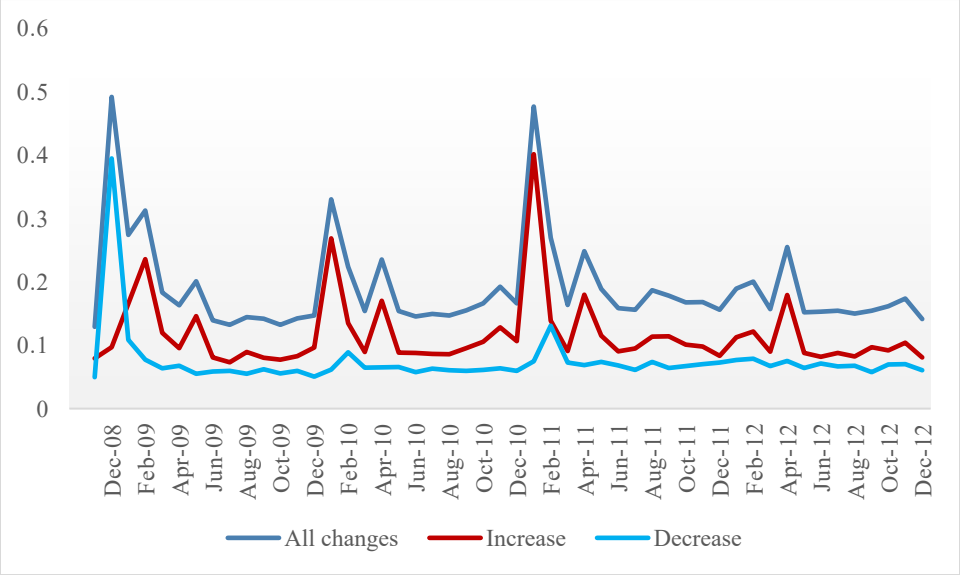

Figure 3 Frequency of price changes (VAT affected subsample)

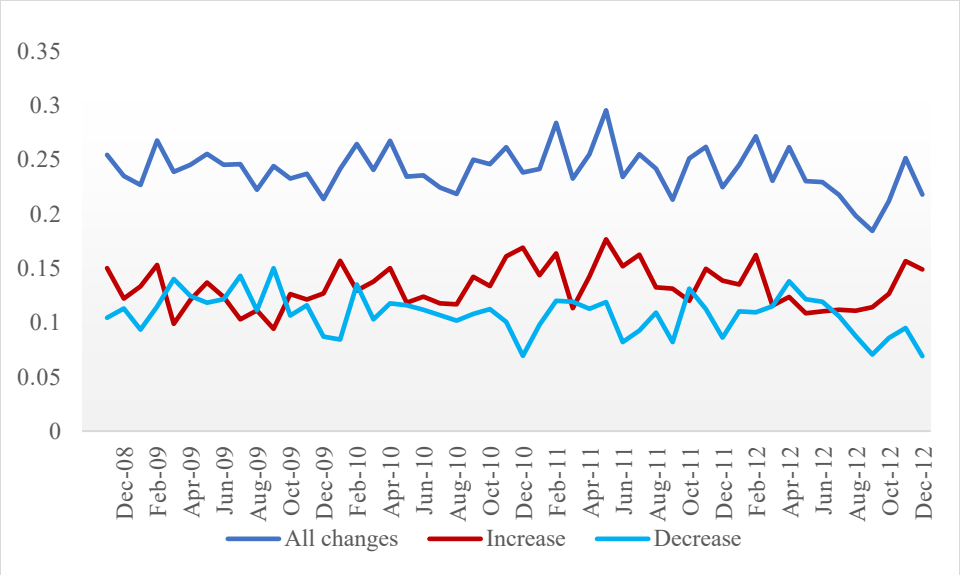

Figure 4 Frequency of price changes (VAT non-affected subsample)

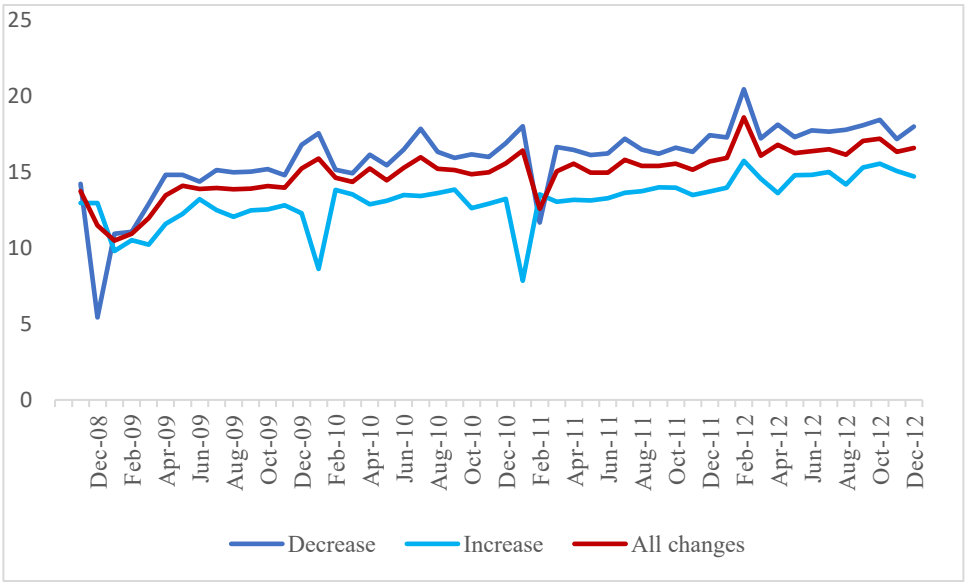

Figure 5 Magnitude of price changes (VAT affected subsample)

Figure 5 shows that for the VAT affected subsample, there are sharp reductions in the size of price increases in January 2010 and 2011, while in December 2008 the size of price decreases falls considerably. The higher share of relatively small price adjustments caused by the VAT reform is likely to offset the larger price changes and lower the average magnitude of changes.

For the VAT-exempted and VAT-reduced subset, which were not affected by the VAT changes, Figure 6 does not show any clear pattern in the size of price changes around the VAT reforms.

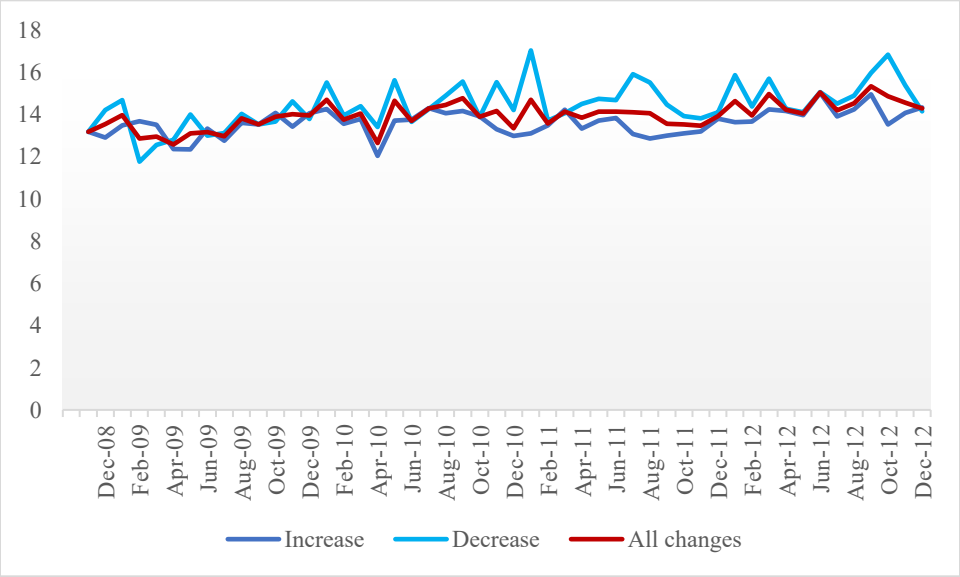

Figure 6 Magnitude of price changes (VAT non-affected subsample)

4.2. Data

The visual inspection of the data suggests that the VAT effects are only significant for the affected subsample. So, I use only the sample of affected items to carry out the quantitative estimations. Following Gabriel and Reiff (2010), I further drop items that are highly volatile due to external factors. For example, alcoholic beverages and tobacco products are strongly affected by changes in excise taxes (in the same periods), the fresh foods products prices are highly influenced by weather conditions and energy prices change frequently due to global oil price. I also drop the items which have no observations in the months of VAT changes, seasonal items and items with small maximal length of price trajectories as insufficient number of observations prevents getting reliable estimates.

After these steps, the VAT sample covers only 325 representative items with 2,825,249 observations. Its coverage is down to 37.7% CPI weight. Table 5 compares the coverage of VAT sample and the original sample by COICOP divisions (excluding items in COICOP 4, COICOP 8 and COICOP 2 which are dropped in the data preparation process). The coverage of the category food and non-alcoholic beverages is also considerably lowered as the majority of items in this division is not subject to the standard VAT rate.

Table 5 VAT sample coverage

COICOP division	Description	Full sample		VAT sample		
		Number of items	CPI weight	Number of items	CPI weight	Coverage CPI weight
1	Food and non-alcoholic beverages	170	11.1	21	2	18.02%
3	Clothing and footwear	84	5.9	58	4.7	79.66%
5	Furnishings, household equipment and routine household maintenance	84	6.2	64	5.7	91.94%
6	Health	17	1.6	9	0.8	50.00%
7	Transport	22	3.9	21	3.7	94.87%
9	Recreation, sport and culture	93	6.2	59	4.9	79.03%
11	Restaurants and accommodation services	55	11.1	49	10.6	95.50%
12	Miscellaneous goods and services	55	5.7	44	5.3	92.98%
	Total	**580**	**51.7**	**325**	**37.7**	**72.92%**

4.3. Methodology

In this section, I follow the methodology of Klenow and Kryvtsov (2009) and Gabriel and Reiff (2010). The inflation for item i at date t can be decomposed as a sum of frequency and magnitude of price changes as follows:

$$\pi_{it} = fr_{it}{}^{+} dp_{it}{}^{+} - fr_{it}{}^{-} dp_{it}{}^{-} \quad (1)$$

Where π_{it} is inflation rate, $dp_{it}{}^{+}$is the average size of price increase, $dp_{it}{}^{-}$ is the average size of price decrease (in absolute value), and $fr_{it}{}^{+}$ and $fr_{it}{}^{-}$ are the frequency of price increase and decrease, respectively.

To quantify the effect of VAT changes on inflation, one needs to compute the inflation rate without and without the presence of VAT changes. Gabriel and Reiff (2010) defines the following formula for the overall inflation effect of VAT:

$$(fr_{it}^{+V} dp_{it}^{+V} - fr_{it}^{+} dp_{it}^{+}) - (fr_{it}^{-V} dp_{it}^{-V} - fr_{it}^{-} dp_{it}^{-}) \quad (2)$$

Where fr_{it}^{+V} is the frequency of price increase with the presence of VAT changes, dp_{it}^{+V} is the average size of price increase in the presence of VAT changes, fr_{it}^{+}, dp_{it}^{+} are their (counterfactual) counterparts in absence of VAT changes. Further, fr_{it}^{-V} , fr_{it}^{-} are the frequency of price decrease with and without the presence of VAT changes, while dp_{it}^{-V} and dp_{it}^{-} are the average size (in absolute value) of price decrease with and without the presence of VAT changes.

The term in the first bracket in equation (2) can be interpreted as inflation effect due to the change in the willingness to increase price and the second one is the inflation effect due to the change in the willingness to reduce price. To estimate the first term for a given representative

item i, I set up a Heckman selection model. I create VAT changes dummies which equal 1 in the month of VAT changes. Specifically, VAT08 is 1 in December 2008, 0 otherwise, VAT10 is 1 in January 2010 and 0 otherwise and VAT11 is 1 in January 2011 and 0 otherwise. I denote Y_{jt} as size of desired (as opposed to actual) price increase of firm j at date t. Then, regressing Y_{jt} on VAT dummies and other control variables, I can get the marginal effect of VAT on the desired size of price increase:

$$Y_{jt} = \beta' X_{jt} + u_{jt} \quad (3)$$

However, the desired price increase is not always observable. One reason of this might be that price adjustment is costly, and therefore firms will choose to adjust price only if the benefit from this change outweighs the cost of adjustment. There is a rich literature that studies the price setting behavior of firms under costly price adjustment (menu costs). The implication of this is that prices are rigid, as firms only change their prices if their desired price change is large enough – so we only observe a (non-random) selection of desired price changes as actual price changes. This non-random selection of desired price changes into the set of actually observed price changes (called selection effect) is widely studied in the menu cost literature that investigates the real effects of nominal shocks in menu cost models (see, among others, Golosov and Lucas, 2007, Midrigan 2011 and Karadi and Reiff, 2019).

Thus, the sample of actually observed price changes is likely to suffer from selection bias. To account for the non-random selection of firms, I use an indicator variable INC_{jt} that indicates whether a firm chooses to increase its price or not. With this variable, I first specify the following model:

$$INC_{jt} = \gamma' W_{jt} + \epsilon_{jt} \quad (4)$$

where W_{jt} are factors determining if firms choose to increase price or not.

Under the assumption that the error terms u_{jt} and ϵ_{jt} follow bivariate normal distribution, I can apply the Heckman two-step method to estimate the inflation effect of VAT changes. Specifically, the conditional expected value of *observed* price increases (i.e .the conditional expected value of desired price changes, given that they are observed) is:

$$E\left(Y_{jt} \middle| INC_{jt} = 1, X_{jt}\right) = \beta' X_{it} + \rho\sigma E\left[\frac{\emptyset(\gamma' W_{jt})}{\Phi(\gamma' W_{jt})} X_{jt}\right] \quad (5)$$

where $\emptyset$ and Φ are standard normal density and cumulative distribution function, respectively. Firstly, for each representative item, I run a probit regression for equation (4) and estimate the inverse Mills ratio that will be an explanatory variable in the size equation (see equation (5)). In this analysis, W_{jt} include VAT dummies, year and seasonal dummies. . I include year dummies to control for the changing business cycle position of the UK economy during 2008-2012. Next, controlling for VAT dummies, seasonal dummies, I estimate the equation (5) to find dp_{it}^{+V} & dp_{it}^{+}. Now all the unknowns in equation (2) have

been estimated. I'm using these estimates to compute the inflation effects due to willingness to increase/decrease price as well as the overall effects of the VAT changes. Due to heterogeneity between items, I repeat this procedure for each representative item separately to find the inflation effect of VAT at item level and then aggregate them using the average CPI weights to get estimates at higher aggregation levels. The same procedure can be applied with size of price decrease and indicator for price decrease (DEC_{jt}).

This methodology estimates the VAT effects based on a panel data for each representative item, taking into account price changes of each individual store for a given item over time. Hence, the estimates are more reliable than alternative estimates using time series data on frequencies and sizes of price changes.

4.4. Results

Table 6 reports the inflation effects of the VAT cut in December 2008. The overall effect of the 2.5 percentage point decrease in December 2008 is -1.23%, out of which -1.22% comes from the higher willingness to decrease prices and only -0.01% is from the willingness to increase prices.

The highest inflation effect can be found in the health products and services. Interestingly, the overall inflation effect in this component is higher than the size of VAT cut (in absolute value). The negative effect comes both from the willingness to increase and decrease prices. Figure 18 and 19 in appendix show the frequency and magnitude of price changes for these products and services. Beside the higher frequency of price decrease due to the VAT cut, one can observe that frequency and magnitude of price increase are both lower in December 2008, causing a negative inflation effect through willingness to increase prices. In December 2008 (the month of VAT change), the UK Department of Health introduced the Pharmaceutical Price Regulation Scheme (PPRS) in order to ensure that the National Health Service has access to medicines at reasonable prices. This mechanism, together with the VAT cut may reduce the price level in the healthcare industry by more than the size of VAT cut. As a result, the absolute value of the overall inflation effect for this category and also at the aggregate level may be biased upward. Separating the effects of the PPRS and VAT change may be a challenging task and require more data. This is out of scope of this paper.

The smallest inflation effect can be observed in Restaurant and Accommodation services component, which is consistent with the infrequent price decrease observed in this sector (see Figure 26 in appendix). One possible reason for delaying price adjustment is the fear that reduction in prices may be mistakenly considered as worse quality.

Table 6 VAT effect in Dec-2008

COICOP division	Description	Dec-08		
		Increase	Decrease	Overall
1	Food and non-alcoholic beverages	-0.25%	-1.00%	-1.25%
3	Clothing and footwear	0.12%	-1.44%	-1.32%
5	Furnishings, household equipment and routine household maintenance	-0.11%	-1.82%	-1.93%
6	Health	-1.64%	-1.63%	-3.27%
7	Transport	-0.16%	-0.75%	-0.91%
9	Recreation, sport and culture	0.10%	-2.35%	-2.25%
11	Restaurants and accommodation services	0.21%	-0.48%	-0.27%
12	Miscellaneous goods and services	-0.12%	-1.07%	-1.19%
	Total	**-0.01%**	**-1.22%**	**-1.23%**

Table 7 reports the inflation effect of VAT increase in January 2010. The overall effect of the 2.5 percentage point increase in January 2010 is 0.24%, out of which 0.27% comes from the willingness to decrease prices and only -0.03% is from the willingness to increase prices. The effect of lower average size of price increase seems to offset the frequency of price increase, resulting in a negative inflation effect through willingness to increase prices. The overall inflation effect mostly is from the lower willingness to decrease prices. According to Bunn and Ellis (2011), in general, the UK consumer prices decrease the most frequently in January. Probably, the VAT increase makes firms behave differently in 2010.

The inflation effect is relatively small across the sectors. As the VAT change in January 2010 is announced well in advance (December 2008), the firms can lower their prices in response to the VAT cut and gradually adjust their prices later on or they can just keep their prices unchanged. In January 2010, firms no longer need to increase their prices. Indeed, Pike et al. (2009) maintain that by February 2009, around 50% of VAT prices had risen back to at least their level prior the VAT cut. Crossley et al. (2014) also have a similar conclusion that after a few months, prices of VAT goods begin to increase, and temporary cut was partly reversed.

The highest inflation effect can be observed in Transport sector with 1.51%, mostly coming from higher willingness to increase prices. Prices of transport services are usually sticky due to menu costs, and transport firms often adjust their prices at predetermined intervals, most commonly in January (see Figure 20 in appendix). The prices of these services cannot be adjusted gradually over time like the other sectors. Thus, the transportation is the only sector that have significant inflation effect of 2010 VAT increase. This finding seems robust as the inflation effect of December 2008 VAT cut for this sector is relatively small compared to other sectors.

Table 7 VAT effects Jan - 2010

COICOP division	Description	Jan-10		
		Increase	Decrease	Overall
1	Food and non-alcoholic beverages	-0.29%	0.26%	-0.04%
3	Clothing and footwear	-1.87%	1.70%	-0.17%
5	Furnishings, household equipment and routine household maintenance	-0.21%	-0.06%	-0.26%
6	Health	0.01%	-0.13%	-0.12%
7	Transport	1.22%	0.29%	1.51%
9	Recreation, sport and culture	-0.20%	0.35%	0.16%
11	Restaurants and accommodation services	0.53%	-0.07%	0.46%
12	Miscellaneous goods and services	0.13%	-0.04%	0.09%
	Total	**-0.03%**	**0.27%**	**0.24%**

Table 8 reports the inflation effect of VAT increase in January 2011. The overall effect of the 2.5 percentage point increase in January 2011 is 1.26%, out of which 0.36% comes from lower the willingness to decrease prices and 0.90% is from the willingness to increase prices. The VAT increase induces firms to increase their prices and disincentivize them from lowering prices. The inflation effect of this VAT increase is five times higher than the VAT increase I January 2010, which confirms my hypothesis that the VAT increase in 2011 has a more profound impact on the economy. There are two possible reasons for that. First, as I mentioned above, VAT increase in 2010 is announced in December 2008, so firms can plan ahead their price setting strategies and decide to keep their price unchanged or adjust before January 2010. This is not the case for the VAT increase in January 2011, so most of consumer prices are strongly affected immediately upon the implementation of the VAT change. Second, in January 2010, the UK economy has not fully recovered and the price elasticity of demand may be high, so any price increase may lead to lower demand. This prevents firms from adjusting their prices. In January 2011, the economy has more positive signs, this allows firms to pass the VAT increase to customers without risking losing customers. So, for most of COICOP categories, the effect of VAT increase in 2011 considerably greater than the effect of VAT increase in 2010, further validating the central hypothesis of the paper.

The highest inflation effect can be observed in recreation, sport and culture sector with 2.64%, mostly coming from lower willingness to decrease prices. Prices of products and services in this sector are hardly adjusted (see Figure 24 in appendix) but they are significantly affected by VAT decrease in December 2008 and VAT increase in January 2011. The small effect in January 2010 may be due to the severe macroeconomic conditions and the high price elasticity of demand for these products and services.

Table 8 VAT effects Jan - 2011

COICOP division	Description	Jan-11		
		Increase	Decrease	Overall
1	Food and non-alcoholic beverages	1.73%	0.30%	2.03%
3	Clothing and footwear	0.04%	-0.03%	0.01%
5	Furnishings, household equipment and routine household maintenance	0.58%	0.15%	0.73%
6	Health	0.07%	-0.03%	0.04%
7	Transport	1.72%	0.20%	1.93%
9	Recreation, sport and culture	0.99%	1.65%	2.64%
11	Restaurants and accommodation services	1.12%	0.08%	1.20%
12	Miscellaneous goods and services	0.78%	0.43%	1.21%
	Total	**0.90%**	**0.36%**	**1.26%**

4.5. Robustness

4.5.1. Time series estimation

The inflation effect of the VAT changes can also be quantified by using time series data. In this section, I present a time series model to estimate the terms in the equation (2), compute the inflation effects of VAT changes and compare them to what I have obtained in Heckman selection model.

To estimate the term under the first bracket of equation (2), I run the following regressions:

$$INC\_FR_t = \alpha + \beta_1 VAT_{08} + \beta_2 VAT_{10} + \beta_3 VAT_{11} + \gamma' X_t + \epsilon_t \quad (6)$$

$$INC\_SIZE_t = \varphi + \delta_1 VAT_{08} + \delta_2 VAT_{10} + \delta_3 VAT_{11} + \tau' X_t + \omega_t \quad (7)$$

where INC_FR_t and INC_SIZE_t are the time series of the average probability and average size of price increases. The VAT dummies are equal to 1 in the months of VAT changes, 0 otherwise and X_t are seasonal and year dummies.

To estimate the unknowns in equation (2), I implement the following procedure: I have $\beta_1, \beta_2, \beta_3$ are the marginal effects on the frequency of price increases of the VAT changes in 2008, 2010 and 2011, respectively. I also have $\delta_1, \delta_2, \delta_3$ are marginal effects on size of price increases of the VAT changes in 2008, 2010 and 2011, respectively. Estimating these parameters and calculate fitted values with and without VAT coefficients, I can obtain the overall inflation effect of all of the VAT reforms through the change in the willingness to increase prices.

Similarly, I follow the above procedure with price decreases to estimate the inflation effect of the VAT changes through the willingness to decrease prices.

$$DEC\_FR_t = \alpha + \beta_1 VAT_{08} + \beta_2 VAT_{10} + \beta_3 VAT_{11} + \gamma' X_t + \epsilon_t \quad (8)$$

$$DEC\_SIZE_t = \varphi + \delta_1 VAT_{08} + \delta_2 VAT_{10} + \delta_3 VAT_{11} + \tau' X_t + \omega_t \quad (9)$$

where DEC_FR_t and DEC_SIZE_t are the time series of the average probability and average size of price decreases (in absolute value). The VAT dummies are equal to 1 in the months of VAT changes, 0 otherwise and X_t are seasonal and year dummies.

Table 9 reports the inflation effect of the VAT cut in January 2010 estimated with time series data. The overall effect of the 2.5 percentage point increase in January 2010 is 0.87%, out of which 0.14% comes from lower the willingness to decrease prices and 0.73% is from the willingness to increase prices. The effect is positive, and the magnitude is more than triple of the results obtained using panel data.

Table 9 VAT effect Jan-2010 (time series)

COICOP division	Description	Jan-10		
		Increase	Decrease	Overall
1	Food and non-alcoholic beverages	1.08%	-0.10%	0.98%
3	Clothing and footwear	-0.86%	1.12%	0.26%
5	Furnishings, household equipment and routine household maintenance	0.06%	-0.18%	-0.12%
6	Health	0.42%	-0.38%	0.04%
7	Transport	3.56%	0.75%	4.31%
9	Recreation, sport and culture	0.06%	-0.41%	-0.35%
11	Restaurants and accommodation services	0.86%	-0.05%	0.81%
12	Miscellaneous goods and services	1.24%	0.24%	1.48%
	Total	**0.73%**	**0.14%**	**0.87%**

Table 10 reports the inflation effect of the VAT cut in January 2011 estimated with time series data. The overall effect of the 2.5 percentage point increase in January 2011 is 3.15%, out of which -0.19% comes from lower the willingness to decrease prices and 3.33% is from the willingness to increase prices. The effect is positive, and the magnitude is more than double of the results obtained using panel data.

Using regressions model on time series, I get less reliable estimates. This may be caused by the small time dimension of the data. My sample covers only 51 months from October 2008 to December 2012. This means for each model from (6) to (9), I have only 50 different values of dependent variables. The small variation in data prevents me from getting precise estimates of the inflation effects. However, one can observe that the sign of these estimates is consistent with the one obtained in Heckman selection model (using panel data). And the effects of VAT increase in 2011 is still much higher than the VAT increase in 2010, this pattern is true for the overall effect as well as all the COICOP divisions.

Table 10 VAT effect Dec-2011 (time series)

COICOP division	Description	Jan-11		
		Increase	Decrease	Overall
1	Food and non-alcoholic beverages	4.04%	-0.36%	3.68%
3	Clothing and footwear	2.23%	-0.88%	1.35%
5	Furnishings, household equipment and routine household maintenance	4.23%	-0.56%	3.67%
6	Health	3.19%	-0.08%	3.11%
7	Transport	6.12%	0.16%	6.29%
9	Recreation, sport and culture	3.28%	-0.16%	3.12%
11	Restaurants and accommodation services	2.23%	0.07%	2.30%
12	Miscellaneous goods and services	3.45%	0.11%	3.55%
	Total	**3.33%**	**-0.19%**	**3.15%**

4.5.2. Dynamic effects of VAT changes

It is possible that the prices adjustment does not occur immediately in the month of VAT changes but is delayed to subsequent months due to, for instance, the presence of menu costs. Perhaps consumers anticipate the VAT reforms and adjust their demand, making firm respond to these adjustments by changing their prices. This is likely to cause the lead effects. In this paper, I only consider the delay effect. Controlling for these possible delay effects may give me more precise effects of VAT changes. To account for the possible lag effects of the VAT changes, I control for first-lag VAT dummies in the regressions of the Heckman selection model. The first-lag VAT dummies are defined as follows: $VAT08\_lag$ is 1 in January 2009 and 0 otherwise, $VAT10\_lag$ is 1 in February 2010 and 0 otherwise and $VAT11\_lag$ is 1 in February 2011 and 0 otherwise. Repeating the same procedure as in the baseline Heckman selection model defined in section 4.3, I get the estimates for the immediate and lagged effect of the VAT changes.

Table 11 and 12 report the immediate effects of the VAT changes by COICOP categories in 2010 and 2011, respectively. The estimates are consistent with what I obtain in the baseline model in terms of sign. Controlling for the lag effects, I observe a slight decrease in magnitude of the immediate effects of the VAT changes. Nevertheless, these estimates robustly confirm my hypothesis that the effect of the VAT increase in 2011 exceeds the one of VAT increase in 2010 and this holds for all COICOP categories.

There are lagged effects of the VAT changes, but all of them are relatively small. The table 13 and 14 in appendix report these estimates by COICOP divisions.

Under the assumption that there is no particular shock to any specific industry in the months of VAT changes, our estimates show that the inflation effects of VAT increase in January 2011 is greater than the effect of VAT increase in 2010. This result also is true in both the time series regression model and the dynamic selection model. The result suggests that the level of VAT pass-through is higher when there is no restriction in consumer demand and the reform is not announced a long time beforehand. If the above assumption does not hold, it is hard to estimate the sign and magnitude of the bias without additional data on the shock and the affected industry.

Table 11 VAT effect Jan-2010 (dynamic)

COICOP division	Description	Jan-10		
		Increase	Decrease	Overall
1	Food and non-alcoholic beverages	-0.41%	0.05%	-0.37%
3	Clothing and footwear	-2.42%	2.42%	0.00%
5	Furnishings, household equipment and routine household maintenance	-0.29%	0.13%	-0.16%
6	Health	-0.63%	-0.20%	-0.83%
7	Transport	1.65%	-0.21%	1.44%
9	Recreation, sport and culture	-0.15%	0.01%	-0.14%
11	Restaurants and accommodation services	0.62%	-0.08%	0.54%
12	Miscellaneous goods and services	0.19%	0.10%	0.30%
	Total	**-0.05%**	**0.30%**	**0.25%**

Table 12 VAT effect Jan-2011 (dynamic)

COICOP division	Description	Jan-11		
		Increase	Decrease	Overall
1	Food and non-alcoholic beverages	1.45%	0.13%	1.58%
3	Clothing and footwear	-0.48%	0.61%	0.13%
5	Furnishings, household equipment and routine household maintenance	0.60%	0.31%	0.91%
6	Health	-0.67%	-0.31%	-0.98%
7	Transport	2.16%	-0.23%	1.92%
9	Recreation, sport and culture	1.01%	0.08%	1.09%
11	Restaurants and accommodation services	1.23%	0.07%	1.30%
12	Miscellaneous goods and services	0.71%	0.24%	0.95%
	Total	**0.87%**	**0.16%**	**1.04%**

5. Summary

This paper aims to analyze the UK consumer price behaviors, quantify and compare the inflation effects of the two VAT increases of 2.5 % in January 2010 and January 2011. The main hypothesis of the paper is that the inflation of the second VAT is larger, due to two following reasons. First, the VAT increase of January 2010 was simply a reversal of the previous VAT cut in December 2008, this anticipated reversal may make firms decide to keep their prices unchanged or adjust before the date that the increase is put in action. Second, the VAT increase in 2010 took place under the depressed economic conditions whereas in January 2011, the UK economy already experienced positive growth. This difference in the cyclical position may lead to the difference in consumer demand and then the resulting price-setting response of firms.

In this paper, I find that the average frequency of price changes during 2008-2012 in the United Kingdom is 20%, suggesting the UK consumer prices are slightly less flexible than the US prices during 1998-2005 period and change more frequently than prices in the UK in 1996-2006. The average magnitude of price changes is 14.11%, which is higher than the ones of the US and Euro area.

Following the methodology of Gabriel and Reiff (2010), I find that the overall effect of the 2.5 percentage point increase in January 2010 is 0.24% and the overall effect of the 2.5 percentage point increase in January 2011 is 1.26%. These estimates confirm the central hypothesis of this paper that the overall inflation effect of the VAT increase in 2011 is larger than the effect of the VAT increase in 2010. The same conclusion does hold for most consumption categories in the CPI basket. The results remain robust in the time series regression model and the dynamic selection model. The results suggest that the level of VAT pass-through is higher when there is no restriction in consumer demand and the reform is not announced a long time beforehand.

My findings have implications for VAT rate related policy making process. Using these estimates, we can examine the distributional and welfare effects of VAT reforms. By estimating response of consumers' demand to the price adjustment due to VAT changes and the resulting change in consumers' welfare, we can fully evaluate the social impact of VAT reforms and decide when such reforms are appropriate policy tools. A detailed analysis on this question is left for future work.

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7. Appendix

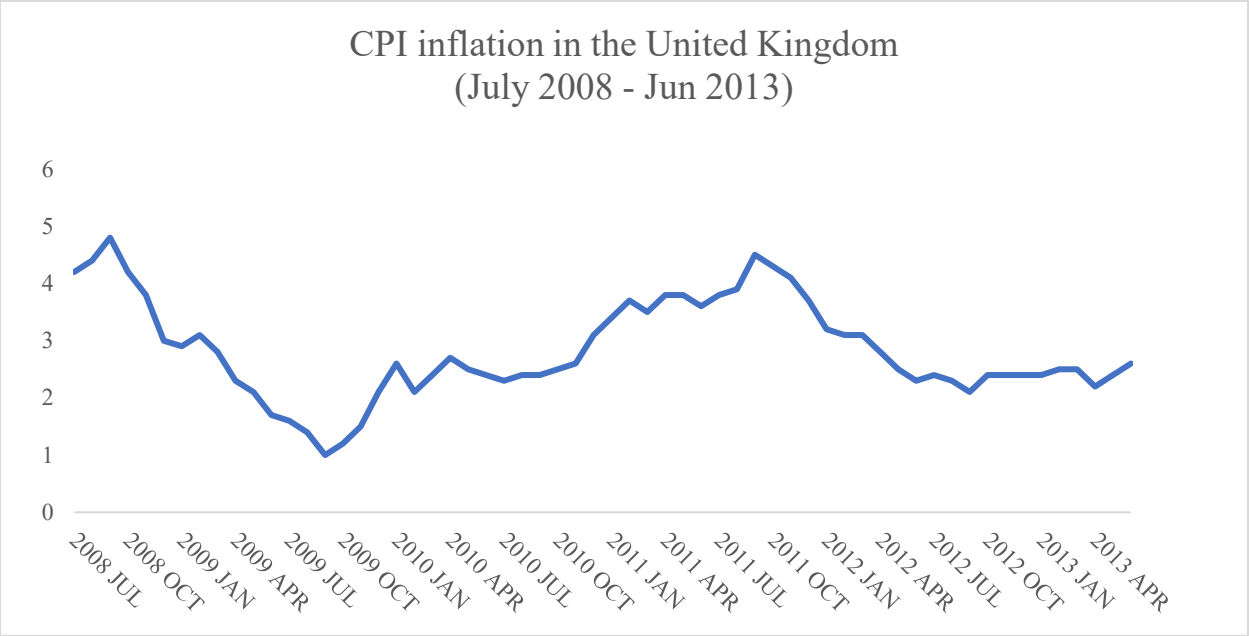

Figure 7 CPI inflation rate in the UK 2008-2013

(Source: ONS consumer price inflation time series)

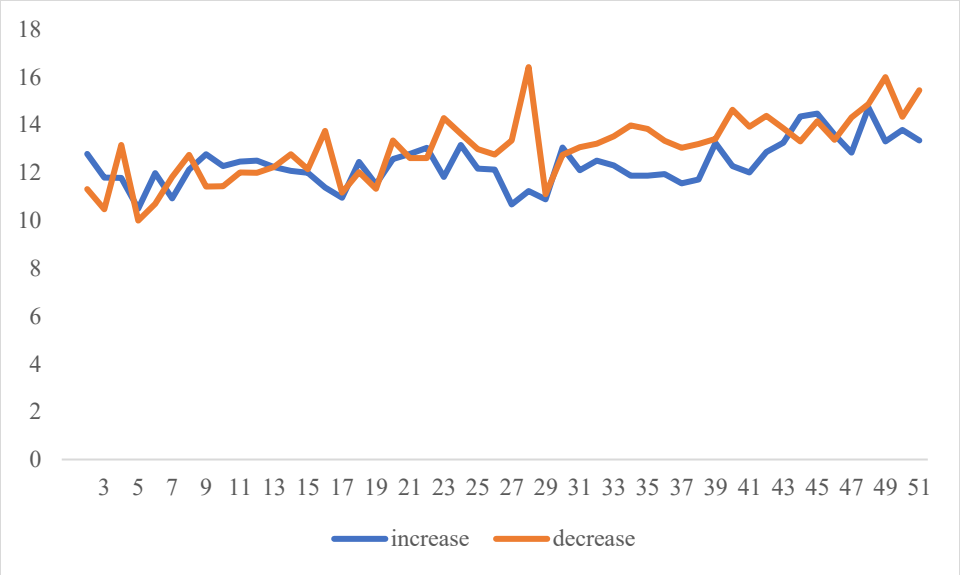

Figure 8 Magnitude of price changes – COICOP 1

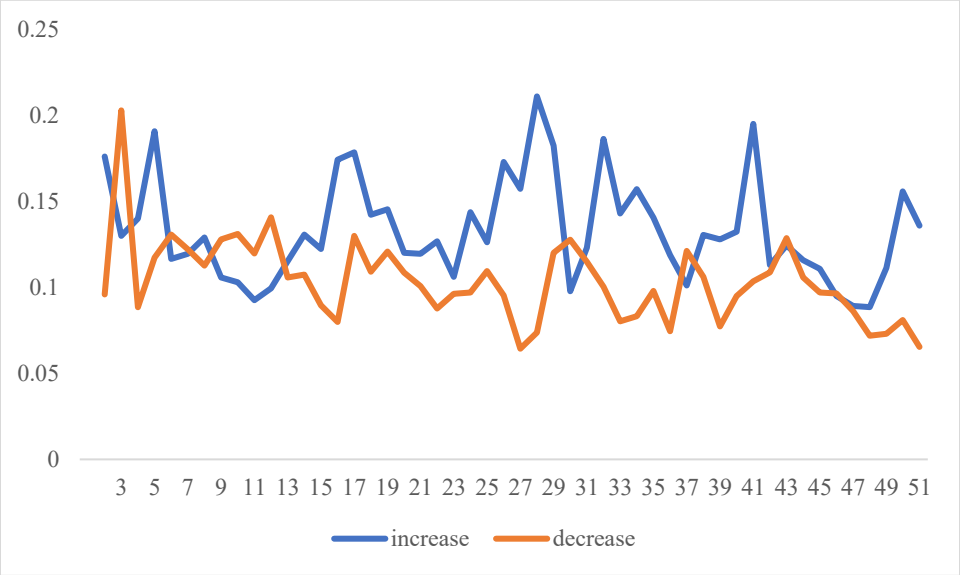

Figure 9 Frequency of price changes – COICOP 1

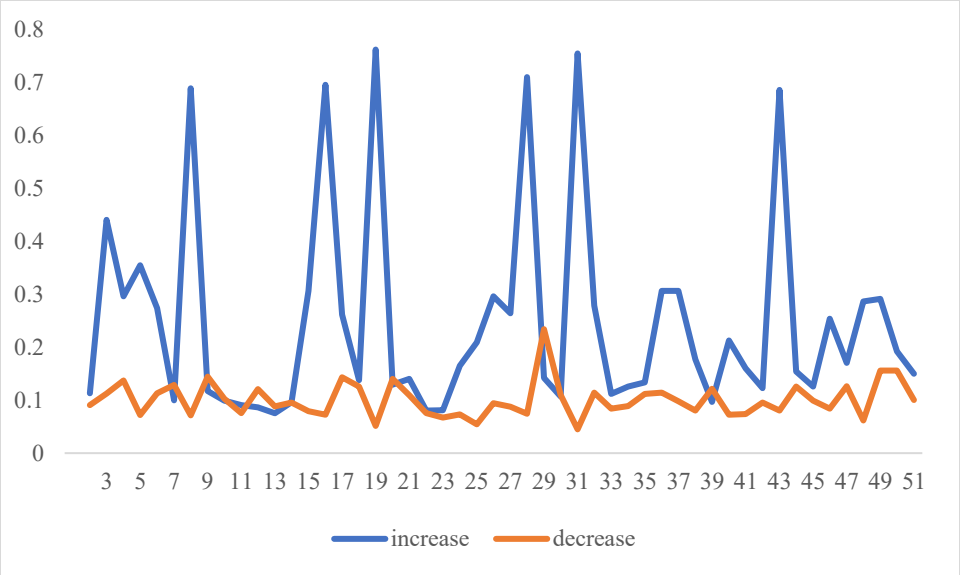

Figure 10 Frequency of price changes – COICOP 2

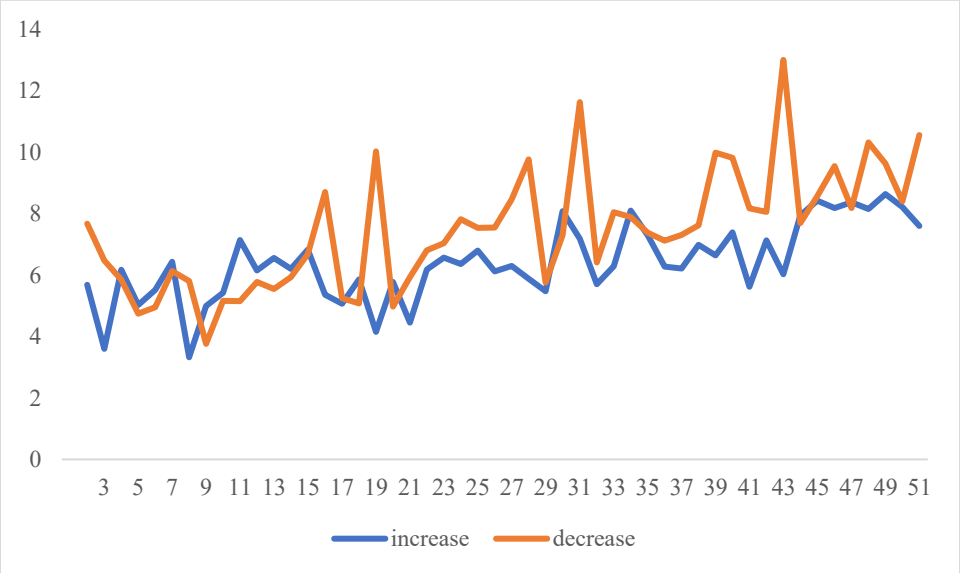

Figure 11 Magnitude of price changes – COICOP 2

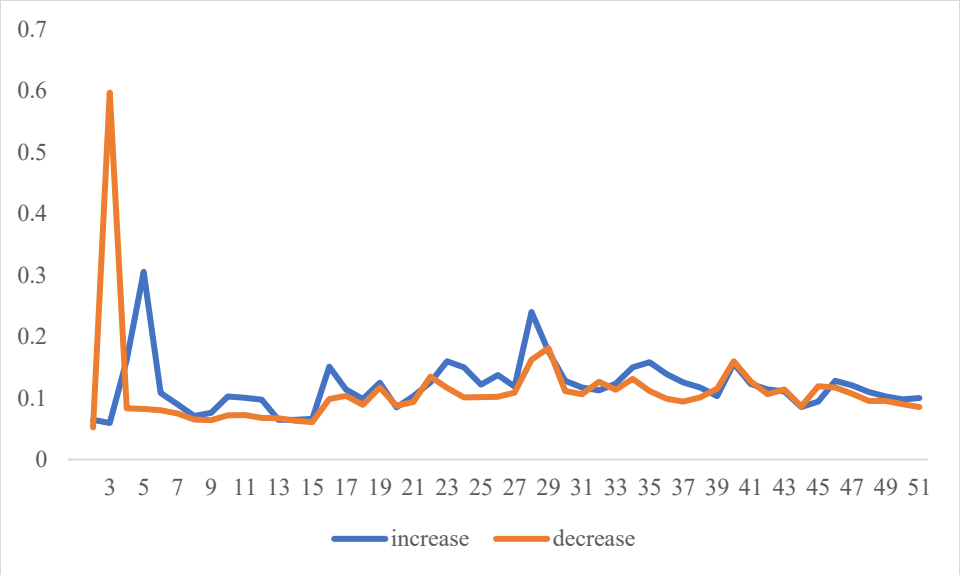

Figure 12 Frequency of price changes – COICOP 3

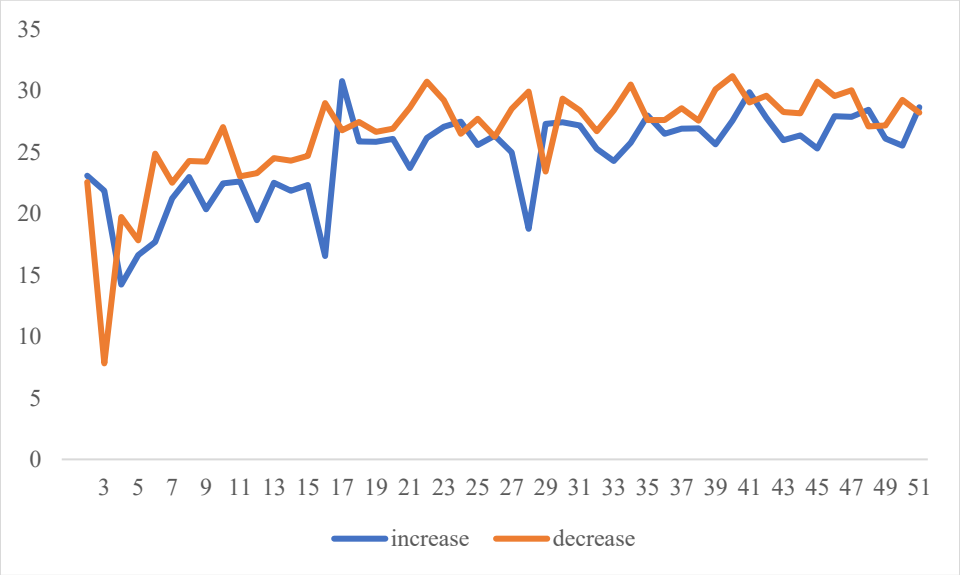

Figure 13 Magnitude of price changes – COICOP 3

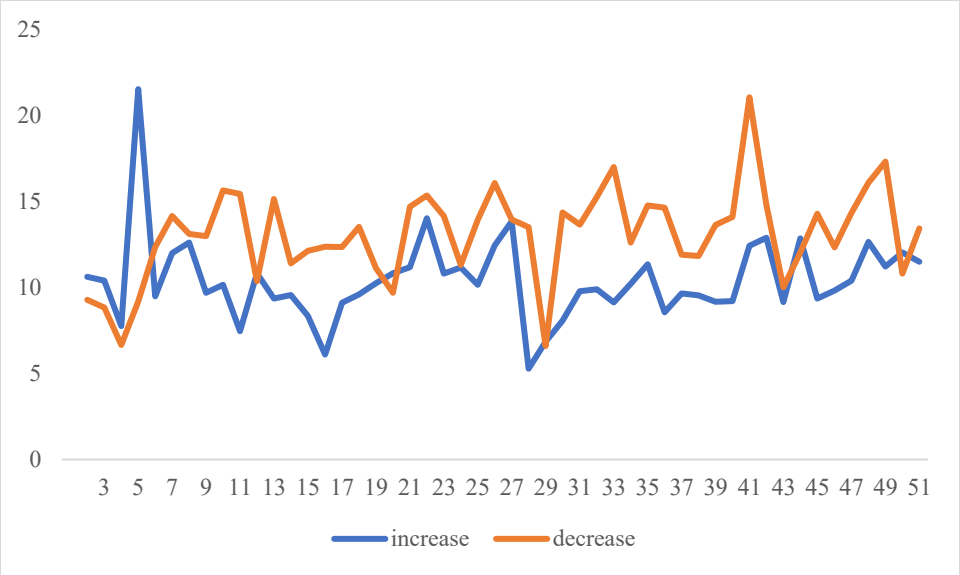

Figure 14 Magnitude of price changes – COICOP 4

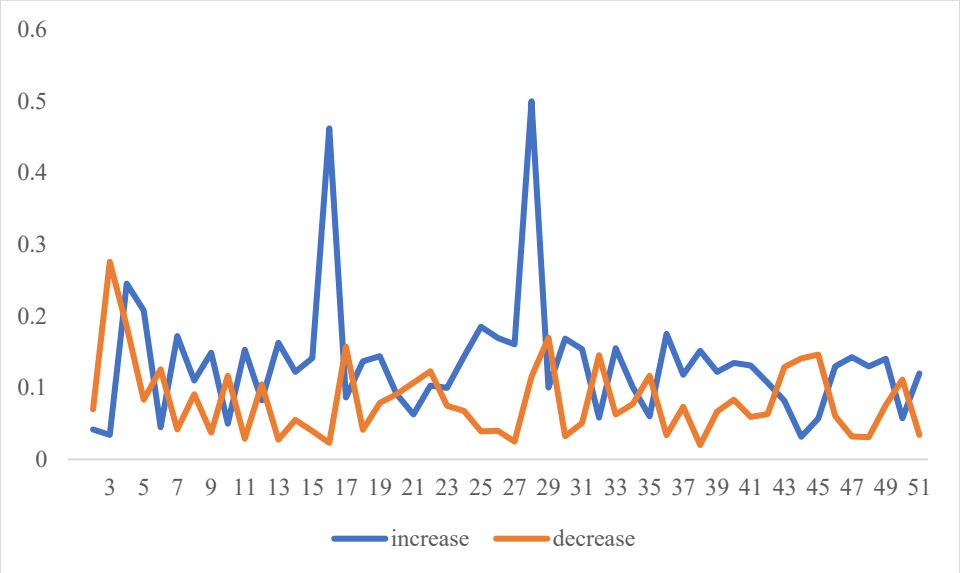

Figure 15 Frequency of price changes – COICOP 4

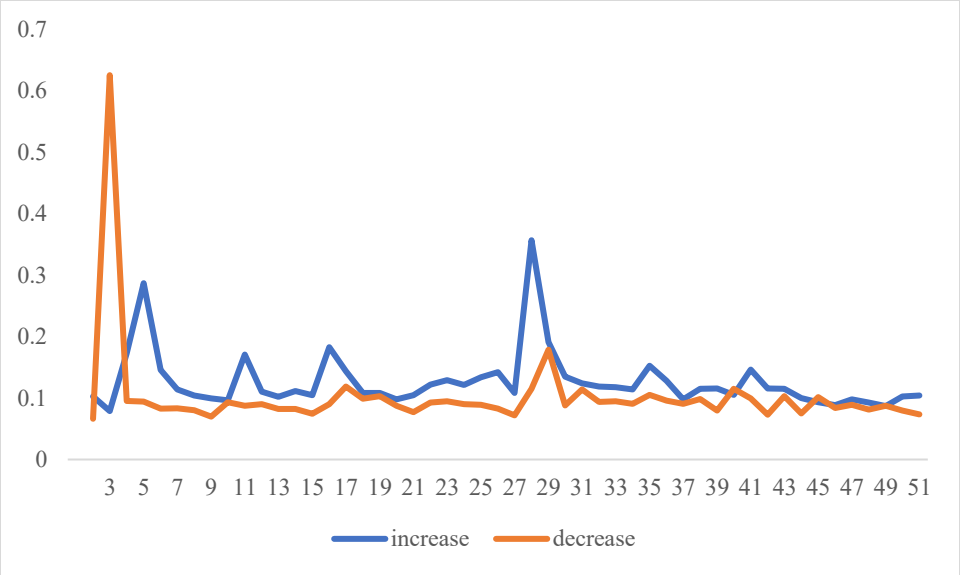

Figure 16 Frequency of price changes – COICOP 5

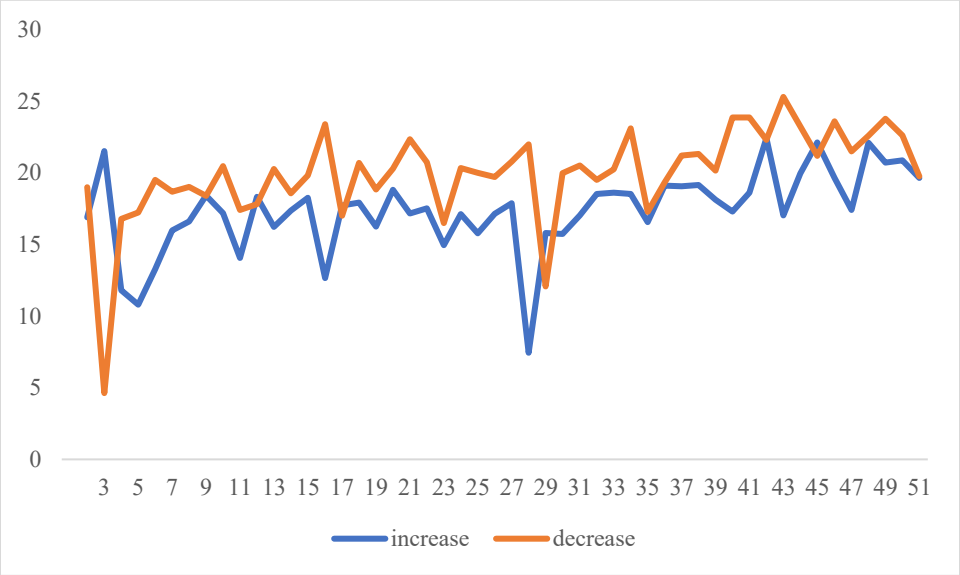

Figure 17 Magnitude of price changes – COICOP 5

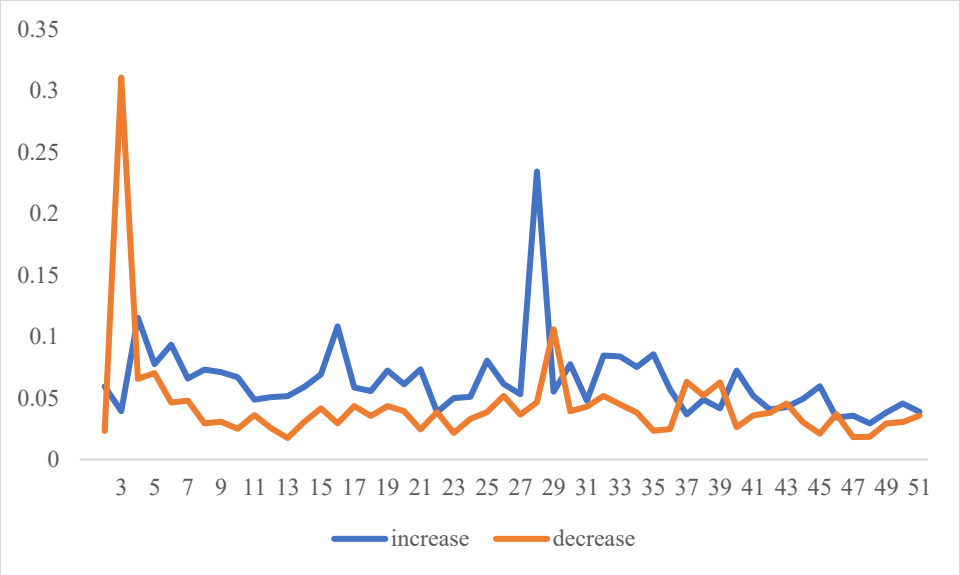

Figure 18 Frequency of price changes – COICOP 6

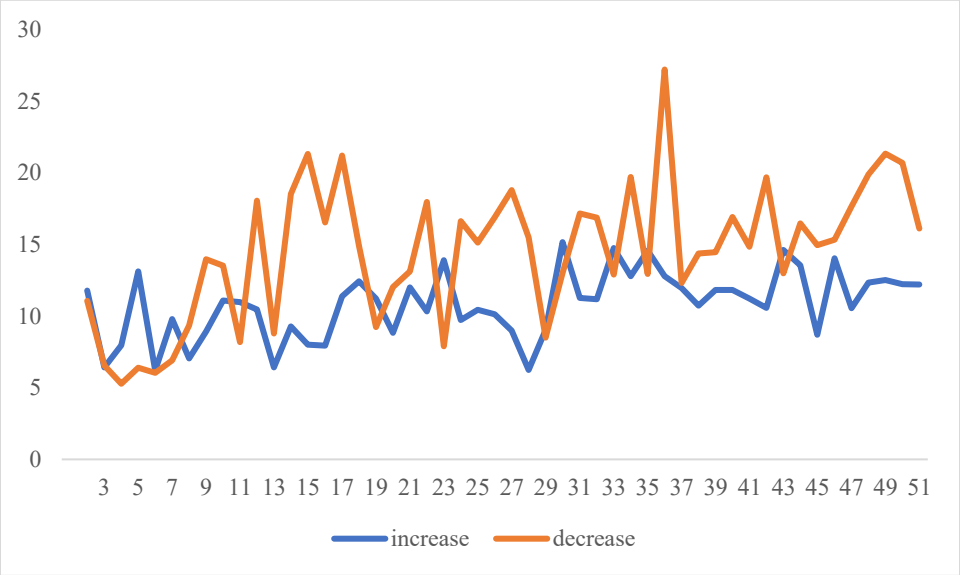

Figure 19 Magnitude of price changes – COICOP 6

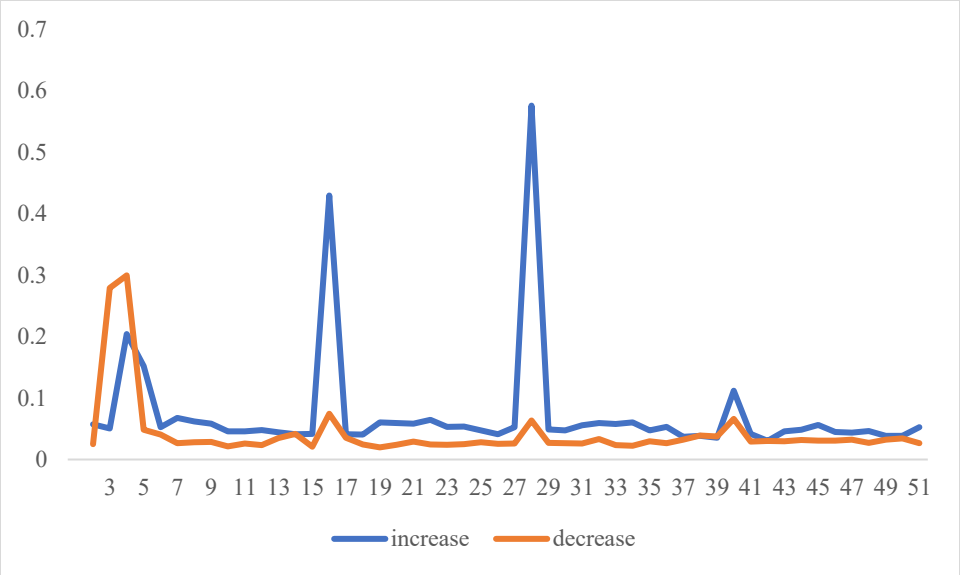

Figure 20 Frequency of price changes – COICOP 7

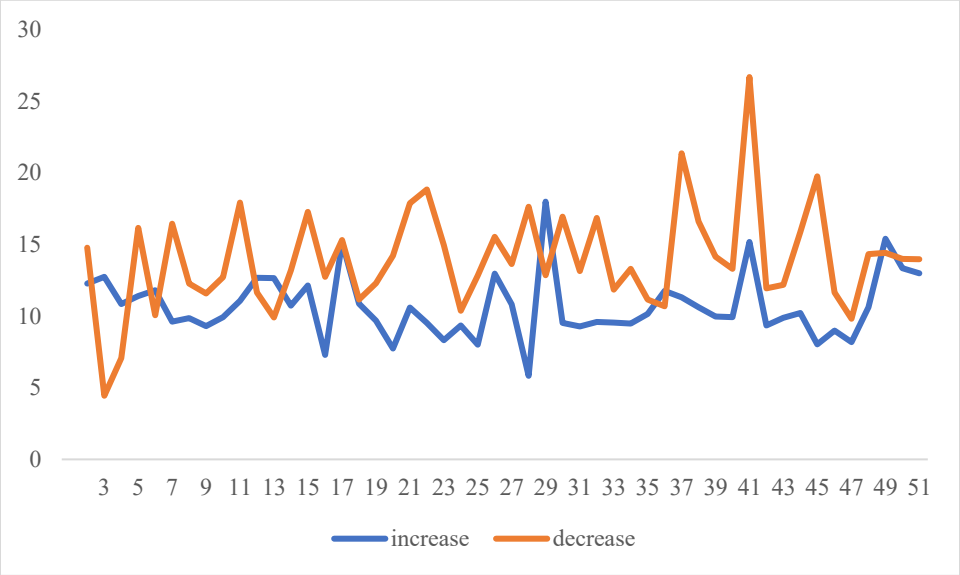

Figure 21 Magnitude of price changes – COICOP 7

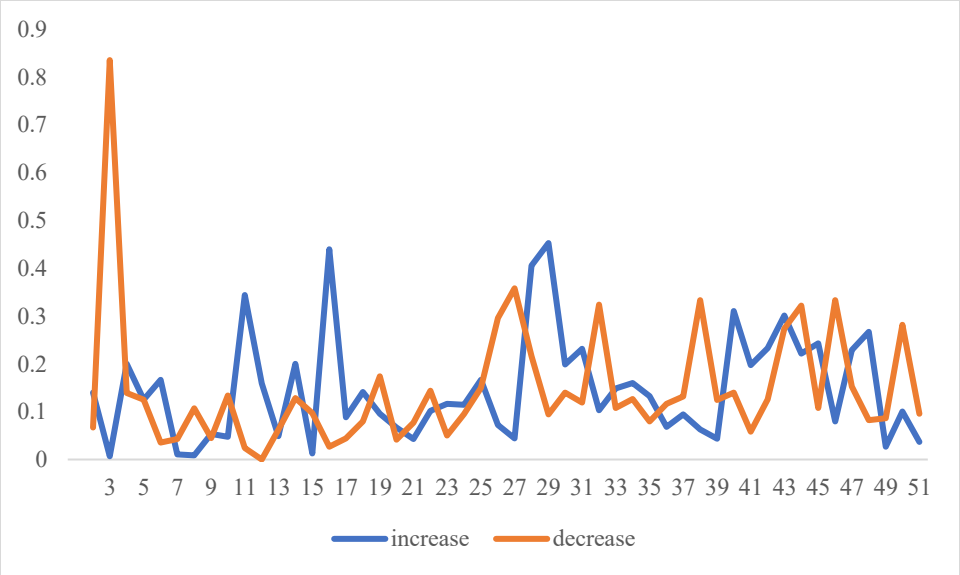

Figure 22 Frequency of price changes – COICOP 8

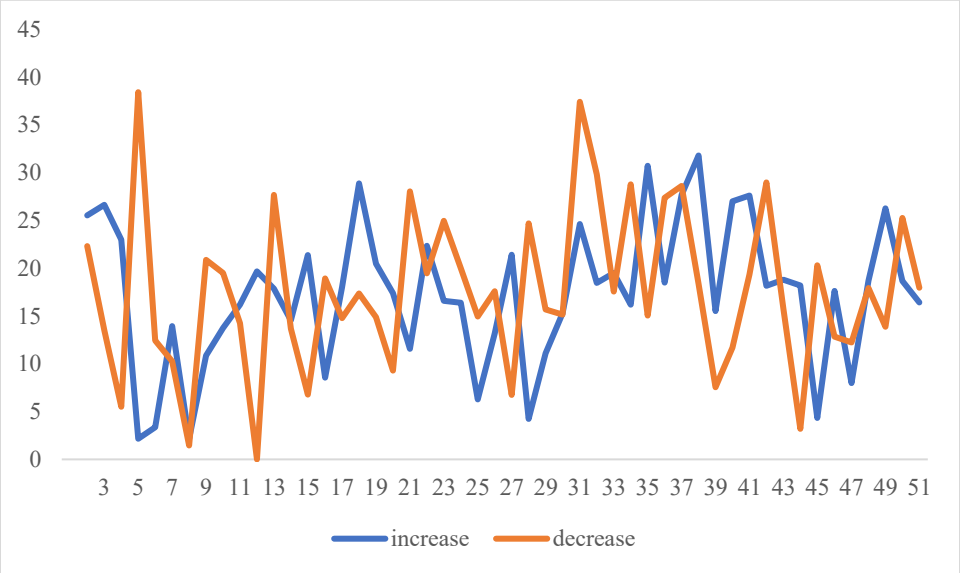

Figure 23 Magnitude of price changes – COICOP 8

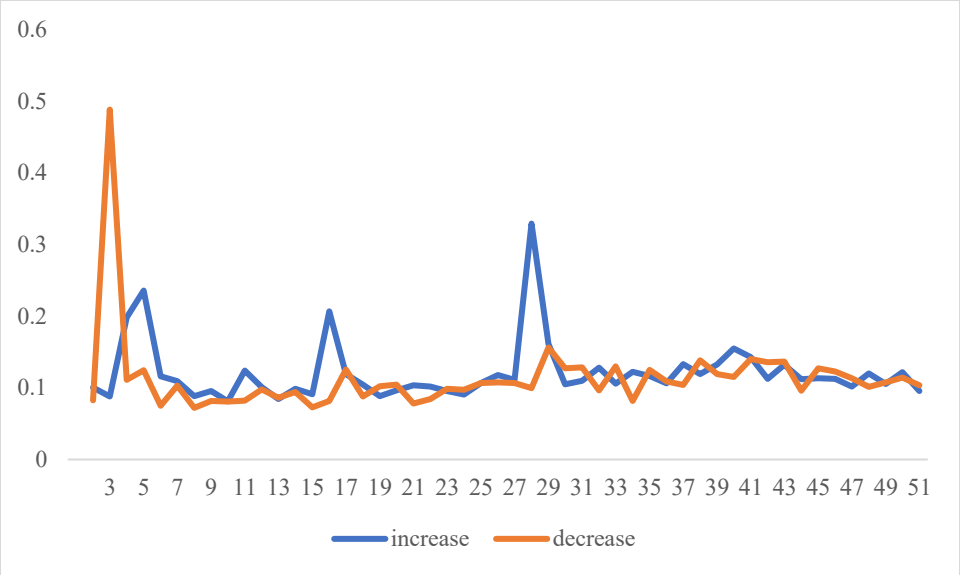

Figure 24 Frequency of price changes – COICOP 9

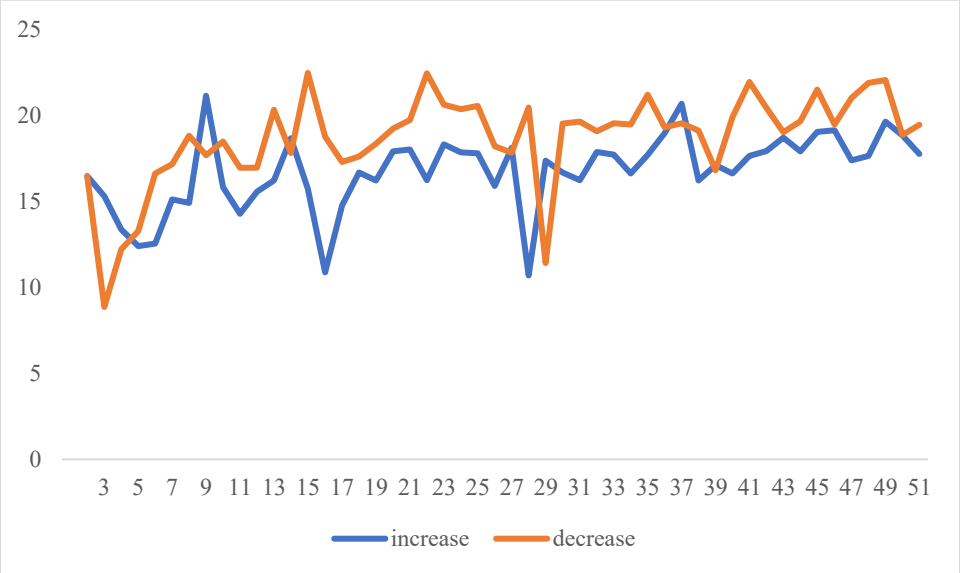

Figure 25 Magnitude of price changes – COICOP 9

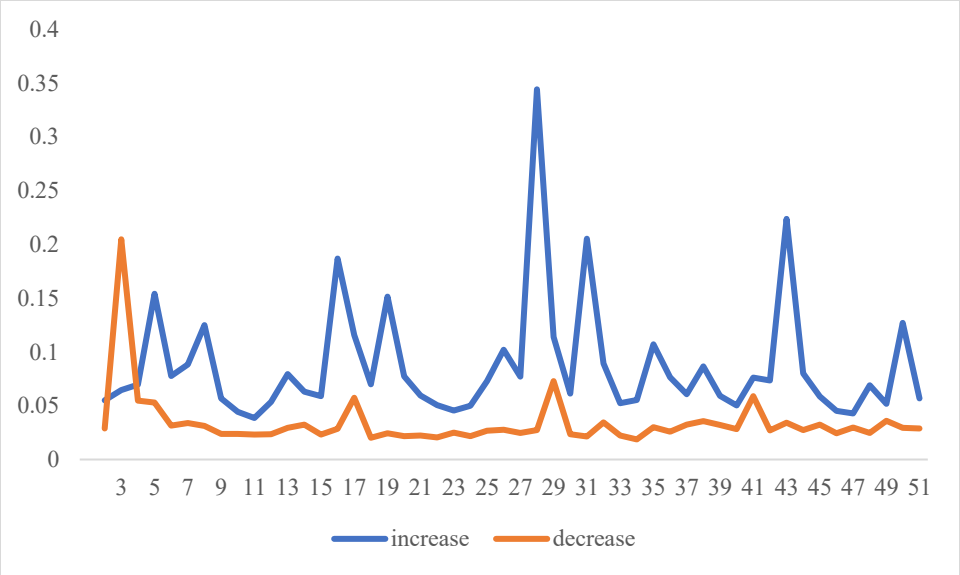

Figure 26 Frequency of price changes – COICOP 11

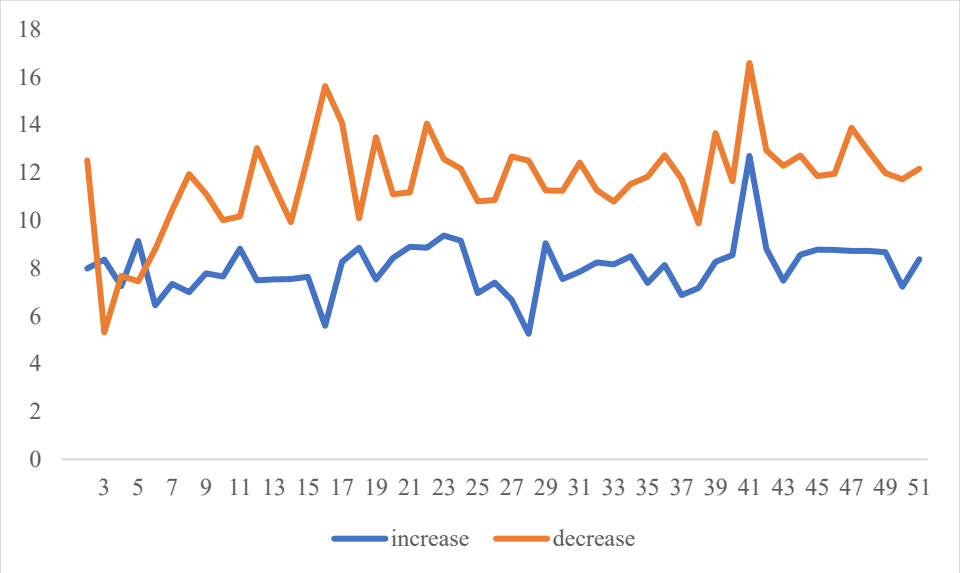

Figure 27 Magnitude of price changes – COICOP 11

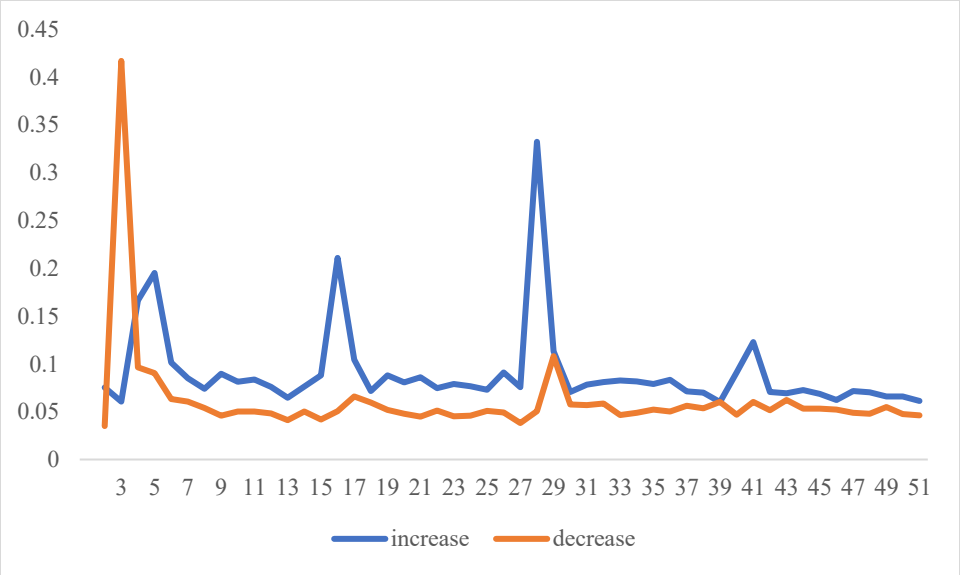

Figure 28 Frequency of price changes – COICOP 12

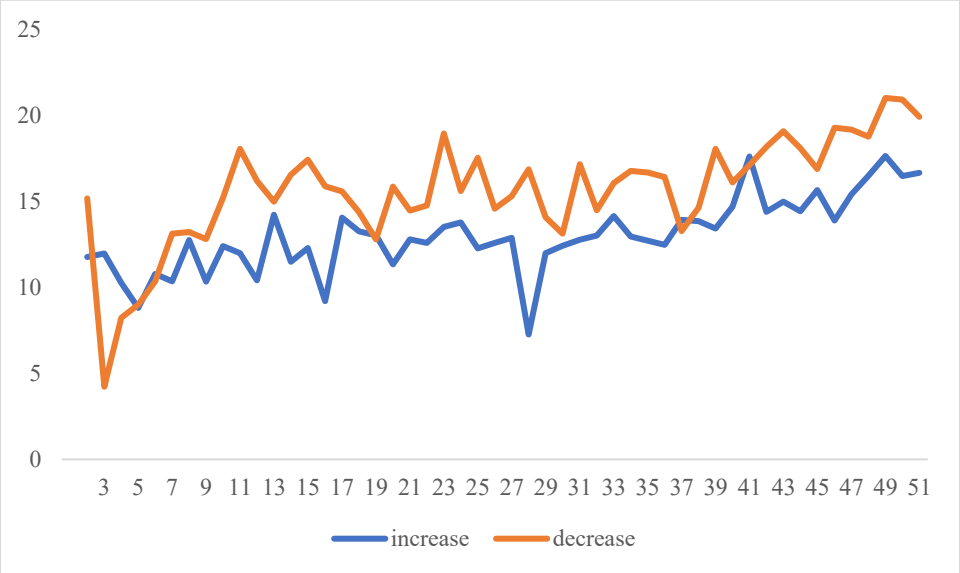

Figure 29 Magnitude of price changes – COICOP 12

Table 13 VAT effect Feb-2010 (dynamic)

COICOP division	Description	Feb-10		
		Increase	Decrease	Overall
1	Food and non-alcoholic beverages	-0.51%	-0.36%	-0.87%
3	Clothing and footwear	-2.42%	0.69%	-1.73%
5	Furnishings, household equipment and routine household maintenance	-0.82%	0.10%	-0.72%
6	Health	-0.06%	-0.55%	-0.62%
7	Transport	-0.07%	0.19%	0.12%
9	Recreation, sport and culture	-0.26%	0.33%	0.07%
11	Restaurants and accommodation services	-0.08%	-0.24%	-0.31%
12	Miscellaneous goods and services	-0.51%	-0.11%	-0.62%
	Total	-0.59%	0.05%	-0.54%

Table 14 VAT effect Feb-2011 (dynamic)

COICOP division	Description	Feb-11		
		Increase	Decrease	Overall
1	Food and non-alcoholic beverages	-0.32%	-0.07%	-0.39%
3	Clothing and footwear	-0.40%	0.02%	-0.38%
5	Furnishings, household equipment and routine household maintenance	-0.48%	-0.06%	-0.54%
6	Health	-0.09%	-0.44%	-0.53%
7	Transport	-0.03%	0.49%	0.46%
9	Recreation, sport and culture	0.14%	0.27%	0.41%
11	Restaurants and accommodation services	-0.15%	-0.27%	-0.42%
12	Miscellaneous goods and services	-0.48%	-0.16%	-0.64%
	Total	-0.23%	-0.03%	-0.27%