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Does domestic output gap matter for inflation in a small open economy?

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Abstract

In the paper we have investigated to what extent the behaviour of CPI inflation depends on changes in domestic economic activity in Polish economy which is usually described as a small open economy. We conducted a disaggregated analysis using price indices at the COICOP 4-digit level. We specified a small open economy Phillips curve for individual price indices. Additionally we investigated the exchange rate pass through at COICOP group levels. We found that more than 50 per cent of the categories react to the output gap. According to our expectations the categories which are mostly linked to the output gap are services but also non-durable goods. We identified that only small share of prices of durable and semi-durable goods react to domestic demand which can be explained to some extent by globalization process. We also found that more than one third of the price indices respond to exchange rate movements and/or foreign inflation. The impact of exchange rate is most substantial for durable and semi-durable goods which are to large extent perceived as tradable goods. Finally we aggregated the price indices for items sensitive to domestic economic activity and formed an index which, taking into account uncertainty and substantial lags in calculating output gap, may be used as an alternative measure of domestic inflationary pressure.

JEL: C53, E31, E37, E52

Keywords: Inflation, monetary policy, Phillips curve, dissagregated price indices, output gap, exchange rate pass-through

1 Introduction

The experience of the last decades revealed the weakening of relationship between inflation and domestic output gap in many small open economies. Less sustainable relationship between inflation and domestic economic activity was a global phenomenon, which was observed in many countries but growing turnovers in the world trade, decreasing production costs in emerging economies and higher volatility of commodity prices made this issue more important for small open economies, where the inflation to a larger extent was shaped by external factors.

In the period of Great Moderation, inflation in many countries was relatively low and fluctuated only slightly in reaction to changes in domestic economic activity. This issue has been raised by many authors and attributed to several factors. The first reason for weakening of co-movement between inflation and domestic economic activity was a growing impact of globalization related to increasing turnovers in international trade supplemented by falling unit labour costs in China and other emerging economies. The impact of globalization on the flattening of the Phillips curve has been studied by Borio and Filardo (2007), who argued that apart from domestic factors inflation in many countries was also influenced to large extent by external factors (foreign output gap, decreasing unit labour costs in emerging economies). They believed that the impact of external factors on the inflation was increasing during the last decade. Chmielewski and Kot (2006) analysed the relationship between core inflation measure and output gap in the Polish economy and they revealed that there was no statistically significant impact of domestic output gap on the core inflation. However, they proved that after removing small share of tradable goods from the core inflation basket, whose prices were for the long time in a downward trend, the statistically significant relationship between domestic output gap and core inflation was recovered. The second stream of literature (Blanchard and Gali (2007), Evans and Fisher (2011), see also Ciccarelli and Mojon (2005)), explaining why the inflation in the 90-ies and in the first half of the previous decade was relatively stable and low, attributed this issue to the growing credibility of central banks, which - after the experience of the oil shocks - paid more attention to keeping inflation under control. It is worth emphasising that in the 90-ies many central banks adopted strategy of direct inflation targeting (Bank of England, Riksbank and National Bank of Poland as well) or similar strategies (ECB) where the price stability was the primary goal of the central bank. Rogoff (see Rogoff (2003, 2006)) attributed the phenomenon of low inflation to both above mentioned factors: globalization

and growing credibility of central banks.

In the second half of 2000-ies the situation reversed and due to substantial shocks to commodity prices the inflation has been permanently heightened. FAO (2012) attributed these long lasting positive shocks to food and fuel prices to structural factors. They argued that the upward trend in food prices resulted from higher demand in emerging economies caused by growing disposable income and change in consumption structure. The increase of oil prices was also associated with fast economic growth in emerging economies faced by some rigidities, which did not allow to increase the supply of oil in the short term to meet the demand overhang. According to some authors the growth of commodity prices was driven to some extent by speculative motives (Masters (2008), Tang and Xiong (2010), see also more comprehensive discussion on this issue in Sanders and Irwin (2010)). Hamilton (2009) argued that loose monetary policy of some central banks also contributed to the increase of commodity prices. Disregarding the nature and sources of commodity prices growth this phenomenon heightened the inflation not only in years 2006-2007 but also in the recent period when the global economy was in a downturn phase. It led to weakening of relationship between output gap and CPI inflation in particular in developed economies strongly hit by a crisis.

The last but probably not least reason why the headline inflation does not co-move with changes in economic activity is the counter-cyclical impact of increase in taxes and regulated prices. The deterioration of fiscal position and fast growing public debt followed by growing costs of debt services forced many European countries to decrease budget deficits. The tightening of fiscal policy has been realized mostly by both cutting expenditures and increasing revenues. While in the longer term the tax increase may have some disinflationary effects by decreasing the disposable impact of households, in the short term due to non-zero price elasticity of demand on several goods it usually leads to temporary growth of inflation. The issue of counter-cyclical impact of taxes increase on inflation has been raised by the IMF (2010).

The abovementioned factors led to weakening of relationship between inflation and domestic economic activity in many countries as pointed out by Rumler and Valderrama (2010). Thus taking into account a growing role of global output gap in shaping domestic inflation as well as higher volatility and persistency of commodity prices this weakening may be more pronounced for small open economies, which are more sensitive to external shocks. Guender and Xie (2006) analysed co-movements between domestic output gap and inflation for a group

of developed countries characterized as small open economies and concluded that this relationship was rather weak.

However, Bryan and Meyer (2010) pointed out that cyclical sensitivity of individual prices may differ and that prices of some goods and services may react to the changes in the domestic economic activity stronger than others. Using the methodology of Bils and Klenow (2004) they differentiated between sticky and flexible prices basing on the frequency of price adjustment. According to their findings the index of flexible prices for the US contained 30% of CPI basket. They showed that the price index containing so called flexible prices co-move stronger with the domestic output gap than CPI and index containing prices classified by them as sticky. As a measure of cyclical changes in domestic economic activity they used a gap between real and natural rate of unemployment and the investigation has been conducted in the framework of traditional Phillips curve. Finally they tested whether substituting newly constructed price indices and their "core" counter-partners in place of lagged CPI into the Phillips curve may improve its forecasting performance in respect to the CPI. They concluded that the forecasts of the headline CPI based on the sticky-price indices are more accurate than the forecasts based on headline CPI inflation only.

The more comprehensive analysis of the relationship between individual price indices and an output gap has been conducted for the euro area by Froehling and Lommatzsch (2011). They estimated disaggregated Phillips curves for individual price indices at COICOP 4-digit level. The certain price index has been classified as "cyclical sensitive" or "output gap sensitive" if the output gaps in the disaggregated Phillips curve constructed for this index proved to be statistically significant. Finally they formed an index of all goods and services sensitive to the changes in an output gap and compared the strength of the relationship between an output gap and the new index as well as other commonly used indices. They concluded that this newly formed index is closer related to the output gap than traditional core inflation measures but similar to CPI and FROOPP[1].

The analyses conducted by Bryan and Meyer (2010) and Froehling and Lommatzsch (2011) concerned two large economies which are perceived to be rather closed. The investigation has been conducted in the framework of traditional Phillips curve specified for a closed economy where the role of exchange rate and external factors in shaping domestic inflation has been not explicitly revealed.

[1]FROPP stands for frequent out-of-pocket purchases defined by EUROSTAT http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-SF-09-015/EN/KS-SF-09-015-EN.PDF

However, in a small open economy the relationship between inflation and domestic output gap may be weaker what has been showed for aggregated data by Guender and Xie (2006). So we may expect that a number of price indices sensitive to domestic output gap may differ from the case of large, relatively closed economy when the prices of some goods are shaped by external factors.

Thus in our paper we would like to investigate the relationship between inflation and an output gap in the Polish economy, which is usually classified as small open economy, using the disaggregated price indices. In the analysis we take similar approach to Froehling and Lommatzsch (2011) and we estimate disaggregated Phillips curves for individual price indices at COICOP 4-digit level. However, in contradiction to their approach we base our research on a version of the Phillips curve specified for small open economy, which allows for direct influence of exchange rate and external factors on inflation.

The aim of our analysis is to check which groups of goods and services constituting CPI in Poland react to changes in domestic economic activity measured as an output gap. Moreover, by incorporating explicitly an exchange rate in the Phillips curve and allowing for direct impact of external factors on inflation we are going to check to what extent the CPI inflation in Poland co-moves with a global price trend and which categories of goods and services are sensitive to changes in exchange rate and/or foreign inflation. After identifying the goods reacting to external price factors we may investigate the exchange rate pass-through for individual price categories.

The rest of the paper is structured as follows. Section 2 describes the model and data chosen for the analysis. Section 3 discusses the estimation results and Section 4 concludes.

2 Model and data

2.1 Phillips curve for small open economy.

As an extension of the New Keynesian Phillips Curve derived by Gali and Gertler (1999) for the closed economy, Gali and Monacelli (2005) proposed a Phillips curve basing on a small open economy version of the Calvo sticky price model. The small open economy Phillips curve derived from optimisation behaviour of the firms takes a form

$$\pi_t = \beta E_t \left\{ \pi_{t+1}^H \right\} + \kappa x_t + \frac{\alpha}{1-\alpha} q_t \tag{1}$$

where π_t stands for inflation, π_t^H is a domestic inflation (defined as the rate of change in the index of domestic goods prices), x_t denotes output gap and q_t is a real effective exchange rate. A parameter α in equation (1) measures the degree of openness of the economy.

Thus as pointed out by several authors (e.g.Rudd and Whelan (2007)) the New Keynesian Phillips Curve does not match data well. That is why for empirical investigation of relationship between output gap and inflation usually the hybrid version of the Phillips curve has been used. The hybrid NKPC as proposed for closed economy by Gali and Gertler (1999) relates the inflation not only to future inflation and current output gap but also to the past inflation. In case of a small open economy the inflation is a function of future and lagged domestic inflation, a current output gap and a real effective exchange rate (see e.g. Baranowski and Leszczyńska (2011)). This hybrid version of the Phillips curve can be also derived from the optimization behaviour of the enterprises if we assume that some enterprises when resetting the prices use "the rule of thumb" and set the prices in line with the recent inflation.

The small open economy hybrid Phillips curve has been extensively used for the analysis of the inflationary process in the Polish economy for aggregated data. Kłos et al. (2005) investigated monetary transmission mechanism, Przystupa and Wróbel (2009) analysed the asymmetry in exchange rate pass-through while Baranowski and Leszczyńska (2011) tested the forecasting performance of the NKPC for future inflation. In all above mentioned analyses conducted for Poland the output gap had statistically significant impact on the inflation, but the strength of the relationship differed regarding to measure of output gap, sample and detailed specification of the model. However taking into account the results of Bryan and Meyer (2010) for the US and Froehling and Lommatzsch

(2011) for euro area we may expect that also in the Polish economy some prices react to output gap stronger than the others what has been to some extent pointed out by Chmielewski and Kot (2006).

2.2 Model for disaggregated data.

According to microfoundations of the NKPC a price set by an individual firm depends on its marginal cost, which after aggregation allows to rewrite the overall inflation as a function of marginal cost for the whole economy, which is usually approximated by an economy-wide output gap. Therefore from a theoretical point of view when investigating the reaction of the disaggregated price indices to changes in domestic economic activity, it would be more convenient to relate the price indices to disaggregated output gaps corresponding to categories of goods and services covered by these indices. Imbs et al. (2011) derived the sectoral NKPC and investigated the relationship between prices expressed as value-added deflators and sector-specific marginal costs for 16 sectors of French economy. However, the structure of the CPI basket is specified on the basis of households' budgets survey and the prices in the CPI are calculated using the individual quotations of particular services and goods in retail trade. On the other hand, the economy-wide output gap is usually measured using GDP, industrial production or some labour market variables, which after disaggregation do not match with the structure and methodology of CPI basket. For that reason following Bryan and Meyer (2010) and Froehling and Lommatzsch (2011) we decided to relate the individual price indices to an economy-wide output gap.

As pointed out by Froehling and Lommatzsch (2011) the posing of relationship between the individual price indices and the aggregated output gap can be explained within factors analysis framework. This approach popularized by Stock and Watson (1998) allows to assume that behaviour of all disaggregated price indices constituting CPI depends on some common unobservable factors and also idiosyncratic components.

To understand this idea let $\pi_{i,t}$ denote a change of price index for category i between periods $t-1$ and t, while π_t denotes an $N \times 1$ vector which includes price changes (inflation rates) of all N categories of goods and services included in the CPI. The linear factor model decomposes every component $\pi_{i,t}$ in vector π_t as:

$$\pi_t = \Lambda F_t + \varepsilon_t \tag{2}$$

where F_t stands for a vector of size $k \times 1$ of k unobservable factors, and Λ an $N \times k$ matrix of factor loadings. With ε_t we denote an $N \times 1$ vector of idiosyncratic components for individual indices. Those factors contain information about common changes in series under analysis, loadings allow presenting individual series as a linear combination of factors. Loadings also allow assessing the impact of a given factor on a given index, which may be different for particular price indices.

In our analysis we assume that we have two common factors which may have non-zero impact on the behaviour of some price indices and no impact on others (some loadings in (2) may take a value of zero). The first factor is an economy-wide output gap which, following the interpretation of Froehling and Lommatzsch (2011), represents a general domestic economic activity (a country's position in a business cycle). The second factor which combines changes in nominal exchange rate and foreign inflation may be interpreted as external sources of domestic inflation. Moreover, every price index constituting CPI is affected by an idiosyncratic component. These components represent determinants of inflation for particular categories of goods and services other than an economy-wide output gap and foreign factors (foreign inflation adjusted for nominal exchange rate).

We formulated a model for individual price indices, where inflation in subsequent categories of goods and services depends on lagged disaggregated inflation, economy-wide output gap and nominal effective exchange rate plus foreign inflation.

However, we have to keep in mind that in the second half of the previous decade we observed substantial price shocks on the food and oil markets, which had significant impact on the respective price categories in Poland not necessarily related directly to the fluctuations of the domestic output gap. For that reason disaggregated Phillips curves describing the behaviour of food and fuel prices have been supplemented by control variables which expressed the relative increase of food and fuel prices abroad.

All in all the disaggregated Phillips curves (98 out of 110 equations) for the non-food and non-fuel price categories take a form:

$$\pi_{i,t} = \alpha_0 + \sum_{p=1}^{P} \alpha_p \pi_{i,t-p} + \beta \bar{y}_{t-1} + \gamma er_{t-1} + \varepsilon_{i,t} \tag{3}$$

while for food and fuel categories (12 equations) respective control variable has been added:

$$\pi_{i,t} = \alpha_0 + \sum_{p=1}^{P} \alpha_p \pi_{i,t-p} + \beta \bar{y}_{t-1} + \gamma er_{t-1} + \delta control_t + \varepsilon_{i,t} \quad (4)$$

In both variants of model $\pi_{i,t}$ stands for quarterly inflation in i-th category of goods and services, $\overline{y}_t$ is an economy-wide output gap, er_t is an effective nominal exchange rate plus foreign inflation while control variable expresses the relative growth of food or fuel prices in the category corresponding to the respective category expressed by the variable on the left hand side of the equation to the average inflation abroad. As an output gap we used two different measures (see Section 2.3).

The maximum lag order for the lagged inflation has been set to 2 for all equations, which allows removing the autocorrelation without losing too much degrees of freedom. The lag order for the output gap and exchange rate has been set to 1 which fits the empirical data to the largest extent and broadly stays in line with the results for aggregated Phillips curve for Polish economy (see Przystupa and Wróbel (2009)).

We estimated the parameters of equations (3) and (4) with the OLS using Newey-West correction to make the results robust to potential autocorrelation and heteroscedasticity problems. We classified the categories of goods and services as price sensitive to domestic output gap if the output gap was statistically significant at 10% significance level. In the assessment of exchange rate price sensitivity we assumed the same significance level. It is worth emphasising that there was only slight difference in the outcome if we chose 5% significance level.

After establishing the structure of the goods and services, whose prices are sensitive to the output gap, we aggregated the respective price indices and formed a new index: the index of goods and services sensitive to output gap (IDSG - index of demand sensitive goods). This index may be interpreted as a measure of inflationary pressure in the economy stemming from excessive domestic demand. Despite of the fact that IDSG is a function of the output gap it may have some advantages over the investigation of the output gap development only. Firstly, it allows quantifying the excessive demand pressure in terms of price development. So we may move directly from the output gap to price inflation and compare the behaviour of the newly formed IDSG index with the CPI and core inflation measures.

Secondly, the output gap is an unobservable variable calculated on the quarterly basis, usually with some lag. Moreover, the output gap is often subject to

revisions, which can be quite large. On the other hand, when we identify the goods and services whose prices are influenced by a domestic output gap we may form an index (IDSG) that can be calculated on a monthly basis which reduces the lag substantially. So the information provided by the index may be more up to date than information stemming from the output gap only.

Thirdly, according to our estimates (see Section 3) almost all goods sensitive to exchange rate and/or foreign price development are covered by the index of goods and services sensitive to the output gap. Kłos et al. (2005) argue that two main channels by which the central bank in a small open economy may influence domestic inflation are interest rate channel and exchange rate channel. Therefore this newly formed index (IDSG) includes almost all goods and services, which prices can be influenced by the central bank: by output gap or by exchange rate channel (at least to some extent). We believe that monitoring the index may give an additional information to the central bank when conducting the monetary policy and address the question to what extent the inflation is beeing influenced by the domestic monetary policy.

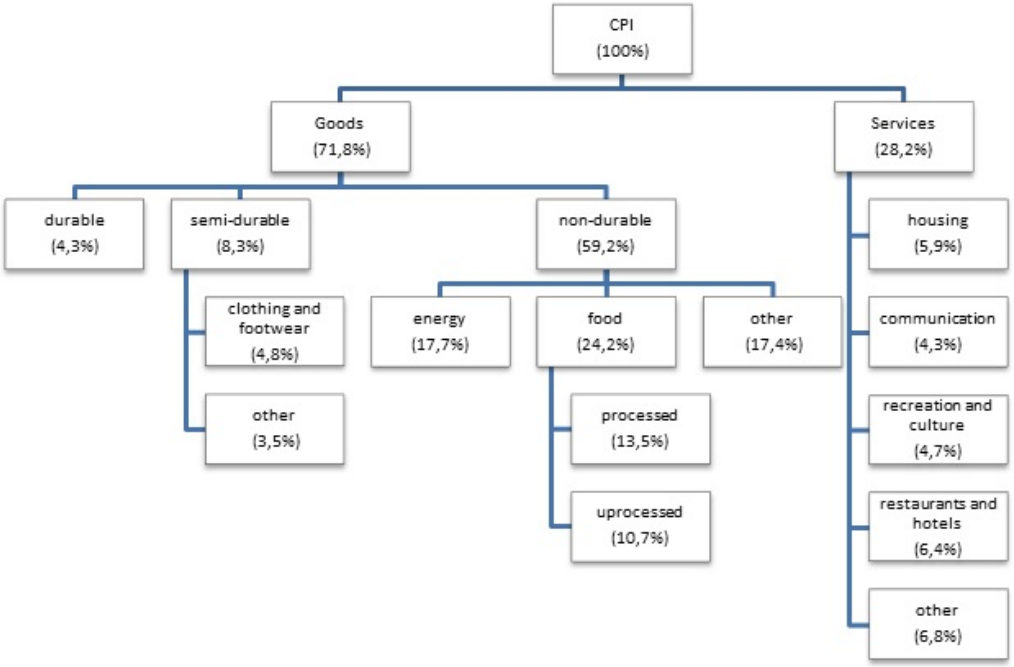
After calculating the aggregated index of goods and services sensitive to an output gap (IDSG) we estimated the aggregated Phillips curve for the new index as well as for some other indices like CPI and two core inflation measures: inflation after excluding food and energy prices and inflation after excluding the administered prices. The aim of this exercise was to check whether the method of classification of goods and services sensitive to output gap was the correct one in the sense that the newly formed index IDSG reacts stronger to output gap than CPI and traditional core inflation measures. The aggregated Phillips curve has been formulated as:

$$\pi_t = \alpha_0 + \sum_{p=1}^{P} \alpha_p \pi_{t-p} + \beta \bar{y}_{t-1} + \gamma er_{t-1} + \delta control_t + \varepsilon_{i,t} \qquad (5)$$

where π_t stands for certain inflation measure (IDSG, CPI or one of two core indices) and $control_t$ denote control variables: relative food and fuels prices growth abroad. Remaining variables have been defined in the same way as for disaggregated Phillips curve (4). We estimated this equation by OLS and additionally by GMM to check for potential endogeneity problem[2]. We conducted the calculations for two different output gap measures. The estimation results

[2]In the GMM estimation we used the instruments proposed by Budnik et al. (2009). We used lagged respective inflation measures, lagged output gap, lagged exchange rate, lagged wage inflation and relative foreign food and fuels prices growths.

Figure 1: CPI structure in Poland



Source: Polish Central Statistical Office.

have been described in Section 3.

2.3 Data

In the analysis we used disaggregated to COICOP 4-digit level consumer price index (CPI). After disaggregation we received altogether 110 time series expressing price changes of subsequent categories of goods and services. The price indices are collected by the Polish Central Statistical Office. Figure 1 presents classification of the CPI into main categories, as used in our research, and also weights of each component in the CPI basket in year 2012.

What is worth noting, nearly three quarters of the Polish CPI basket constitute goods, while e.g. in the euro area goods cover only c.a. 60 per cent of the HICP basket. This structure of the CPI basket (calculated on the basis of households' expenditure structure) is characteristic for converging economies, which Poland belongs to.

In all categories, except food, we may find some goods or services whose prices are administered[3] – whether fully or partly. We may expect that these components should be less or even insensitive to both internal or external factors

[3]By the definition of the EUROSTAT (http://epp.eurostat.ec.europa.eu/portal/page/portal/hicp/methodology/administered_price

at least in the short term. In the Polish CPI these make up 14 per cent of the consumer basket. The biggest share of administered prices is in the energy (ca. 53%) and services (ca. 14%) groups.

For the purpose of our research we used two alternative measures of output gap. The first one has been constructed using a production function a part of the structural macroeconometric model NECMOD (see Budnik et al. (2009)). This model is used by the National Bank of Poland as a workhorse for preparing the official macroeconomic projection. The second measure reflects deviations of the GDP from a HP-filtered series. We believe that employing two alternative measures of an output gap may increase the robustness of the results.

The nominal effective exchange rate has been calculated as a weighted average nominal exchange rate of Polish złoty against euro and US dollar. Following Przystupa and Wróbel (2009) we set the weights at 0.7 and 0.3 respectively.

The foreign inflation is a weighted inflation in the euro area and in the US using the same weights as in case of effective exchange rate.

In the regressions we also used some control variables which represent price shocks on food and oil global markets. We calculated the control variables as a relative growth of food or fuels prices to foreign inflation.

All data are seasonally adjusted quarterly data. The inflation is measured as a seasonally adjusted quarterly change of price level. The sample covers the period from first quarter 1999 to second quarter 2012.

3 Empirical results

3.1 Goods and services sensitive to output gap.

The estimation results prove that in Poland being a small open economy there is a substantial group of CPI's components whose prices are sensitive to the changes in domestic economic activity reflected by output gap – more than 50 per cent of the CPI's basket components. Moreover the services are in general more sensitive to changes in domestic economic activity than goods. These findings are very similar for both output gap measures.

The results for the services are in general in line with our expectations. Firstly, among services there is a substantial share of output gap sensitive items (their weight is ca. 60%) – more than in case of goods (Table 1). Secondly, they belong to these COICOP groups where prices are intuitively regarded as sensitive to changes in domestic economic activity. These are mostly services related to hotels, restaurants, tourism, recreation, personal care but also health care and housing (Table 6 in Annex). However, prices of some items which belong to such categories like transport, education or insurance proved to be insensitive to both output gaps measures. A possible explanation for this outcome is a substantial share of administered prices in the first of these two groups. The administered prices usually do not co-move in line with the business cycle. On the one hand some administered prices by construction may follow other prices more related to changes in domestic economic activity, which gives a spurious positive relation with output gap. However on the other hand some of the administered prices used to be changed countercyclically. In the slowdown phase a government or local governments which are in charge of administered prices tend to increase these prices to improve the fiscal balance. Moreover, administered prices are sometimes adjusted to meet some regulations which do not need to be related to business cycle. For that reasons the relationships between most administered prices and domestic economic activity is expected to be rather fragile.

Our findings differ slightly from the results for the euro area countries reported by Froehling and Lommatzsch (2011). They found that communication services were output sensitive to the largest extent, which is not the case in Poland. We also received different estimates for the prices of housing services. In Poland, all items from this group are sensitive to the output gap in opposition to the euro zone where only 36 per cent react to the business cycle.

There are a few surprises as far as prices of goods are concerned. Analysing

Table 1: Weights of the output gap sensitive items in the CPI and selected sub-categories

	weight in CPI	weight in category	weight in CPI	weight in category	weight in CPI
		NECMOD gap		HP gap	
services	28.2	55.1	15.5	62.9	17.7
durable	4.3	35.7	1.5	35.7	1.5
semi-durable	8.3	28.5	2.4	28.5	2.4
non-durable	59.2	60.5	35.8	58.9	34.9
administered	14.0	55.8	7.8	77.3	10.8

Source: Own calculations.

the behaviour of goods prices we found the biggest share of the output gap sensitive items in the group of non-durable goods what is in line with the results for the euro area countries. In this category the prices of more than 55 per cent items (over 55% of the weight) were found to react to an output gap (Table 1). In particular our results show that prices of more than half of the items in either unprocessed or processed food and also energy categories are influenced by changes in domestic economic activity (Table 2). These findings remain in contradiction with the common understanding that the price elasticity of demand on food and energy in particular in converging economies is rather low and that prices of these items react more to price changes on the international commodities markets. That is one of the reasons why we usually exclude these items from traditional core inflation calculations. The second one is the high volatility of these components.

It is worth noting that Froehling and Lommatzsch (2011) found that all items in the unprocessed food category are sensitive to the business cycle. Thus having in mind these results for euro area countries we may formulate the question why some categories of food in Poland do not react to changes in domestic demand. One reason why (in terms of weights) only half of the group mentioned above is influenced by output gap stems from the fact that we have not found statistically significant reaction of fruit and vegetables whose prices in Poland strongly depend on the domestic supply conditions (Table 9 in Annex). Other non-sensitive groups of food are milk and oil products whose prices are affected mostly by external market conditions and also the Common Agricultural Policy. In the energy group neither fuels nor gas react to the output gap. Prices of these items are strongly influenced by the trends on international commodities markets. Their reaction to the domestic output gap is much weaker and thus not statistically significant.

Table 2: Weights of food and energy categories sensitive to the output gap in the whole CPI basket (in %)

	CPI	NECMOD gap	HP gap
unprocessed food	13.5	7.3	8.0
processed food	10.7	7.1	7.1
energy	17.7	10.0	10.0

Source: Own calculations.
The numbers in the table express the weight of food and energy categories sensitive to the output gap in the CPI basket.
NECMOD gap is an output gap measure calculated on the basis of the production function within NECMOD model (see Section 2.3). HP gap is an output gap measure derived using HP filter.

On the other hand, there is a substantial group of non-durable goods other than food and energy that do not react to the domestic business cycle. Apart from the abovementioned food and energy components, some other items which have a sizable share in the category of non-durable goods, are also insensitive to the output gap. These are fuels and lubricants for personal transport equipment and medical products. It is very likely that fuels' prices reveal no reaction to the business cycle because of a substantial share of indirect taxes inside (over 50% of the fuel price are excise tax and VAT). Whereas nearly 50 per cent prices of pharmaceutical products are influenced by administrative decisions.

The estimation results for durable and semi-durable goods show rather low share of output sensitive items (in terms of weights 35.7% and 28.5% respectively). However, this is mostly due to the fact that prices of some items with substantial weight in the CPI basket do not react to the output gap. These items are: major household appliances and cars from durables (Table 7 in Annex) and garments, footwear, games and toys and books from semi-durables (Table 8 in Annex). Looking closer at these items we see that their prices were in a downward trend for most of the time covered by the sample (until 2008-2009). Their prices exhibited no reaction to changes in domestic economic activity, exchange rate or inflation abroad (represented in our models by inflation in the US and euro area) throughout this period. The downward trend and negative dynamics of these prices were mostly a consequence of relocating production to countries with relatively lower labour costs – so we may consider them as goods influenced by globalization. Similar results were achieved by Froehling and Lommatzsch (2011) for the euro area countries, who claimed that the categories of durables and semi-durables are less sensitive to the output gap then others. The explanation also seems quite similar – no co-movement of major items in these categories

with the output gap, e.g. garments or footwear.

To sum up, we found that prices in the categories most sensitive to the changes in domestic economic activity are these that are relatively volatile i.e. food and energy products, but also services. Industrial goods (durable and semi-durable) are less sensitive as they include items that we may assess as influenced by globalization and thus insensitive to cyclical changes. Our results for goods are similar to these for the euro area, but slightly different when services are concerned.

It is worth adding that we usually presume that a core inflation measure (most often inflation excluding food and energy prices) exhibits price tendencies of goods that are sensitive to the changes of demand. Our results are in contradiction to this common understanding. By excluding food and energy we exclude some components which react to the changes in domestic demand. On the other hand the core inflation measure includes these items that are insensitive to the output gap. Therefore, the behaviour of inflation excluding food and energy prices is not a good approximation of the demand pressure in the economy what has been clearly shown in Table 5 - see Section 3.3.2.

Additionally, we cannot confirm that goods regarded as superior goods (e.g. cars, apparels, audio-visual equipment) are more business cycle sensitive than services. The explanation is twofold. The first one is a globalisation process, which led to the permanent price decrease not related to the business cycle. The second reason may be the habits of Polish households, which after transition and fifty years of obligatory savings are not very keen to resign from buying superior goods even in the time of slowdown at the cost of decreasing saving rate, which has remained in a downward trend for a decade.

3.2 Pass through for individual goods and services categories.

We may have expected that in a small open economy the share of output gap sensitive goods will be lower than in large and more closed economies like the euro area. We presume however, that instead the prices of several goods may be influenced by exchange rate movements and foreign inflation. The outcome of our analysis shows that ca. 37 per cent of the CPI components react to the changes in the exchange rate and/or foreign prices. These components add up to slightly more than 30 per cent of the CPI's weight. The results are insensitive to the choice of the output gap measure.

Table 3: Weights of the exchange rate sensitive items in the CPI and selected sub-categories

	weight in CPI	weight in category	weight in CPI	weight in category	weight in CPI
		NECMOD gap		HP gap	
services	28.2	29.4	8.3	29.4	8.3
durable	4.3	66.5	2.9	66.6	2.9
semi-durable	8.3	35.0	2.9	35.0	2.9
non-durable	59.2	33.3	19.7	30.7	18.2
administered	14.0	0.0	0.0	0.0	0.0
globalization	8.6	12.4	1.1	12.5	1.1

Source: Own calculations. Category "globalization" comprises the goods usually decribed as beeing influenced by globalization (see Chmielewski and Kot (2006)).

As we could expect, the biggest share (measured by the CPI's weight) of items with prices reacting to the exchange rate has been found in the group of durable goods (Table 3). As a matter of fact, only prices in one major group among durables (furniture and furnishings) exhibit no reaction to the exchange rate (Table 11 in Annex). It is probably due to the fact that Poland is one of the leading exporters of products belonging to this category. Moreover, Polish companies, which have a dominant position on the market, are rather price setters than takers. Therefore, prices depend more strongly on the domestic market conditions than on the external factors as confirmed by the outcome of the output gap analysis.

The second important category that reveals sensitivity to the exchange rate channel is the group of semi-durable goods. However, weight of components whose prices react to the changing external factors is not as big as we would expect. Only 35 per cent of the category's weight is influenced by an exchange rate and/or foreign inflation. This outcome is due to the fact that prices in three important groups i.e. garments, footwear and games and toys are not sensitive to the changes of exchange rate (similarly as in the case of the output gap - see Table 12 in Annex). As we mentioned above until years 2008-2009 prices of these components were in a downward trend, showing no reaction, both to internal and external factors. These goods are classified as ones with prices influenced by globalization (relocation of production to the countries with lower production costs, but also increasing openness of the Polish economy). These claims prove the results of our analysis of the output gap sensitive items. Prices of these items follow neither domestic nor external developments.

Similar outcomes were achieved by Chmielewski and Kot (2006). They found

out that there is a group of CPI's components the prices of which show no reaction to the changes on domestic and external markets. They also showed that by excluding these components from CPI basket, we would receive a stronger correlation between the inflation and the output gap.

We found a much weaker relationship between exchange rate channel and prices of non-durable goods and, as we presumed, for services. Most of components in these two categories are insensitive to the changes in external environment. But, not surprisingly, we may also find within these two categories items such as package holidays (services - see Table 10 in Annex) or most of food components (non-durable - see Table 13 in Annex) the prices of which react to the exchange rate changes.

Furthermore, the outcomes of our research showed no reaction of energy components to the exchange rate. These surprising results can be attributed to the fact that most of the energy components are administered. Their prices are set by the Regulator therefore very often they do not immediately follow changes on the international energy markets. The remaining items of energy are solid fuels and fuels and lubricants for personal transportation. No evidence of the influence from the exchange rate to the first category may result from the fact that the good which dominates this category is coal, the prices of which do not depend on fluctuations of international markets. The explanation of no reaction of fuels is somehow more complex. Firstly, there is a big component dependent on the governmental policy i.e. excise tax and VAT. Indirect taxes make more than 50 per cent of the final price of fuels. Secondly, in our model we included exchange rate and foreign inflation, but in fact fuel prices react rather to the changes of oil prices than to the external factors such as inflation. It is worth noting that estimating the disaggregated equation for fuel prices we found that the control variable representing relative changes of fuel prices was statistically significant.

According to our expectations the strength of the exchange rate influence is not the same for all items. The short-term exchange rate pass through coefficient varies from 0.004 (for furnishings and household equipment) to 0.23 (for food and rather expensive goods, like cars), with an average pass-through of 0.05. The average pass-through in our study is slightly weaker than reported by Przystupa and Wróbel (2009) for aggregated data.

Finally, when it comes to these items that are usually perceived to be under the influence of globalization only little more than 10 per cent of its weight reacts to the exchange rate (Table 14 in Annex). As we mentioned earlier (in the section

describing output gap sensitive items) their prices are in a downward trend for most of the analysed period and we could not observe any influence of the foreign inflation (measured by inflation in euro area and in the US) or exchange rate on these prices.

It is worth adding that almost all categories of goods sensitive to exchange rate and/or foreign inflation movements are also sensitive to domestic output gap fluctuation. For that reason the index of demand sensitive goods (IDSG) encompassed the categories influenced by external factors.

To summarize, the results of our research confirm our foreknowledge in this respect – the most sensitive items to the exchange rate (understood as external market conditions) are durable and semi-durable goods, and the least sensitive are services and goods with administered components. What might be surprising is so small effect of the external factors on goods influenced by globalization. But these findings are better understood when we bear in mind the behaviour of their prices in the analysed period and the structural reasons for this behaviour not fully incorporated into the model which, by the construction, has been designed to explain the cyclical movement of prices.

3.3 Index of goods and services sensitive to output gap.

3.3.1 Index

Having determined the items whose prices co-move with the business cycle we constructed two price indices, denoted as IDSG_Y for NECMOD output gap, and IDSG_HP for one obtained using HP filter. We used the same methodology as Central Statistical Office (CSO) when constructing consumer price index (CPI) – both – the method of calculation and changing the weights every year.

The annual growth rate of newly created indices is higher on average than CPI and two core inflation measures (Table 4). The difference between CPI and both IDSG_Y and IDSG_HP is particularly well visible in the period 2007-2009. At the beginning of 2007 we could observe low and stable dynamics of consumer prices in Poland (CPI) although this process was accompanied by positive output gap - see Figure 2 and Figure 3. This phenomenon was attributed at that time to several reasons, like exchange rate appreciation and in particular an effect of globalization which allowed to keep low inflation despite high economic growth and positive output gap. According to our results the index of demand sensitive goods (IDSG) encompassed almost all categories which are influenced by exchange rate and/or foreign inflation. That is why the difference between growth

of IDSG and headline inflation cannot be explained by the appreciation of the exchange rate only. When we look more closely at the remaining categories we may conclude that the growth of CPI has been really hampered mostly by falling prices of goods influenced by globalisation but a low dynamics of other goods and services not related to business cycle also matters. It is worthy to note that in the whole sample a dynamics of prices of goods influenced by globalization was lower than IDSG. All in all the demand pressure in the Polish economy in this period has been higher than indicated by the behaviour of CPI what was proved in year 2009 when headline inflation accelerated significantly. An especially big difference between both indices was observed at the end of 2008 and the beginning of 2009 – the spread between IDSG and CPI was over 2 pp. Also at the bench of years 2011 and 2012 the inflation of goods sensitive to the business cycle was higher than headline inflation.

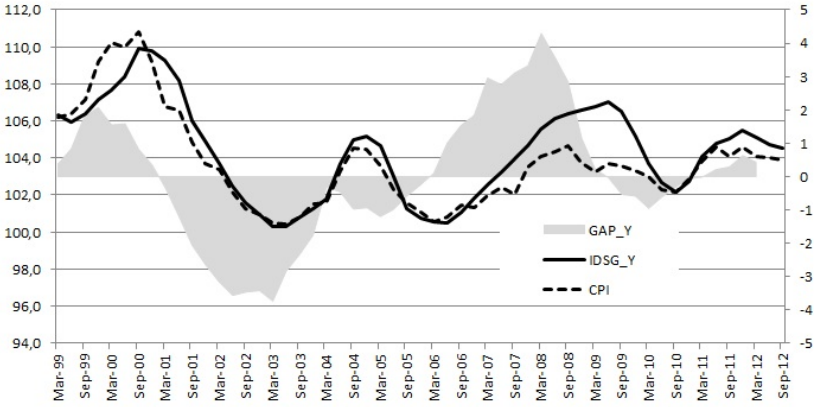
Table 4: Basic statistics of the CPI and alternative inflation measures

Index	mean	standard deviation
CPI	3.8	2.5
Inflation excluding administered prices	3.3	2.6
Inflation excluding most volatile prices	2.8	1.4
Inflation excluding food and energy prices	3.1	3.0
15% trimmed mean inflation	3.5	2.2
IDSG_Y	4.4	2,5
IDSG_HP	4.4	2.7

Source: CSO and own calculations.

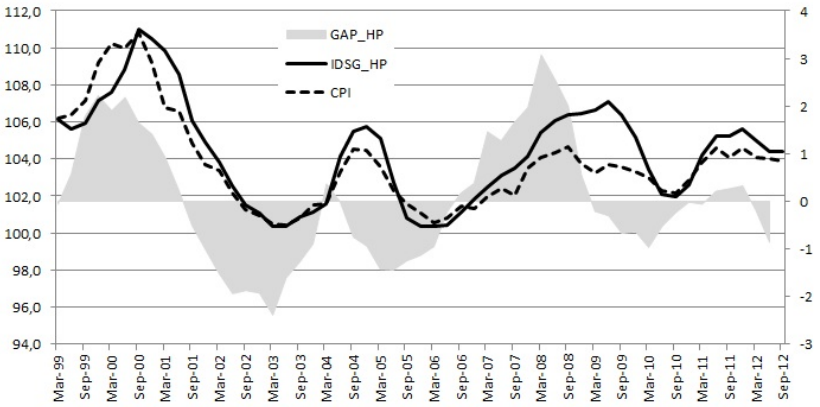
Rows 3-6 contain statistics for core inflation measures calculated by NBP (http://www.nbp.pl/homen.aspx?f=/en/statystyka/core.html). In rows 7-8 the respective statistics for two variants of index of output gap sensitive prices are included. IDSG_Y is the index derived using output gap from NECMOD model while IDSG_HP has been calculated with the output gap derived using HP filter

Figure 2: Index of the demand sensitive goods (IDSG, NECMOD gap) vs CPI



Source: Own calculations, NBP and Polish Central Statistical Office data.
GAP_Y is an output gap measure calculated using the production function within the NECMOD model.
IDSG_Y denotes index of goods and services sensitive to this output gap.

Figure 3: Index of the demand sensitive goods (IDSG, HP gap) vs CPI



Source: Own calculations, NBP and Polish Central Statistical Office data.
GAP_HP is an output gap measure calculated using HP filter.
IDSG_HP denotes index of goods and services sensitive to this output gap.

3.3.2 Vulnerabilities of price indices

As we mentioned earlier, it would be desirable if our newly created indices reacted to the output gap stronger than other inflation measures. It would confirm that a method of selection of goods and services sensitive to output gap was the correct one. In order to check that, we employed our Phillips curve again, but this time we used aggregated data. We checked the output gap sensitivity of four

Table 5: The sensitivity of selected inflation measures in respect to the output gap

Inflation measure	NECMOD gap		HP gap	
	OLS	GMM	OLS	GMM
IDSG	0.00113 (0.00024)	0.00095 (0.00019)	0.00354 (0.00081)	0.00353 (0.00052)
CPI	0.00070 (0.00028)	0.00060 (0.00018)	0.00163 (0.00056)	0.00119 (0.00043)
CORE	0.00047 (0.00014)	0.00041 (0.00009)	0.00106 (0.00028)	0.00102 (0.00016)
COREADM	0.00070 (0.00038)	0.00062 (0.00019)	0.00161 (0.00065)	0.00136 (0.00051)

Source: Own calculations.

The numbers in the table are estimates and standard errors of parameters expressing the impact of the output gap on inflation for different output gap and inflation measures in aggregated Phillips curve (5). Abbreviation *CORE* denotes inflation excluding food and energy while *COREADM* is inflation excluding administered prices.

inflation measures: CPI, two core inflation measures: inflation excluding food and energy prices, inflation excluding administered prices and our newly formed index – IDSG. Our explanatory variables were two different output gap measures, nominal effective exchange rate plus foreign inflation (measured as in the case of disaggregated Phillips curves) and two control variables expressing relative growth of food (as a whole) and fuel prices abroad[4]. We applied two different estimation methods to ascertain that there were no problems of endogeneity – the ordinary least squares (OLS) and general method of moments (GMM).

We can summarise the results of our calculations in three main points (see Table 5). Firstly, the output gaps proved to be statistically significant (at 5% level) for all inflation measures. Secondly, the estimates of parameters related to the output gap are in general similar for both estimation methods across the models. Finally and most importantly, our indices of output gap sensitive goods (IDSG_Y and IDSG_HP) exhibit the strongest reaction to the output gap among all investigated inflation measures. What might seem surprising is the weakest reaction of inflation excluding food and energy prices to both measures of the output gap. But when we recall that a big share of non-durable goods (food and energy) is sensitive to the changes in domestic economic activity and, additionally, there is a substantial share of durable and semi-durable goods that are insensitive to the output gap, then such an outcome is no longer a surprise.

[4]In fact we used two versions of index of good sensitive to output gap, which we related to corresponding output gap measure.

4 Conclusions

In our paper we investigated, which categories of goods and services constituting CPI are sensitive to fluctuations in the domestic economic activity in Poland. To answer this question we estimated disaggregated small open economies Phillips curves for individual price indices at COICOP 4-digit level. Moreover by including explicitly the exchange rate in the Phillips curve and allowing for direct impact of external factors on inflation we checked to what extent the CPI inflation in Poland co-moves with a global price trend and which categories of goods and services are sensitive to changes in exchange rate and/or foreign inflation. Finally we aggregated the price indices for goods sensitive to domestic economic activity and formed an index which, taking into account the uncertainty and substantial lags in calculating output gap, may be used as an alternative measure of domestic inflationary pressure.

We found that more than 50 per cent of the categories react to output gap. In line with our expectations the categories which are mostly linked to the output gap are services but also non-durable goods and the findings are robust to choice of output gap measure. Our results show that prices of more than half of the items in either unprocessed or processed food as well as energy categories are influenced by changes in domestic economic activity. This outcome leads to the conclusion that even in a converging and still low income economy the price elasticity of demand on food and energy is not negligible.

According to our findings only a small share of durable and semi-durable goods react to domestic economic activity, which can be explained to some extent by a globalization process. Prices of several goods from these categories were in a downward trend during the last decade unrelated to the cyclical position of the Polish economy.

Having determined the categories whose prices co-move with the business cycle, we constructed a price index of goods and services sensitive to domestic economic activity. We proved that after aggregation this index is more strongly related to output gap than CPI and two commonly used core inflation measures: inflation excluding food and energy prices and inflation excluding administered prices. We believe that taking into account uncertainty and substantial lags in calculating the output gap this newly formed index may be used as an alternative and more up to date measure of domestic inflationary pressure.

When investigating the exchange rate pass through at COICOP group levels we found that more than one third of the price indices in the Polish economy

respond to exchange rate movements and/or foreign inflation. The impact of exchange rate is most significant on durable and semi-durable goods which are to a large extent perceived as tradable goods.

In the further research it would be interesting to conduct a similar analysis for other small open economies and compare the share and structure of goods and services sensitive to domestic output gap and exchange rate development. It may help to generalize the findings we received for Poland. However we believe that there may be some similarities across the countries but also some differences related to a particular stage of development, consumption structure and level of openness of the economies.

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Annex: Tables and Figures

Table 6: The sensitivity of services categories in respect to the output gap

services	no. of models	weight 2012
Cleaning, repair and hire of clothing	2	0,0
Repair and hire of footwea	2	0,0
Actual rentals paid by tenants	2	0,9
Services for the maintenance and repair of the dwelling	2	0,6
Other services relating to the dwelling n.e.c.	2	2,2
Repair of furniture, furnishings and floor coverings	2	0,0
Repair of household appliances	2	0,0
Domestic services and household services	2	0,2
Medical services	2	0,6
Dental services	2	0,2
Paramedical services	2	0,8
Maintenance and repair of personal transport equipment	2	0,7
Other services in respect of personal transport equipment	2	0,1
Postal services	2	0,0
Repair of audio-visual, photographic and information processing equipment	2	0,0
Maintenance and repair of other major durables for recreation and culture	2	0,0
Veterinary and other services for pets	2	0,1
Recreational and sporting services	2	0,3
Package holidays	2	1,4
Pre-primary and primary education	2	0,5
Education not definable by level	2	0,1
Restaurants, cafés and the like	2	5,8
Accommodation services	2	0,3
Hairdressing salons and personal grooming establishments	2	0,4
Social protection	2	0,1
Other actual rents	1	0,0
Refuse collection	1	1,1
Sewerage collection	1	1,2
Other purchased transport services	1	0,0
Financial services n.e.c.	1	0,1
Hospital services	0	0,1
Passenger transport by railway	0	0,2
Passenger transport by road	0	0,7
Passenger transport by air	0	0,1
Passenger transport by sea and inland waterway	0	0,0
Combined passenger transport	0	0,2
Telephone and telefax services	0	4,2
Cultural services	0	2,8
Games of chance	0	0,0
Secondary education	0	0,1
Post-secondary non-tertiary education	0	0,0
Tertiary education	0	0,4
Canteens	0	0,3
Insurance connected with the dwelling	0	0,2
Insurance connected with health	0	0,1
Insurance connected with transport	0	0,6
Other insurance	0	0,0
Other services n.e.c.	0	0,2

Source: Own calculations.

The second column reveals in how many models with different output gap measures (up to two) the respective price category was sensitive to the output gap.

Table 7: The sensitivity of durable goods in respect to the output gap

durables	no. of models	weight 2012
Furniture and furnishings	2	1,2
Carpets and other floor coverings	2	0,1
Major tools and equipment	2	0,1
Bicycles	2	0,1
Jewellery, clocks and watches	2	0,1
Major household appliances whether electric or not	0	0,5
Motor cars	0	1,5
Motor cycles	0	0,1
Telephone and telefax equipment	0	0,1
Equipment for the reception, recording and reproduction of sound and pictures	0	0,3
Photographic and cinematographic equipment and optical instruments	0	0,1
Information processing equipment	0	0,2
Major durables for indoor and outdoor recreation	0	0,0
Musical instruments and major durables for indoor recreation	0	0,0

Source: Own calculations.

Table 8: The sensitivity of semi-durable goods in respect to the output gap

semi-durables	no. of models	weight 2012
Clothing materials	2	0,0
Household textiles	2	0,4
Glassware, tableware and household utensils	2	0,4
Small tools and miscellaneous accessories	2	0,2
Spares parts and accessories for personal transport equipment	2	0,5
Equipment for sport, camping and open-air recreation	2	0,1
Other personal effects	2	0,8
Garments	0	3,2
Other articles of clothing and clothing accessories	0	0,2
Shoes and other footwear	0	1,4
Small electric household appliances	0	0,1
Recording media	0	0,1
Games, toys and hobbies	0	0,4
Books	0	0,5
Electrical appliances for personal care; other appliances, articles and products for personal care	0	0,0

Source: Own calculations.

Table 9: The sensitivity of non-durable goods in respect to the output gap

non-durables	no. of models	weight 2012
Bread and cereals	2	4,2
Meat	2	6,4
Fish and seafood	2	0,8
Food products n.e.c.	2	1,0
Mineral waters, soft drinks, fruit and vegetable juices	2	1,3
Wine	2	0,6
Beer	2	1,5
Materials for the maintenance and repair of the dwelling	2	2,0
Electricity	2	4,4
Solid fuels	2	3,1
Heat energy	2	2,4
Non-durable household goods	2	1,5
Other medical products	2	0,1
Gardens, plants and flowers	2	0,3
Pets and related products	2	0,4
Miscellaneous printed matte	2	0,0
Stationery and drawing materials	2	0,2
Personal effects n.e.c.	2	2,4
Sugar, jam, honey, chocolate and confectionery	1	1,6
Coffee, tea and cocoa	1	0,9
Tobacco	1	2,4
Water supply	1	0,8
Milk, cheese and eggs	0	3,4
Oils and fats	0	1,2
Fruit	0	1,3
Vegetables	0	2,3
Spirits	0	1,6
Gas	0	2,6
Liquid fuels	0	0,1
Pharmaceutical products	0	3,0
Therapeutic appliances and equipment	0	0,3
Fuels and lubricants for personal transport equipment	0	5,1
Newspapers and periodicals	0	0,3

Source: Own calculations.

Table 10: The sensitivity of services categories in respect to the exchange rate

services	no. of models	weight 2012
Repair and hire of footwear	2	0,0
Repair of furniture, furnishings and floor coverings	2	0,0
Paramedical services	2	0,8
Repair of audio-visual, photographic and information processing equipment	2	0,0
Package holidays	2	1,4
Restaurants, cafés and the like	2	5,8
Financial services n.e.c.	2	0,1
Cleaning, repair and hire of clothing	0	0,0
Actual rentals paid by tenants	0	0,9
Other actual rents	0	0,0
Services for the maintenance and repair of the dwelling	0	0,6
Refuse collection	0	1,1
Sewerage collection	0	1,2
Other services relating to the dwelling n.e.c.	0	2,2
Repair of household appliances	0	0,0
Domestic services and household services	0	0,2
Medical services	0	0,6
Dental services	0	0,2
Hospital services	0	0,1
Maintenance and repair of personal transport equipment	0	0,7
Other services in respect of personal transport equipment	0	0,1
Passenger transport by railway	0	0,2
Passenger transport by road	0	0,7
Passenger transport by air	0	0,1
Passenger transport by sea and inland waterway	0	0,0
Combined passenger transport	0	0,2
Other purchased transport services	0	0,0
Postal services	0	0,0
Telephone and telefax services	0	4,2
Maintenance and repair of other major durables for recreation and culture	0	0,0
Veterinary and other services for pets	0	0,1
Recreational and sporting services	0	0,3
Cultural services	0	2,8
Games of chance	0	0,0
Pre-primary and primary education	0	0,5
Secondary education	0	0,1
Post-secondary non-tertiary education	0	0,0
Tertiary education	0	0,4
Education not definable by level	0	0,1
Canteens	0	0,3
Accommodation services	0	0,3
Hairdressing salons and personal grooming establishments	0	0,4
Social protection	0	0,1
Insurance connected with the dwelling	0	0,2
Insurance connected with health	0	0,1
Insurance connected with transport	0	0,6
Other insurance	0	0,0
Other services n.e.c.	0	0,2

Source: Own calculations. The second column reveals in how many models with different output gap measures (up to to) the respective price category were sensitive to the exchange rate and/or foreign inflation.

Table 11: The sensitivity of durable goods in respect to the exchange rate

durables	no. of models	weight 2012
Carpets and other floor coverings	2	0,1
Major household appliances whether electric or not	2	0,5
Major tools and equipment	2	0,1
Motor cars	2	1,5
Motor cycles	2	0,1
Bicycles	2	0,1
Telephone and telefax equipment	2	0,1
Equipment for the reception, recording and reproduction of sound and pictures	2	0,3
Photographic and cinematographic equipment and optical instruments	2	0,1
Jewellery, clocks and watches	2	0,1
Musical instruments and major durables for indoor recreation	1	0,0
Furniture and furnishings	0	1,2
Information processing equipment	0	0,2
Major durables for indoor and outdoor recreation	0	0,0

Source: Own calculations.

Table 12: The sensitivity of semi-durable goods in respect to the exchange rate

semi-durables	no. of models	weight 2012
Clothing materials	2	0,0
Household textiles	2	0,4
Small electric household appliances	2	0,1
Glassware, tableware and household utensils	2	0,4
Small tools and miscellaneous accessories	2	0,2
Spares parts and accessories for personal transport equipment	2	0,5
Recording media	2	0,1
Games, toys and hobbies	2	0,4
Equipment for sport, camping and open-air recreation	2	0,1
Other personal effects	2	0,8
Garments	0	3,2
Other articles of clothing and clothing accessories	0	0,2
Shoes and other footwear	0	1,4
Books	0	0,5
Electrical appliances for personal care; other appliances, articles and products for personal care	0	0,0

Source: Own calculations.

Table 13: The sensitivity of non-durable goods in respect to the exchange rate

non-durables	no. of models	weight 2012
Meat	2	6,4
Fish and seafood	2	0,8
Milk, cheese and eggs	2	3,4
Oils and fats	2	1,2
Fruit	2	1,3
Sugar, jam, honey, chocolate and confectionery	2	1,6
Coffee, tea and cocoa	2	0,9
Mineral waters, soft drinks, fruit and vegetable juices	2	1,3
Wine	2	0,6
Other medical products	2	0,1
Therapeutic appliances and equipment	2	0,3
Gardens, plants and flowers	2	0,3
Stationery and drawing materials	2	0,2
Beer	1	1,5
Bread and cereals	0	4,2
Vegetables	0	2,3
Food products n.e.c.	0	1,0
Spirits	0	1,6
Tobacco	0	2,4
Materials for the maintenance and repair of the dwelling	0	2,0
Water supply	0	0,8
Electricity	0	4,4
Gas	0	2,6
Liquid fuels	0	0,1
Solid fuels	0	3,1
Heat energy	0	2,4
Non-durable household goods	0	1,5
Pharmaceutical products	0	3,0
Fuels and lubricants for personal transport equipment	0	5,1
Pets and related products	0	0,4
Newspapers and periodicals	0	0,3
Miscellaneous printed matte	0	0,0
Personal effects n.e.c.	0	2,4

Source: Own calculations.

Table 14: The sensitivity of categories influenced by globalization in respect to the exchange rate

globalization	no. of models	weight 2012
Clothing materials	2	0,01
Telephone and telefax equipment	2	0,06
Equipment for the reception, recording and reproduction of sound and pictures	2	0,34
Photographic and cinematographic equipment and optical instruments	2	0,07
Recording media	2	0,07
Games, toys and hobbies	2	0,37
Equipment for sport, camping and open-air recreation	2	0,15
Musical instruments and major durables for indoor recreation	1	0,00
Garments	0	3,24
Other articles of clothing and clothing accessories	0	0,16
Shoes and other footwear	0	1,44
Information processing equipment	0	0,24
Electrical appliances for personal care; other appliances, articles and products f	0	0,03
Personal effects n.e.c.	0	2,43

Source: Own calculations.