Global or domestic? Which shocks drive inflation in European small open economies?*

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Abstract

In the paper we investigate to what extent the inflation in small open economies is driven by global demand and supply shocks. We proceed in two steps. Firstly we use SVAR approach to identify the global shocks. In the second step we regress the disaggregated price indices for selected European economies: the Czech Republic, Poland and Sweden on the global shocks controlling for the domestic variables. The results show that the direct impact of the global demand shock on the price dynamics is negligible while it affects the country's inflation mainly through the domestic output gap. We also find that in two out of three analyzed countries the fluctuations of inflation are to the largest extent determined by the cyclical movements of the domestic output gap with the commodity shock being the second important source of inflation variability. The role of the non-commodity global supply shock is less prominent however this shock interpreted to some extent as a globalization shock for the most of analyzed period lowers the prices of semi-durable and durable goods and therefore the inflation. Nonetheless this shock reversed in the aftermath of the global financial crisis what may be interpreted as a weakening of the globalization process.

JEL: C53, E31, E37, E52

Keywords: Inflation, monetary policy, globalization, dissagregated price indices, output gap, exchange rate pass-through, SVAR models.

*The views expressed herein are those of the authors and not necessarily those of the Narodowy Bank Polski or the Warsaw School of Economics.

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1 Introduction

The experience of the last decades reveals the growing role of the global factors in determining inflation process in many small open economies. This phenomenon may be attributed to the ongoing integration of the world economy, accompanied by the liberalization of the international trade and capital flows. For a long time this process was disinflationary. The shifting of the production to low cost production countries put downward pressure on prices of tradable goods. Moreover declining import prices affect inflation also indirectly. Lower prices of imported goods might put pressure on the domestic producers through competition to lower its mark-up or increase productivity. It also leads to the removal of firms with higher production costs from the market. Moreover domestic producers when facing competition from abroad are more reluctant to give higher wages. All in all the globalization process led to substantial decline of inflation in the many developed and emerging economies in 1990s and the first half of 2000s – the process called by Rogoff (2003) the global disinflation. As pointed out by Borio and Filardo (2007) the intensification of the globalization process resulted in the weakening of the traditional relationship, rooted in the Phillips curve framework, between the measures of domestic slack and the inflation in several advanced and emerging economies. They emphasize the shift in the determinants of the inflation from country specific towards global ones and argue for the flattening of the country specific Phillips curve. This flattening materializes due to more prominent role of global excess demand and global output gap in affecting the domestic inflation via trade and financial channel. They also advocate for the declining influence of the nominal exchange rate fluctuations for the inflation process.

While Borio and Filardo (2007) in their theoretical considerations emphasize the increasing relevance of both global demand and supply factors stemming from the globalization process, they do not fully recognize between both shocks in the empirical analysis. Several other authors investigate the impact of globalization on the domestic prices as well. Pain et al. (2006) find for the group of OECD countries that since the middle of 1990s the import prices have become more important driver of domestic consumer prices. They also point out that globalization lowers inflation but in a longer run it may also lead to the increase of commodity prices and further inflation, because countries with low cost of production are usually more commodity intensive. They conclude however that the drop of manufacturing and tradable prices dominates over the opposite effect stemming from the upward pressure on commodity prices. Wynne and Kersting (2007) investigating the link between the globalization and inflation find a negative correlation between openness and long term inflation across the analyzed countries. They also conclude that the foreign output gap matters for inflation in the US economy. Martinez-Garcia and Wynne (2010) show that bilateral agreements lead to the increasing influence of the import prices on the domestic inflation. The more open country the flatter Phillips curve. However they emphasize the role of the potential nonlinearities. The slope of the curve may differ in time depending on the speed of the process of opening up the country. Such nonlinearities may explain why it is difficult to obtain significant correlation between the slope of the curve and the degree of the openness of the country. On the contrary Ihrig et al. (2010) for the sample of 11 industrial countries do not find any support

for the hypothesis about the significant role of the foreign output gap in determining domestic inflation.

The role of common global shocks in determining inflation in various developed economies is investigated by Ciccarelli and Mojon (2010) who find that nearly 70% of inflation variability in OECD countries was driven by one common global factor. However the authors do not analyze the sources of this inflation commonality in more detail and conclude that it is not clear whether it is a common global factor or whether domestic monetary policy in the OECD countries have become similar and synchronized. Additionally Hakkio (2009) who examines various inflation measures for the OECD countries states that "the commonality of (...) inflation rates reflects the commonality of the determinants of inflation". By contrast Rogers (2007) analyzing the price dispersion in the EU economies attributes the prices convergence in the euro area countries to harmonization of VAT rates and a decline in income dispersion rather than to increased trade flows.

It is worth to note that the globalization affects inflation in small open economies not only via trade and competitiveness channels. One should also account for an indirect impact of globalization on the inflation process via global financial and monetary policy spillovers affecting the overall macroeconomic conditions and therefore the inflation in small open economies. Several authors emphasize also the role of financial markets integration in the propagation of the monetary policy shocks from the major central banks to other countries. Kamin (2010) argues that the central banks in countries with floating exchange rate regimes may to some extent realize independent interest rate policy, but the financial conditions in that countries due to abovementioned spillovers are vulnerable to external shocks making the conducting of appropriate monetary policy more difficult. There is a broad stream of literature dealing with the propagation of monetary policy shocks from one economy (usually the US or the euro area) to other both advanced and emerging countries. Eichenbaum and Evans (1993) focus on the impact of the US monetary policy shocks to nominal and real US exchange rate against several other currencies, Grilli and Roubini (1995) investigate the liquidity transmission channel, while Kim (2001) analyzes the effect of US monetary policy shocks on foreign long term yields. In the comprehensive research related to the globalization of the financial markets Ehrmann and Fratzscher (2009) find that Federal Reserve announcements influence stock prices in foreign countries and the strength of reaction depends on the level of the financial market's openness.

When analyzing the impact of the global shocks on inflation one needs to account for the commodity markets shocks with the prominent role of the oil market. According to the Hamilton (2008) nine out of ten recessions were preceded by the oil prices soaring. Moreover as pointed out by Kilian (2008) the nature of changes of oil prices is different than of other goods due to three reasons. Firstly, energy prices increases are often abrupt and materialize at times which are not typical of other goods and services. Secondly, usually those increases affect the domestic and global economy more than rises of other inflation's components as the demand for energy is relatively inelastic, thirdly oil prices' fluctuations are often of the external reasons (e.g. political tensions in the Middle East). Kilian (2009) and Peersman and Robays (2009) analyze the impact of oil shocks to large developed economies and show that the responses of the US and the euro area economies to oil price shocks depend on the source of the oil shock. However in comparison to the US, in the euro area the inflation reacts more to second round effects i.e. through wage increases (partially due

to the automatic indexation mechanism in several member countries). In the US the pass-through of the oil price surge on inflation is more direct – through increasing prices of energy and rising production costs. Furthermore, Jääskelä and Smith (2013) and Charnavoki and Dolado (2014) analyze the impact of the shocks to commodity prices on the countries, which opposite to the US and the euro area are perceived to be small open economies (Australia and Canada) and find that the commodity shock accounts for the large part of inflation variability in these economies[1].

The broad stream of literature investigates the direct and indirect effect of the global demand and supply shocks on the inflation in small open advanced and emerging economies using the SVAR and FAVAR methodology. Aastveit et al. (2011) examine influence of the global and regional factors on inflation and other key macroeconomic variables for selected advanced economies (Canada, New Zealand, Norway, UK) using FAVAR model. They find that the world shocks dominate the variability of inflation and account for 50-80% of its variance. Maćkowiak (2007) analyzes, using structural VAR, the importance of the external shocks for emerging markets economies. He finds that external shocks play important role in the fluctuations of the main macroeconomic variables in emerging economies (Chile, Hong Kong, Korea, Malaysia, Mexico, Philippines, Singapore and Thailand). According to his estimates nearly 50% of the variation in the price level can be explained by the external shocks.

In this strand of research the common approach in the literature is to form a two-block SVAR or FAVAR model (see Boivin and Giannoni, 2007, Maćkowiak, 2007, Jääskelä and Smith, 2013, Aastveit et al., 2011 or Charnavoki and Dolado, 2014), where the first block consists of global variables, while the second block summarizes the domestic ones. The variables in the foreign block are assumed to be exogenous in respect to the domestic block. The economic interpretation is usually assigned to the global shocks by imposing the recursive or sign restrictions on the impulse response functions within the global block in the model. The pattern of the remained unrestricted impulse responses is used to conclude about the relationship between global shocks and domestic variables. It is worth to note that the globalization shock is usually associated with the non-commodity global supply shock, which increases the economic activity and lowers inflation of manufactured or tradable goods (see Jääskelä and Smith, 2013, Filardo and Lombardi, 2014).

In our paper we investigate to what extent the inflation in small open economies is driven by global demand and supply shocks and to what extent is determined by the domestic factors. We focus on European economies remaining outside the euro area but tightly integrated with this area via trade and financial channel and due to their involvement in global value chains strongly affected by the globalization process. We propose an alternative two-step approach, which provides more detailed analysis of disaggregated inflation in the examined economies. In the first step we form a small SVAR model, which contains three global variables: the volume of world import, the real commodity prices and the consumer inflation. Then by

[1]It is worth to note that there are in general two opposite views whether globalization of the financial markets and financialisation led to the rise of the commodities prices and its higher volatility. On the one hand some research shows that there is a growing correlation between commodity price returns and stock market returns (Lombardi, 2013). Such a correlation reflects higher sensitivity of the commodity prices to the sentiment and risk aversion of global financial investors than to the fundamentals. Second strand of the literature states that there are no convincing proofs that higher activity of the financial institutions led to the higher volatility of the commodity prices. Sanders and Irwin (2010) document that increased participation of the investment funds on the agricultural markets did not lead to the increase of the price volatility.

imposing the recursive restrictions we extract three shocks, which can be interpreted as global demand shock, commodity specific shock and non-commodity supply shock which to some extent is associated with globalization process. In the second step we regress the disaggregated price indices for selected EU economies (the Czech Republic, Poland and Sweden) on the global shocks extracted in the previous step controlling for the domestic output gap and exchange rate. This approach allows us to identify at relatively high level of disaggregation these groups of goods and services, which prices react the most to the global shocks, in particular to non-commodity supply shock, which contributed to large extent in maintaining low inflation in several small open economies in 1990s and in the first half of 2000s as argued by Borio and Filardo (2007) and Rogoff (2003).

Our main finding is that nowadays the low inflation in the examined countries results not only from the positive shocks to commodity prices but also from the weak demand pressure both domestic and abroad – however this outcome is more evident for the Czech Republic and Poland than for Sweden. We also find that for two out of three examined countries the domestic output gap matters for the inflation development despite of their relative high openness. Furthermore we confirm that the exchange rate channel is also effective in shaping inflation however its strength differs across the countries. Finally we recognize that the non-commodity supply shock which contributed to low inflation over the long time reversed after the global financial crisis what may interpreted as a sign of the weakening of globalization process.

The remaining structure of the paper is as follows. In section 2 we describe the method and data we use. In section 3 we present the empirical results while section 4 concludes.

2 Data and model

2.1 SVAR model

Initially we specify a three-dimensional VAR model with a set of global variables, which we use to identify the global shocks contributing to inflation development in selected small open economies. Following the literature we form a model with the variables reflecting the level of global economic activity, real commodity prices and global inflation. More specifically we choose the following variables: (1) the growth of global import (*world_imp*), which corresponds to both: the level of economic activity and the globalization process reflected in the shifting of output to countries with low production costs, (2) the index of commodity prices in the real terms (*cp*) and (3) the CPI inflation (*inf*). We apply the recursive identification scheme as suggested by Charnavoki and Dolado (2014) and impose the zero restrictions on the contemporaneous impact matrix. In the recursive identification the global import is ordered first followed by real commodity prices and global inflation. The scheme of the recursive identification has been presented in Table 1. We interpret the first shock as a global demand shock (GD), the second shock as a commodity specific shock (GC), which reflects the unanticipated changes in the supply of energy and non-energy commodities and the third one as a global non-commodity supply shock (GS). According to the proposed ordering the global economic activity (reflected by global import) reacts to commodity specific (GC) shock and non-commodity supply (GS) shock

with a lag. Moreover the non-commodity supply (GS) shock does not have a contemporaneous effect on the real commodity prices. Formally the three-dimensional SVAR model can be written in the following form:

$$A_0 y_t = u + \sum_{i=1}^{p} A_i y_{t-i} + e_t, \tag{1}$$

where $y_t = \left[\begin{array}{ccc} world\_imp_t & cp_t & inf_t \end{array} \right]'$ is a vector of endogenous variables while e_t represents a three-dimensional vector of uncorrelated structural shocks. The reduced-form VAR can be expressed as:

$$y_t = A_0^{-1} u + \sum_{i=1}^{p} \Phi_i y_{t-i} + \varepsilon_t, \tag{2}$$

where $\Phi_i = A_0^{-1} A_i$, $\varepsilon_t = B e_t$ and $B = A_0^{-1}$ while ε_t is a vector of reduced-form error terms. We identify the structural shocks by imposing zero restrictions on B matrix. We assume that the matrix B is a lower diagonal matrix such as $\Sigma = E(\varepsilon_t \varepsilon_t') = BB'$, where Σ is a covariance matrix of reduced-form error terms ε_t. The proposed restrictions can be expressed as follows:

$$\left[\begin{array}{c} \varepsilon_1 \\ \varepsilon_2 \\ \varepsilon_3 \end{array} \right] = \left[\begin{array}{ccc} b_{11} & 0 & 0 \\ b_{21} & b_{22} & 0 \\ b_{31} & b_{32} & b_{33} \end{array} \right] \left[\begin{array}{c} e_t^D \\ e_t^C \\ e_t^S \end{array} \right] \tag{3}$$

We interpret the innovations e_t^D, e_t^C, e_t^S as demand, commodity specific and non-commodity supply shocks respectively.

2.2 Country by country regressions

In the second step we regress the disaggregated price indices for the analyzed economies (the Czech Republic, Poland and Sweden) on the global shocks identified in the previous step, controlling for domestic output gap and exchange rate. We formulate separate models for individual price indices and for all examined countries, where inflation in subsequent categories of goods and services depends on its own lag, the contemporaneous values of the global shocks, the economy-wide domestic output gap[2] and the real effective exchange rate. Accordingly the individual equation for price category i for country k takes a form:

$$\pi_{i,t}^{(k)} = \alpha_{0,i}^{(k)} + \alpha_{1,i}^{(k)} \pi_{i,t-1}^{(k)} + \beta_{1,i}^{(k)} e_t^D + \beta_{2,i}^{(k)} e_t^C + \beta_{3,i}^{(k)} e_t^S + \gamma_{1,i}^{(k)} \bar{y}_{t-h}^{(k)} + \gamma_{2,i}^{(k)} reer_{t-1}^{(k)} + \xi_{i,t}^{(k)} \tag{4}$$

[2]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 gapGali and Gertler (1999). 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. 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 we decided to relate the individual price indices to an economy-wide output gap.

where $\pi_{i,t}^{(k)}$ is a quarterly inflation in i-th category of goods and services for country k, $\bar{y}_t^{(k)}$ stands for domestic economy-wide output gap for country k, $reer_t^{(k)}$ is a real effective exchange rate while e_t^D, e_t^C, e_t^S are global shocks defined in Section 2.1. Due to relatively short sample, we specify model to be rather parsimonious in terms of regressors' lags. We find one lag of inflation sufficient to account for the inflation inertia and autocorrelation. As far as the output gap is concerned we decide to include into the individual regressions only one lag of this variable – the same for all price indices for the subsequent countries. The lag for the output gap is chosen to maximize the average adjusted R2 across the disaggregated regressions. We find the appropriate lag equal to 3 for Sweden and one for the Czech Republic and Poland what for the latter stays in line with the results for aggregated Phillips curve (see for example Przystupa and Wróbel, 2009). The lag for the exchange rate is set to one for all price indices and for all countries, which fit the empirical data to the largest extent. In the regressions we take into account only the contemporaneous values of the global shocks. We estimate the parameters of equation (4) with the OLS using Newey-West correction to make the results robust to potential autocorrelation and heteroscedasticity. We classify the categories of goods and services as price sensitive to respective exogenous variables (the global shocks, domestic output gap and exchange rate) if the variable was statistically significant in the regression at 15% significance level. Finally, to shed more light on the role of respective shocks in driving overall inflation over the sample we aggregate the respective components on the right hand side of equation (4) for the disaggregated price indices. The global demand component of inflation in country k in period t can be calculated as: $GD_t^{(k)} = \sum_{i=1}^{n} w_{i,t}^{(k)} \beta_{1,i}^{(k)} e_t^D$, where $w_{i,t}^{(k)}$ are the weights of subsequent price indices in the CPI basket for country k and time t (the weights are changing over time). The other components of inflation variability are derived as: global commodity specific component: $GC_t^{(k)} = \sum w_{i,t}^{(k)} \beta_{2,i}^{(k)} e_t^C$, global non-commodity supply component: $GS_t^{(k)} = \sum_{i=1}^{n} w_{i,t}^{(k)} \beta_{3,i}^{(k)} e_t^S$, domestic output gap component: $Gap_t^{(k)} = \sum_{i=1}^{n} w_{i,t}^{(k)} \gamma_{1,i}^{(k)}$ and exchange rate component: $ExRate_t^{(k)} = \sum_{i=1}^{n} w_{i,t}^{(k)} \gamma_{2,i}^{(k)} reer_t^{(k)}$. However one should keep in mind that while the global shocks are orthogonal to each other they may be correlated to domestic output gap and exchange rate.

2.3 Data

The data we use in the decomposition of the global shocks within the SVAR framework come from the OCED and IMF databases. The growth of global import, calculated as changes in volume of world import in goods and services, which include both, import from the developed and emerging markets, relies on the OECD estimates[3]. As a proxy for the global inflation we use quarterly seasonally adjusted[4] inflation in OECD countries published by OECD. The last global variable is a primary commodity price index calculated by the IMF[5]. This index complies market prices of food and beverages, agriculture raw materials, metals and energy commodities. The weights in the commodity basket reflect the structure of the international trade. In

[3] http://stats.oecd.org/

[4] All time series, unless otherwise stated, are seasonally adjusted using TRAMO-SEAT procedure implemented in the Demetra+ program.

[5] http://www.imf.org/external/np/res/commod/index.aspx

the disaggregated analysis we use price indices collected from the Eurostat[6] database. The quarterly HICP price indices disaggregated into 3-digits COICOP[7] cover the period 1Q 2000 – 2Q 2014. For each country we obtain 39 time series, except for Sweden, where disaggregation of communication services is not available and we use only 37 indices. All time series are seasonally adjusted. The country specific output gaps are derived with Hodrick–Prescott (HP) filter. The GDP data used in the calculation of the output gaps are the Eurostat's chain linked index 2005=100 seasonally adjusted. The real effective exchange rates (REER) for the examined countries come from the Bank of International Settlement calculations[8]. The descriptive statistics for the disaggregated price indices are shown in Table 2.

3 Estimation results

3.1 Identification of the global shocks

We start with specifying the SVAR model for the set of the global variables as proposed in equation (2). At the beginning, we estimate consistently the reduced form VAR with OLS method. We choose the number of lags on the basis of the AIC criterion, which takes the minimum value for the lag order equal to 6. Next we impose zero restrictions on the contemporaneous impact matrix B. We find the remaining unconstrained elements of B matrix statistically significant at 10% significance level.

Figure 1 displays the impulse response functions for the structural shocks followed by the two standard errors bands. The first panel contains the responses of the respective macroeconomic variables to the global demand shock. The positive global demand shock raises world import as well as real commodity prices and inflation. While the real commodity prices go up the nominal commodity prices must grow stronger in reaction to the demand shock than CPI inflation. The impact of the global demand shock on the world import diminishes after approximately one year, so does the effect on the real commodity prices. On the contrary the response of the CPI inflation to the demand shock is more persistent and long lasting; it dies out after 7 quarters. All responses to the global demand shock are statistically significant at 10% significance level.

The second panel summarizes the responses of the endogenous variables to the commodity specific shock. The commodity specific shock increases immediately real commodity prices and CPI inflation while a substantial share of CPI basket constitutes unprocessed food and energy. The initial reaction of the world import is somewhat puzzling while the import goes up for one quarter. However, this peak proves to be statistically insignificant and after two quarters the response turns out to be negative and statistically significant as suggested by the literature (see Kilian, 2009). The decline of world import in reaction to commodity specific shock reaches its maximum after 4 quarters and fades out after 7 quarters.

In the longer run the slump in the economic activity reflected by the decline of the world import leads

[6] http://ec.europa.eu/eurostat/data/statistics-a-z/abc

[7] COICOP stands for Classification of Individual Consumption According to Purpose (http://unstats.un.org/unsd/cr/registry/regcst.asp?Cl=5)

[8] http://www.bis.org/statistics/eer/

to the drop of the real commodity prices and CPI inflation. These two variables return to their initial levels after approx. 7 quarters. All in all the accumulated response of the world import to positive commodity specific shock is slightly negative while the accumulated responses of real commodity prices and CPI inflation are close to zero.

The last examined shock is the non-commodity supply shock, which lowers world import and real commodity prices and raises the CPI inflation. Basing on the response functions of the three examined variables we may interpret this shock as reversed globalization shock, which can be associated with the technological progress and the process of reallocation the production to countries with lower production costs. The ongoing globalization process results in the growth of global trade and the decrease of the prices of tradable (mostly manufacturing) goods leading also to the higher demand for commodities and increasing their prices. The growth of nominal commodity prices and the simultaneous fall of consumer inflation (due to lower prices of tradable goods) translates into the increase of real commodity prices.

The shape of the impulse response functions in the last panel remains broadly in line with the above-mentioned mechanism. In response to positive non-commodity supply shock (adverse globalization shock) the world import and real commodity prices go down with the peak occurring after 2-3 quarters. This effect fades away after almost 2 years. For both variables this fall in response to the shock is statistically significant. On the contrary the CPI inflation increases immediately but due to simultaneous drop of economic activity reflected in the contraction of world import CPI starts to decline after 2 quarters. The positive direct effect on CPI inflation via prices of tradable goods (unfavorable supply/globalization shock) and negative effect stemming from lower economic activity offset each other and the inflation very fast returns to its initial level.

The Figure 2 shows the structure of the identified shocks all over the sample. The non-commodity supply shock is strongly negative over the years 2002-2007 and is lowering the global inflation despite the fact that the global output gap was in general positive. In this period the globalization process intensified while the emerging economies gained on importance in the global production and trade. After the onset of the global financial crisis in 2008 the globalization process slowed down and the positive supply shocks reversed.

The global demand shock was identified to be mainly positive until 2007 with the exception of the period 2002-2003 what corresponds to the positive sign of the global output gap calculated by the IMF[9]. The outbreak of the crises in 2008 led very quickly to the drop of the global demand, which corresponds to the persistent negative global demand shock, which only temporarily reversed to positive in years 2010-2011. Since 2011 the global demand shock has been again strongly negative reflected by negative global output gap.

The commodity specific shock was in general negative in the first half of 2000s and turned out to be positive around 2007. This positive commodity shock lasted until 2012 (with the one-off negative value in Q4 2008) and was strengthened by the massive growth of liquidity on the global financial markets provided by the major central banks in advanced economies within quantitative easing policy (Hamilton, 2009). These positive commodity shock heightened inflation despite of weakening global economic activity. The exploration

[9]http://www.imf.org/external/pubs/ft/weo/2014/02/weodata/index.aspx

of new unconventional sources of gas and oil in the US and Canada led to substantial increase of energy commodities supply what has been captured by the presence of persistent negative commodity shock, which has been occurring since 2012 and lasted until the end of the sample deepening the decline of the global inflation.

3.2 Disaggregated analysis

Having extracted the global structural shocks from SVAR model we regress the disaggregated prices indices for the examined countries on the global shocks controlling for domestic output gap and exchange rate as proposed in Section 2.2. The results collected in Tables 3, 4 and 5 show that for the subsequent groups of goods and services there are some similarities in their price reaction between analyzed countries, but we can also spot some discrepancies.

First of all, according to our expectations the energy prices in all examined countries respond positively to the commodity specific shock. In the Czech Republic (Table 3) this impact is stronger than in Poland (Table 4) and Sweden (Table 5) as measured by respective regression coefficient and its statistical significance. This weaker reaction of energy prices (expressed in domestic currency) to global commodity specific shock in Poland is to some extent offset by the relative strong reaction to the changes in the exchange rate, what is not seen in the two other countries. The food products are price-sensitive to the commodity specific shock only in the Czech Republic. In two other economies: Poland and Sweden they are determined rather by the domestic supply and also demand conditions while they respond positively (and statistically significant) to domestic output gap. The results for Poland stay in line with findings of Hałka and Kotłowski (2014) who working with price indices at higher disaggregation level found that the prices of almost half of the food categories in the Polish HICP basket react to changes in aggregated domestic demand.

As pointed out in Section 3.1 we attribute the non-commodity supply shock to the technological progress and globalization process, which leads to enhanced competition and the decline of prices. That is why we would expect the prices of appliances, tools and telephone equipment as well as clothing and footwear to be affected by the supply shock. Indeed the prices of clothing and footwear in all examined countries react to the global supply shock. In Poland and the Czech Republic a noticeable downward trend in the prices of these two categories has been observed since the beginning of the 2000s. This long lasting decline in prices of clothing and footwear stopped with the onset of the global financial crises when the substantial depreciation of the exchange rate caused a temporary reverse of this downward trend. However despite the possible weakening of the globalization process in the aftermath of the global financial crisis, as reflected by the change of the sign of the non-commodity supply shock, the price dynamic of these two groups of products remained negative in Poland while in the Czech Republic it reached positive (to some extent due to introducing the exchange rate floor) but still very low numbers. In Sweden we did not observe such distinct trend while the prices of clothing and footwear were fluctuating between -5 - 6% y-o-y, however, especially after the outbreak of the global financial crisis, the trend in prices of clothing and footwear became more

correlated with the GDP growth.

For other durable and semi durable goods, perceived usually as being influenced by the globalization process, the impact of the non-commodity supply shock is not as clear as in the case of clothing and footwear. In the analyzed countries the prices of the most of semi durable goods respond to the supply shock, but the range of these goods varies across the countries. However such country specific discrepancies in the composition of goods, which prices are determined by the global non-commodity supply shock, may be to some extent explained by the fluctuations of exchange rate. While these goods are mostly tradable goods they may also react to fluctuations of the exchange rate. That is why in groups of semi durables, which prices are insensitive to the non-commodity supply shocks the exchange rate is an important driver of the price development.

As far as prices of services are concerned the most of them in Poland and the Czech Republic are affected by the domestic output gap. Nevertheless, when taking into account the ongoing globalization of the services sector it should not be surprising that there is also a substantial group of services, which prices are influenced by the external shocks, although less than domestic ones. Sweden is an exception while prices of only four out of 15 services groups respond to the cyclical changes in domestic economic activity reflected by the movements of the domestic output gap.

While assessing the relative importance of global and domestic factors in affecting the price dynamics we found that their role differs across the examined countries. In Poland the impact of the domestic output gap is the most substantial one – the cyclical fluctuations of domestic economic activity reflected by the changes in domestic output gap affect the prices of ca. 60 per cent of the analyzed groups of goods and services. The second important source of inflation variability in the Polish economy is the movements of real effective exchange rate, which transmits into almost half of the disaggregated price indices. When accounting for weights of the respective groups of goods and services in the HICP basket the findings stemming from this analysis remains broadly unchanged.

The disaggregated analysis of the inflation drivers in the Czech Republic reveals a similar picture. The cyclical fluctuations of the domestic output gap and the changes in exchange rate are the most important sources of inflation development, but in addition to that the prices of relatively large fraction of goods and services are also affected by the global supply shock – this group is larger than in case of Poland. However, when we account for the size of the shocks (adjusted additionally with the HICP basket components' weights) it turns out that apart from the domestic output gap, the second important source of overall inflation variability is a global commodity specific shock with supply shock and even exchange rate being less relevant.

On the contrary the inflation development in Sweden differs slightly from the pattern identified for Poland and the Czech Republic. As far as the number of price categories is concerned the most important source of inflation variability is still the output gap. However, the external shocks, both demand and supply, as well as changes in exchange rate, are also relevant for the inflation variability. Unlike in the other examined economies the exchange rate is the least important factor. Nevertheless, if we account for the relative size of the shocks and the weights in the HICP basket it proves that the shocks to commodity prices followed by

the supply shock and subsequently the output gap are the main drivers of inflation variability.

To sum up, while investigating the relative role of global and domestic factors in determining inflation in three analyzed countries all of them being small open economies, we may conclude that in one country (Poland) the dynamics of prices is shaped mostly by the changes in domestic economic activity, in one mainly by the external factors (Sweden) while the third country may be classified somewhere in between (the Czech Republic).

Next we discuss briefly the historical decomposition of inflation variability as showed on Figures 3, 4 and 5. In Poland (Figure 4) the most important factor driving inflation throughout the whole analyzed period was the domestic output gap. The positive output gap contributed to large extent to the substantial and long lasting positive deviation of the inflation from the inflation target in years 2007-2008. With the outbreak of the global financial crisis and rapid deterioration of economic activity the positive impact of the output gap reversed very quickly. However the inflation remained heightened due to strong depreciation of the Polish złoty, which accounted substantially to inflation variability that time. At the end of 2008 we can also recognize the negative contribution of the external shocks (supply and demand) to inflation development when the world economy falls into the recession. Moreover commodity specific shock turned out from pro-inflationary to disinflationary as the commodity prices started to fall sharply after Lehmann Brothers collapse. As we mentioned before the only pro-inflationary factor (but very strong one) was an exchange rate which was soaring during that period[10].

The more recent evolution of inflation (in fact deflation) in Poland can be attributed to large extent to the changes in the domestic output gap, which remains still negative and does not set an inflationary pressures on the Polish economy. In addition to that we are facing declining commodity prices, both energy and food due to the persistent positive commodity specific shock. The only factor that reveals a slight pro-inflationary pressure is a negative non-commodity supply shock, which can be attributed to the weakening of the globalization process (reflected by a drop in global trade) and a fall in R&D expenditures as a result of the long lasting economic slowdown facing several developed and emerging economies.

Since the beginning of the global financial crisis the global demand shock has had mainly negative contribution to the inflation process in Poland i.e. adds to lower inflation with only temporary reversion in years 2010-2011. However when investigating the role of the global demand shock in affecting inflation one should keep in mind that in our approach we do not impose the orthogonality condition on the domestic output gap in respect to global demand shock. For that reason the movements in the domestic output gap may be to some extent related to the propagation of the global demand shock, which transmits sooner or later into the domestic output gap. However Kolasa (2013) argues that synchronization of business cycles in euro area and non-euro area countries despite of ongoing convergence is still not very high. Nevertheless the overall importance of the global demand shock in determining the inflation process in Poland but also in two other examined economies (the Czech Republic and Sweden) may be in fact larger than if accounting only for its direct impact reflected by the regression coefficient. Thus, in the period covered by our research the

[10]Since the mid-2008 till the beginning of 2009 it depreciated by more than 50%

demand shocks (both global and domestic - reflected by the country's output gap) played in Poland more important role in inflation development than supply shocks.

We get rather similar picture when looking at the decomposition over time of the factors driving inflation in the Czech Republic (Figure 3) with the prominent role of the domestic output gap. The most substantial discrepancy among the countries is that in the Czech Republic the commodity prices' shock is more important in affecting the overall inflation variability. On the contrary the exchange rate channel seems to be less relevant. Additionally the role of the declining commodity prices in lowering inflation was more significant than in Poland. Such an outcome may be less surprising when we bear in mind that the Polish economy is less reliant to the import of energy commodities such as oil or natural gas[11]. Moreover in the Polish economy, where the agriculture sector contributes substantially to the GDP thus making Poland a relevant exporter of food products, the domestic conditions play more prominent role. That is why for Poland the shock to world commodity prices is less important in determining the domestic consumer food prices. The findings, which point out a lower contribution of the exchange rate fluctuations to the inflation variability in the Czech Republic after the beginning of the global financial crisis, may be attributed to some extent to the fact that in the first phase of the crisis Czech koruna depreciated less than the Polish zloty[12].

The decomposition of the global shocks determining the inflation in Swedish economy in the analyzed period is somewhat different (Figure 5). The shock, which contributed the most to overall inflation variability, is a commodity specific shock. It is worth to note that, as compared to two other examined countries the output gap played significant role in explaining the inflation development mainly in the period from mid-2006 until mid-2010 when the fluctuations of the domestic demand were substantial. Before the Lehman Brothers collapse Swedish output gap was adding to the price growth, while after the beginning of the financial crisis it changed its sign muting the inflation. Definitely for Sweden the commodity and non-commodity supply shocks are of the biggest importance as their influence on the inflation in the whole sample is sizable. Additionally a small fraction of goods and services reacts to the global demand shock and exchange rate, both playing a negligible role in explaining the inflation variability in Sweden.

Apart from the issue of the proper measurement of the output gap with the HP filter this phenomenon may be attributed to some extent to lower variability of consumer prices in Sweden in both aggregated and disaggregated levels as compared to the Czech Republic and Poland (see Table 2) and their higher rigidity[13]. Also the firmly anchored inflation expectations may pose to more muted reaction of prices to the fluctuations of aggregated demand. It is worth to note that as opposite to the demand shocks (both global and domestic) the role of the non-commodity supply shock in affecting (mainly lowering) inflation in the analyzed period in Sweden is comparable to other examined economies.

[11] E.g. in Poland natural gas dependence is 73,8% and in the Czech Republic 89%, also Poland imports less oil and both countries are coal net exporters (Eurostat, 2014).

[12] Polish złoty depreciated by 50%, whereas Czech koruna by 25%.

[13] Apel et al. (2005) point out the relatively high rigidity level of the prices set by the Swedish firms - the median firm adjusts the price once a year.

4 Conclusions

The globalization process was supportive for the central banks in maintaining low inflation for almost two decades (Rogoff, 2003). It contributed to better anchoring of inflation expectations and therefore helped the central banks in gaining the credibility. However nowadays the central banks face the problem of too low inflation, which is especially difficult for the countries, in which monetary policy hit zero lower bound (like Sweden or the Czech Republic). These countries are trying to cope with problem of too low inflation and subdued growth by applying several unconventional monetary policy measures like quantitative easing (Sweden) or exchange rate floor (the Czech Republic).

Bearing that in mind, we think that the results of our research may be useful for the monetary authorities. We believe that the identification of the sources of the low inflation (or even deflation) may help central banks to design and implement the proper policy actions.

Our main finding is that the low inflation in the examined countries nowadays results not only from the favorable shock to commodity prices but also from the weak demand pressure, both domestic and external – however this outcome is more evident for the Czech Republic and Poland than for Sweden.

Additionally, we find that for two out of three examined countries the domestic output gap matters for the inflation developments despite of their relative high openness. The issue not discussed in the paper is to what extent the monetary policy in those countries remains autonomous, meaning it may influence the domestic inflation via affecting domestic output gap. Furthermore we confirm that the exchange rate channel is also effective in affecting inflation however its strength differs across the countries.

Finally, we recognize that the non-commodity supply shock which contributed to low inflation over the long time reversed after the outbreak of the global financial crisis what may interpreted as a weakening of the globalization process.

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Tables and figures

Table 1: Recursive restrictions on the contemporaneous impact matrix.

Variable	Demand shock (GD)	Commodity specific shock (GC)	Supply shock (GS)
Word import	x	0	0
Real commodity prices	x	x	0
Global inflation	x	x	x

Note: By symbol x we denote the unrestricted elements of the instantaneous impulse response matrix in SVAR model.

Table 2: HICP descriptive statistics

	The Czech Republic	Poland	Sweden
mean	2,3	3,2	1,6
median	2,1	2,9	1,4
std	1,8	2,5	1,0
min	-0,6	-0,2	-0,4
max	7,1	10,5	4,2

Source: Own calculations.

Table 3: Estimation results - the Czech Republic

HICP component	Class	GAP		exchange rate		demand shock		commodity shock		supply shock	
		coeff	p-value	coeff	p-value	coeff	p-value	coeff	p-value	coeff	p-value
Furnit., furnish., carpets, floor coverings	D	**0.09**	**0.000**	-0.01	0.380	0.03	0.567	-0.02	0.589	0.02	0.673
Household appliances	D	**0.05**	**0.076**	-0.03	0.151	-0.06	0.223	0.03	0.631	**0.08**	**0.104**
Tools and equipment for house, garden	D	-0.07	0.377	-0.02	0.613	-0.09	0.682	0.00	0.996	0.21	0.348
Purchase of vehicles	D	0.02	0.912	**-0.11**	**0.058**	**0.33**	**0.144**	0.29	0.533	-0.15	0.414
Telephone and telefax equipment	D	0.10	0.541	**-0.35**	**0.001**	-0.19	0.675	-0.03	0.931	**0.78**	**0.054**
AV, photo., inform. processing equip.	D	-0.06	0.388	-0.05	0.220	0.00	0.979	0.09	0.493	-0.11	0.448
Other major durables for recrea., culture	D	0.01	0.981	0.02	0.839	0.38	0.240	-0.81	0.276	0.58	0.219
Personal effects n.e.c.	D	**0.04**	**0.123**	-0.01	0.322	**0.08**	**0.048**	0.06	0.213	0.05	0.353
Clothing	SD	**0.06**	**0.105**	0.00	0.908	0.01	0.888	**-0.20**	**0.050**	**0.17**	**0.023**
Footwear	SD	0.04	0.602	-0.04	0.239	-0.10	0.533	-0.08	0.730	**0.25**	**0.030**
Household textiles	SD	0.03	0.389	**0.04**	**0.051**	0.08	0.351	0.08	0.207	0.01	0.907
Glassware, tableware, house. utensils	SD	0.05	0.163	-0.03	0.290	-0.01	0.862	0.11	0.311	**0.13**	**0.148**
Goods, serv. for routine house. maint.	SD	0.05	0.375	**0.04**	**0.108**	0.03	0.728	-0.06	0.481	0.06	0.446
Other recrea. items, equip., garden, pets	SD	0.02	0.617	0.00	0.879	0.02	0.775	0.00	0.979	0.07	0.530
Personal care	SD	0.05	0.395	0.01	0.69	0.00	0.978	-0.03	0.752	0.04	0.691
Food	ND	0.13	0.380	-0.10	0.329	0.01	0.971	**0.42**	**0.077**	0.08	0.816
Alcoholic beverages	ND	-0.01	0.849	0.02	0.572	-0.16	0.165	0.12	0.152	**0.21**	**0.028**
Tobacco	ND	**0.37**	**0.054**	-0.09	0.324	0.3	0.388	-0.36	0.337	**0.92**	**0.018**
Maintenance, repair of the dwelling	ND	0.06	0.332	0.02	0.270	0.04	0.729	0.02	0.816	-0.11	0.299
Electricity, gas and other fuels	ND	**0.46**	**0.004**	0.06	0.468	-0.23	0.559	0.20	0.423	-0.10	0.742
Medical products, appliances, equip.	ND	0.19	0.317	0.17	0.252	0.08	0.743	**0.32**	**0.128**	-0.53	0.217
Operation of personal transport equip.	ND	**-0.58**	**0.042**	-0.02	0.839	0.21	0.746	**1.60**	**0.003**	0.21	0.659
Newspapers, books and stationery	ND	**0.06**	**0.142**	-0.02	0.582	0.05	0.684	0.03	0.824	-0.11	0.267
Actual rentals for housing	S	**0.17**	**0.000**	-0.01	0.777	-0.05	0.358	-0.07	0.352	**-0.11**	**0.046**
Water sup., serv. relat. to dwelling	S	**0.08**	**0.029**	-0.02	0.770	0.03	0.849	0.10	0.405	-0.14	0.361
Out-patient services	S	0.81	0.185	**0.72**	**0.099**	0.32	0.525	0.98	0.202	-1.44	0.277
Hospital services	S	**2.35**	**0.131**	**2.35**	**0.061**	1.65	0.381	**4.14**	**0.068**	-4.49	0.265
Transport services	S	**0.21**	**0.042**	0.03	0.568	**0.32**	**0.094**	0.12	0.506	**-0.36**	**0.130**
Postal services	S	0.15	0.755	**0.73**	**0.021**	**-1.35**	**0.085**	0.43	0.611	-1.57	0.227
Telephone and telefax services	S	-0.1	0.635	**0.25**	**0.013**	0.53	0.338	-0.7	0.188	-0.15	0.529
Recreational and cultural services	S	0.05	0.552	**0.07**	**0.068**	0.23	0.152	-0.08	0.628	0.28	0.363
Package holidays	S	0.08	0.515	-0.02	0.879	0.14	0.618	-0.19	0.454	0.70	0.262
Education	S	0.00	0.980	0.01	0.592	-0.12	0.553	-0.05	0.603	0.01	0.892
Catering services	S	0.03	0.649	0.01	0.645	**0.13**	**0.061**	0.05	0.749	0.02	0.898
Accommodation services	S	**0.19**	**0.054**	0.05	0.277	**0.22**	**0.088**	**-0.27**	**0.068**	**-0.47**	**0.086**
Social protection	S	0.20	0.248	0.03	0.763	**0.34**	**0.135**	-0.36	0.397	**0.72**	**0.065**
Insurance	S	**0.10**	**0.003**	-0.02	0.297	0.09	0.281	-0.03	0.64	-0.03	0.646
Financial services n.e.c.	S	**-0.32**	**0.132**	0.01	0.969	0.28	0.313	-0.05	0.872	0.20	0.798
Other services n.e.c.	S	0.53	0.238	**0.69**	**0.033**	0.39	0.328	0.62	0.395	-0.68	0.442

Note: The p-values for the respective variables have been calculated with HAC standard errors. The coefficients (for demand, commodity and supply shocks multiplied by 100) and p-values related to variables statistically significant at 15% level are bolded. Class: D - durable goods, SD - semi-durable goods, ND - non-durable goods, S-services.

Table 4: Estimation results - Poland

HICP component	Class	GAP		exchange rate		demand shock		commodity shock		supply shock	
		coeff	p-value	coeff	p-value	coeff	p-value	coeff	p-value	coeff	p-value
Furnit., furnish., carpets, floor coverings	D	**0.16**	**0.022**	-0.01	0.390	-0.02	0.750	0.06	0.483	0.08	0.341
Household appliances	D	**0.06**	**0.060**	**-0.02**	**0.030**	0.01	0.735	-0.05	0.461	**0.08**	**0.060**
Tools and equipment for house, garden	D	**0.18**	**0.010**	**-0.02**	**0.089**	0.05	0.305	-0.09	0.496	0.07	0.197
Purchase of vehicles	D	0.11	0.491	**-0.19**	**0.001**	0.11	0.550	-0.15	0.585	-0.13	0.596
Telephone and telefax equipment	D	-0.06	0.614	**-0.06**	**0.011**	0.07	0.531	0.02	0.898	-0.30	0.176
AV, photo., inform. processing equip.	D	0.07	0.476	**-0.06**	**0.099**	-0.01	0.956	**-0.27**	**0.040**	-0.12	0.240
Other major durables for recrea., culture	D	0.30	0.236	-0.03	0.520	0.27	0.154	0.03	0.896	-0.39	0.285
Personal effects n.e.c.	D	**0.13**	**0.010**	**-0.03**	**0.010**	0.03	0.517	0.06	0.261	**0.07**	**0.144**
Clothing	SD	-0.05	0.335	-0.01	0.538	0.01	0.884	0.03	0.592	**0.15**	**0.080**
Footwear	SD	**-0.07**	**0.115**	**-0.02**	**0.069**	-0.01	0.871	0.07	0.166	**0.13**	**0.007**
Household textiles	SD	0.03	0.289	**-0.01**	**0.004**	-0.05	0.214	0.04	0.403	0.05	0.298
Glassware, tableware, house. utensils	SD	**0.13**	**0.001**	**-0.01**	**0.021**	0.03	0.340	0.01	0.787	0.00	0.851
Goods, serv. for routine house. maint.	SD	**0.11**	**0.000**	**-0.01**	**0.047**	0.04	0.172	**0.06**	**0.091**	**0.10**	**0.001**
Other recrea. items, equip., garden, pets	SD	**0.18**	**0.000**	**-0.03**	**0.006**	0.00	0.919	-0.03	0.318	**0.07**	**0.119**
Personal care	SD	**0.08**	**0.000**	**-0.02**	**0.041**	0.03	0.498	0.03	0.355	0.04	0.237
Food	ND	**0.50**	**0.003**	**-0.10**	**0.000**	0.12	0.586	-0.07	0.776	**0.35**	**0.104**
Alcoholic beverages	ND	**0.30**	**0.036**	0.02	0.755	-0.04	0.686	-0.07	0.600	-0.08	0.532
Tobacco	ND	0.23	0.304	0.00	0.990	0.24	0.186	0.01	0.962	0.04	0.843
Maintenance, repair of the dwelling	ND	**0.33**	**0.018**	-0.04	0.298	0.10	0.400	-0.39	0.227	0.26	0.133
Electricity, gas and other fuels	ND	**0.36**	**0.006**	**0.04**	**0.072**	-0.19	0.237	**0.25**	**0.056**	-0.24	0.182
Medical products, appliances, equip.	ND	0.17	0.214	0.00	0.884	-0.01	0.925	0.06	0.624	0.14	0.490
Operation of personal transport equip.	ND	-0.44	0.312	**-0.17**	**0.061**	0.64	0.323	**1.12**	**0.012**	0.50	0.482
Newspapers, books and stationery	ND	0.25	0.162	-0.01	0.526	-0.03	0.873	**-0.3**	**0.076**	0.17	0.152
Actual rentals for housing	S	0.03	0.278	0.00	0.644	-0.02	0.495	-0.01	0.727	0.02	0.467
Water sup., serv. relat. to dwelling	S	**0.21**	**0.129**	-0.01	0.803	0.03	0.893	-0.03	0.813	0.08	0.717
Out-patient services	S	**0.05**	**0.016**	**-0.01**	**0.016**	0.00	0.792	**0.04**	**0.044**	0.00	0.917
Hospital services	S	0.02	0.858	0.06	0.280	-0.09	0.562	0.00	0.981	0.12	0.413
Transport services	S	**0.35**	**0.043**	0.03	0.259	0.05	0.789	-0.04	0.791	-0.05	0.845
Postal services	S	0.12	0.437	0.06	0.346	-0.07	0.819	**-0.47**	**0.102**	-0.57	0.392
Telephone and telefax services	S	**0.59**	**0.099**	**-0.1**	**0.045**	0.19	0.677	-0.09	0.544	0.78	0.245
Recreational and cultural services	S	0.07	0.644	-0.03	0.354	-0.04	0.866	**-0.26**	**0.107**	-0.09	0.564
Package holidays	S	**0.27**	**0.001**	-0.02	0.251	0.03	0.711	-0.09	0.314	-0.09	0.463
Education	S	**0.17**	**0.059**	0.01	0.264	**0.19**	**0.068**	0.07	0.385	-0.04	0.741
Catering services	S	**0.18**	**0.000**	-0.01	0.439	-0.01	0.859	**0.10**	**0.070**	0.00	0.940
Accommodation services	S	**0.25**	**0.000**	0.02	0.178	-0.03	0.635	**0.09**	**0.099**	0.08	0.205
Social protection	S	**0.67**	**0.004**	-0.01	0.600	**0.42**	**0.143**	0.13	0.348	-0.21	0.251
Insurance	S	0.12	0.601	0.06	0.164	-0.16	0.608	-0.14	0.595	0.09	0.577
Financial services n.e.c.	S	**0.33**	**0.113**	**-0.19**	**0.036**	**0.84**	**0.024**	**0.58**	**0.086**	-0.49	0.153
Other services n.e.c.	S	0.46	0.284	-0.03	0.648	-0.44	0.576	-0.56	0.165	0.22	0.565

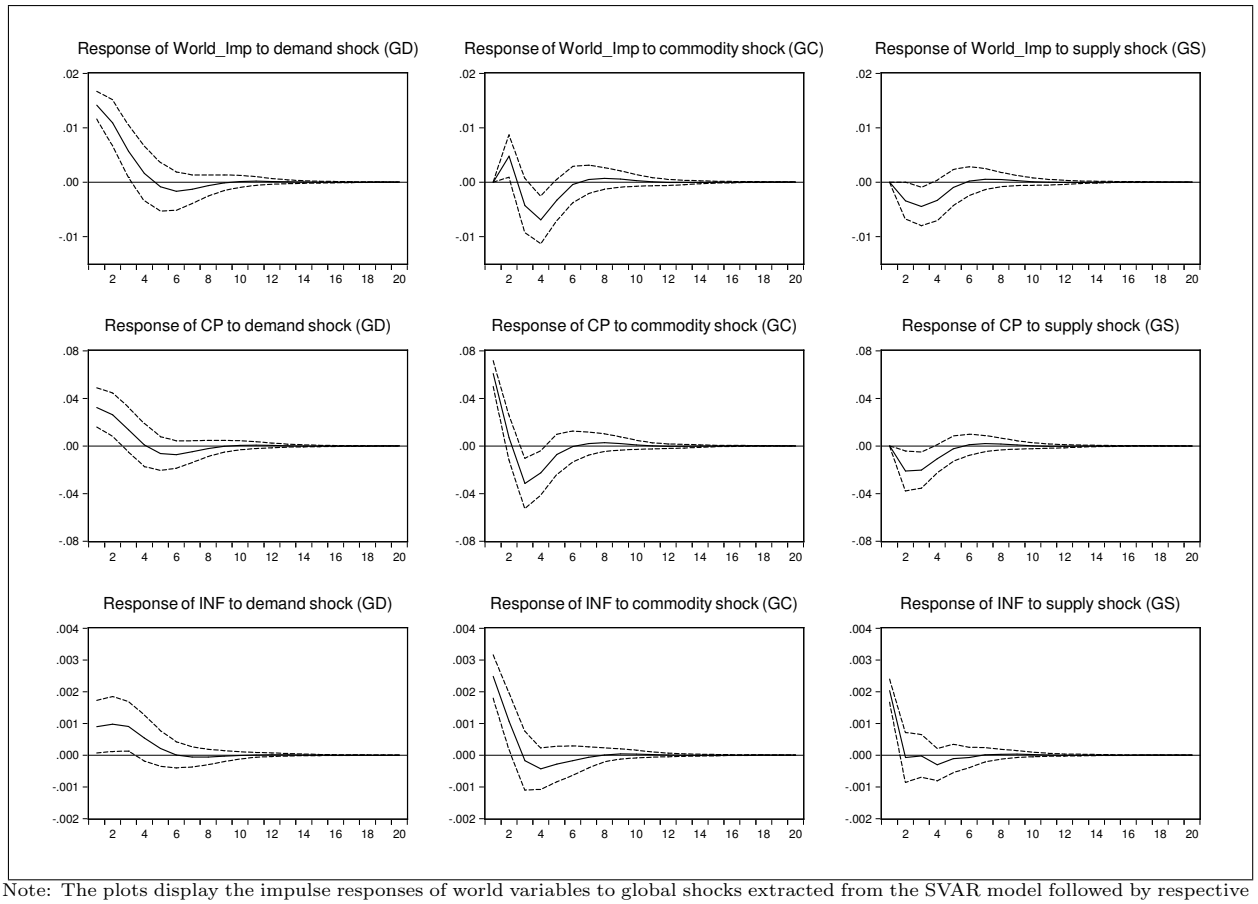
Note: The p-values for the respective variables have been calculated with HAC standard errors. The coefficients (for demand, commodity and supply shocks multiplied by 100) and p-values related to variables statistically significant at 15% level are bolded. Class: D - durable goods, SD - semi-durable goods, ND - non-durable goods, S-services.

Table 5: Estimation results - Sweden

HICP component	Class	GAP		exchange rate		demand shock		commodity shock		supply shock	
		coeff	p-value	coeff	p-value	coeff	p-value	coeff	p-value	coeff	p-value
Furnit., furnish., carpets, floor coverings	D	**0.16**	**0.053**	0.04	0.409	0.13	0.405	0.10	0.518	0.16	0.293
Household appliances	D	0.02	0.525	-0.01	0.817	-0.03	0.541	0.15	0.279	0.02	0.779
Tools and equipment for house, garden	D	**0.43**	**0.044**	**0.23**	**0.065**	**0.68**	**0.019**	-0.24	0.624	-0.06	0.900
Purchase of vehicles	D	-0.05	0.607	-0.09	0.350	0.08	0.693	0.15	0.565	**0.39**	**0.122**
AV, photo., inform. processing equip.	D	**-0.29**	**0.079**	**-0.26**	**0.041**	-0.02	0.957	0.50	0.273	**0.70**	**0.060**
Other major durables for recrea., culture	D	0.02	0.163	0.00	0.988	**-0.07**	**0.102**	0.01	0.704	-0.03	0.373
Personal effects n.e.c.	D	0.09	0.218	-0.01	0.947	0.06	0.657	0.04	0.815	0.08	0.633
Clothing	SD	**0.05**	**0.125**	0.01	0.851	-0.06	0.561	**-0.2**	**0.013**	0.06	0.526
Footwear	SD	0.03	0.860	0.12	0.467	0.11	0.749	**0.91**	**0.017**	0.33	0.498
Household textiles	SD	**0.19**	**0.001**	**0.05**	**0.135**	**0.18**	**0.068**	-0.03	0.749	0.03	0.827
Glassware, tableware, house. utensils	SD	0.06	0.562	0.01	0.864	0.06	0.852	-0.17	0.450	**0.35**	**0.087**
Goods, serv. for routine house. maint.	SD	-0.05	0.642	**-0.14**	**0.105**	-0.01	0.956	-0.02	0.929	0.16	0.583
Other recrea. items, equip., garden, pets	SD	**0.19**	**0.019**	-0.03	0.633	**-0.22**	**0.149**	**-0.26**	**0.102**	0.10	0.605
Personal care	SD	0.01	0.881	0.00	0.949	-0.02	0.911	0.12	0.472	0.10	0.615
Food	ND	-0.02	0.852	-0.04	0.410	-0.09	0.687	0.00	0.986	0.12	0.173
Alcoholic beverages	ND	0.02	0.663	-0.03	0.389	-0.01	0.869	-0.09	0.277	0.18	0.209
Tobacco	ND	-0.26	0.191	-0.13	0.210	-0.05	0.864	-0.14	0.468	-0.30	0.304
Maintenance, repair of the dwelling	ND	0.01	0.981	-0.59	0.325	-5.09	0.248	-0.48	0.467	1.73	0.248
Electricity, gas and other fuels	ND	**-0.11**	**0.008**	-0.06	0.321	0.08	0.522	0.01	0.956	-0.04	0.741
Medical products, appliances, equip.	ND	-0.16	0.342	-0.08	0.570	0.2	0.641	**1.56**	**0.001**	-0.05	0.905
Operation of personal transport equip.	ND	**0.10**	**0.110**	0.02	0.603	0.02	0.851	0.07	0.708	0.16	0.304
Newspapers, books and stationery	ND	**0.09**	**0.096**	-0.03	0.788	0.14	0.606	0.17	0.391	-0.21	0.258
Actual rentals for housing	S	0.02	0.826	-0.02	0.771	0.01	0.929	-0.02	0.899	**0.35**	**0.022**
Water sup., serv. relat. to dwelling	S	-0.03	0.600	**-0.09**	**0.032**	-0.05	0.674	0.12	0.272	**0.27**	**0.010**
Out-patient services	S	-0.01	0.805	-0.04	0.254	-0.04	0.704	0.07	0.453	**0.21**	**0.027**
Hospital services	S	0.03	0.359	-0.03	0.555	0.09	0.593	0.04	0.669	0.09	0.414
Transport services	S	0.01	0.861	-0.02	0.809	-0.41	0.191	0.03	0.875	-0.19	0.387
Postal services	S	-0.11	0.387	-0.16	0.323	-0.41	0.277	-0.24	0.652	0.26	0.490
Recreational and cultural services	S	-0.09	0.307	0.11	0.450	**-1.45**	**0.104**	0.05	0.860	-0.32	0.272
Package holidays	S	0.04	0.385	0.00	0.998	0.11	0.215	0.04	0.636	-0.08	0.214
Education	S	**0.13**	**0.113**	**0.2**	**0.006**	**0.42**	**0.045**	0.11	0.427	-0.15	0.440
Catering services	S	0.01	0.802	0.00	0.786	-0.05	0.516	0.09	0.222	0.09	0.183
Accommodation services	S	-0.12	0.198	**-0.28**	**0.001**	0.20	0.345	**0.33**	**0.051**	0.00	0.988
Social protection	S	-0.01	0.927	0.02	0.819	-0.22	0.314	0.34	0.450	0.09	0.781
Insurance	S	0.07	0.601	0.00	0.987	**0.57**	**0.080**	0.04	0.870	-0.12	0.488
Financial services n.e.c.	S	0.06	0.425	-0.04	0.158	**0.14**	**0.068**	-0.06	0.635	0.07	0.443
Other services n.e.c.	S	-0.10	0.644	**-0.36**	**0.077**	0.42	0.208	0.17	0.278	0.45	0.393

Note: The p-values for the respective variables have been calculated with HAC standard errors. The coefficients (for demand, commodity and supply shocks multiplied by 100) and p-values related to variables statistically significant at 15% level are bolded. Class: D - durable goods, SD - semi-durable goods, ND - non-durable goods, S-services.

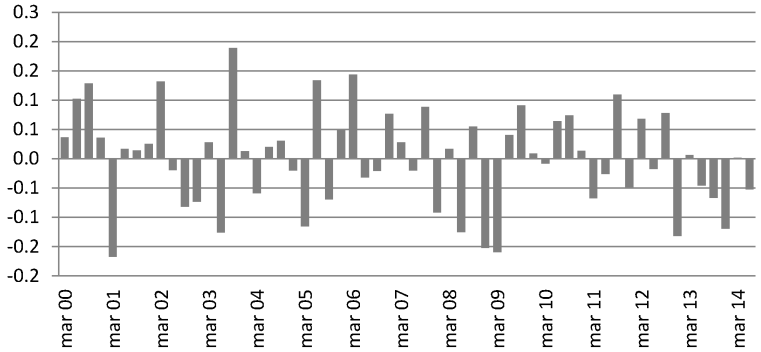
Figure 1: Impulse responses of world variables to global shocks.



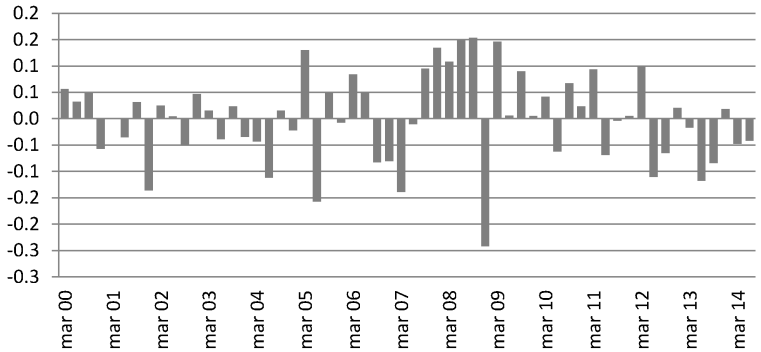
Note: The plots display the impulse responses of world variables to global shocks extracted from the SVAR model followed by respective confidence bands. World_Imp, CP and INF stand for volume of world import, real commodity prices and global inflation respectivelly. GD, GC and GS are global demand, global commodity specific and global non-commodity supply shocks.

Figure 2: The global shocks.

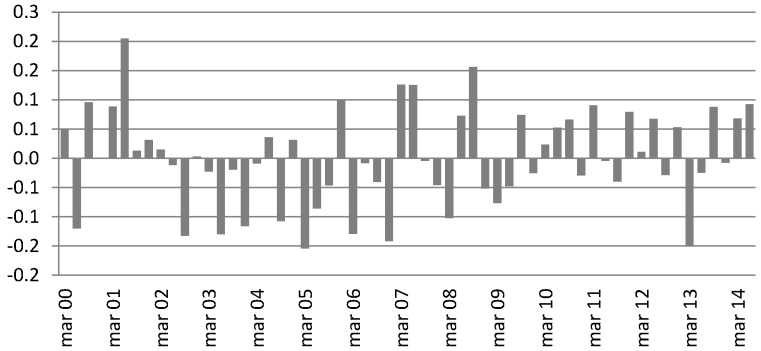
a) Global demand shock (GD)



b) Global commodity specific shock (GC)

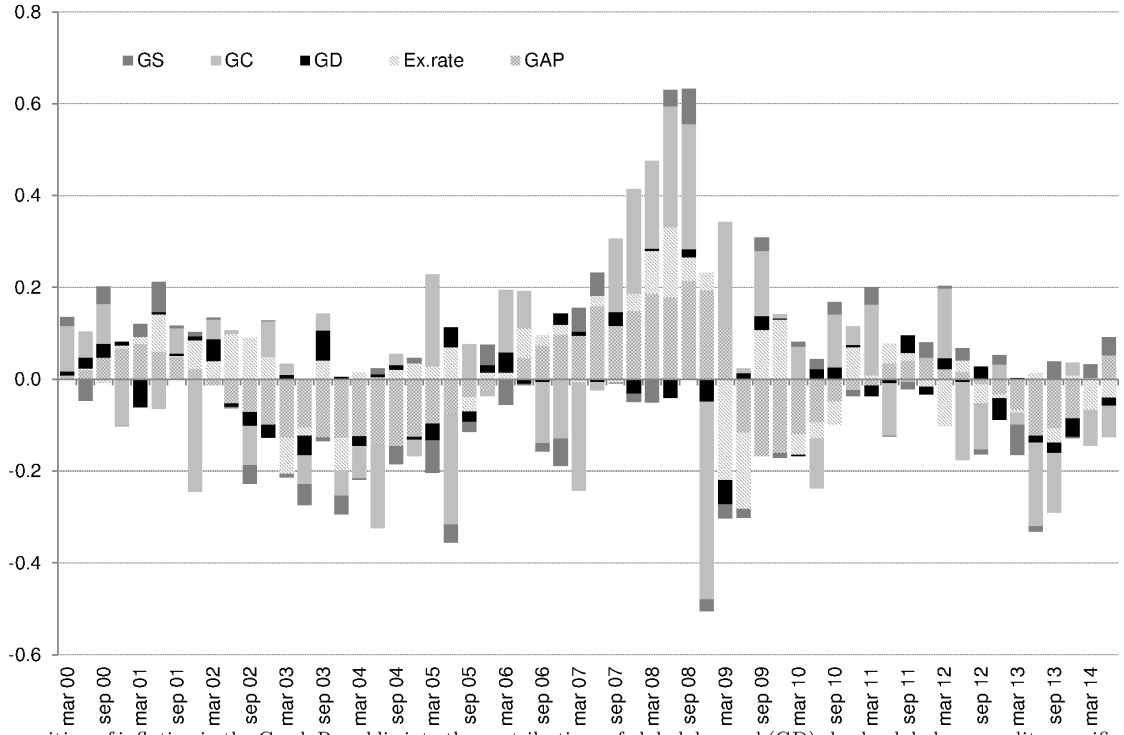


c) Global non-commodity supply shock (GS)



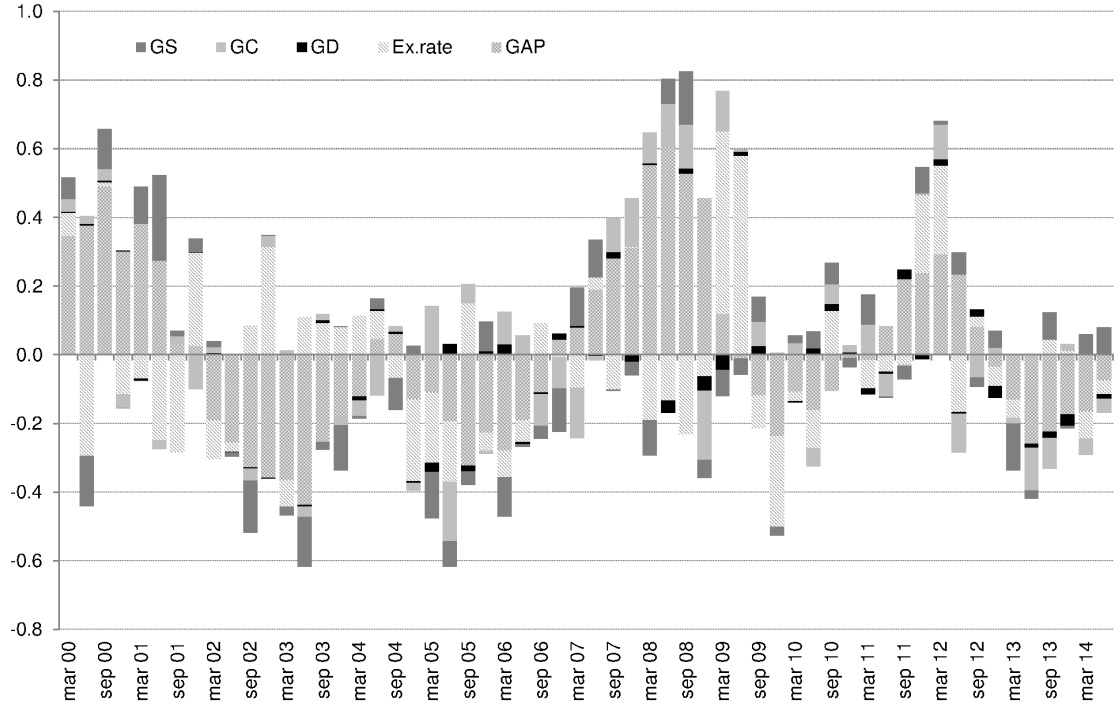
Source: Own calculations.

Figure 3: The decomposition of inflation drivers - the Czech Republic.



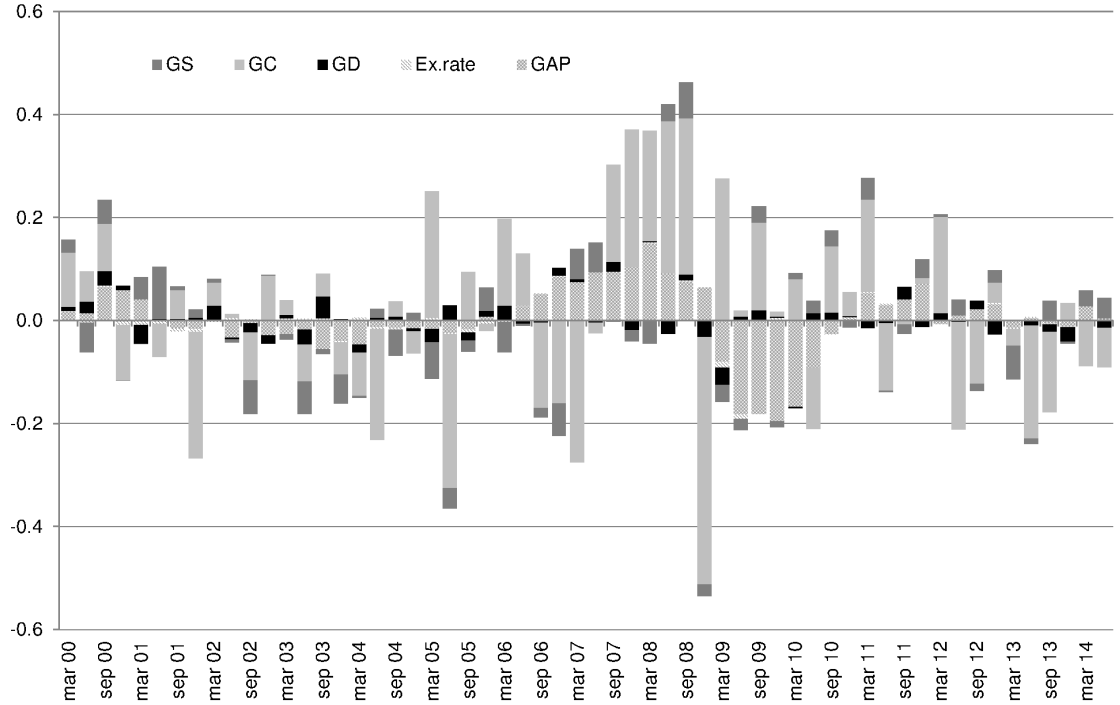
Note: The figure displays the decomposition of inflation in the Czech Republic into the contributions of global demand (GD) shock, global commodity specific (GC) shock, global non-commodity supply (GS) shock, exchange rate (Ex.rate) and domestic output gap (GAP).

Figure 4: The decomposition of inflation drivers - Poland.



Note: The figure displays the decomposition of inflation in Poland into the contributions of global demand (GD) shock, global commodity specific (GC) shock, global non-commodity supply (GS) shock, exchange rate (Ex.rate) and domestic output gap (GAP).

Figure 5: The decomposition of inflation drivers - Sweden.



Note: The figure displays the decomposition of inflation in Sweden into the contributions of global demand (GD) shock, global commodity specific (GC) shock, global non-commodity supply (GS) shock, exchange rate (Ex.rate) and domestic output gap (GAP).