MONETARY POLICY TRANSMISSION TO THE LABOUR MARKET – EVIDENCE FROM THE POLISH ECONOMY[1]

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A b s t r a c t

This article verifies the hypothesis of a short-run impact of undertaken monetary policy on the labour market stance, advocated by the Keynesian/monetarist strand of economic theory. The analyses are performed within a small open economy framework, using data with regards to Poland in the 2000:1–2016:5 period. The research takes into account the high volatility of economic processes in the developing economies as well as their natural business cycle fluctuations and uses Markov Switching Bayesian Structural Vector Autoregressive models.

The presented results confirm that there exists a nexus between monetary policy and the levels of output, inflation and the real effective exchange rate in the Polish economy. There is however no statistically significant relation between the employment level and changes in monetary policy. In this respect, the results are in line with the monetarist theory rather than with the traditional Keynesian\new Keynesian view.

TRANSMISJA POLITYKI PIENIĘŻNEJ NA RYNEK PRACY – WYNIKI DLA POLSKIEJ GOSPODARKI

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S ł o w a   k l u c z o w e: transmisja polityki pieniężnej, rynek pracy, produkcja, inflacja, Bayesowski strukturalny model autoregresji wektorowej z mechanizmem Markov switching.

A b s t r a k t

W artykule zweryfikowano hipotezę wskazującą na istnienie w krótkim okresie związku między charakterem prowadzonej polityki pieniężnej a sytuacją na rynku pracy, co jest postulowane przez przedstawicieli nurtu Keynesowskiego oraz monetarystycznego w teorii ekonomii. Analizy są prowadzone w ujęciu małej gospodarki otwartej, z wykorzystaniem danych dla gospodarki polskiej w okresie 2000:1–2016:5. W badaniu uwzględniono wysoką zmienność procesów ekonomicznych w gospodarkach rozwijających się oraz ich naturalne fluktuacje będące wynikiem cyklu koniunkturalnego, z zastosowaniem Bayesowskiego strukturalnego modelu autoregresji wektorowej z mechanizmem Markov switching.

Uzyskane wyniki potwierdzają istnienie zależności między prowadzoną polityką pieniężną a rozmiarami produkcji, inflacją oraz poziomem realnego efektywnego kursu walutowego. Nie ma jednak dowodów na występowanie statystycznie istotnej reakcji zatrudnienia na zmiany polityki pieniężnej. W tym zakresie wyniki są zatem zgodne z ujęciem postulowanym przez przedstawicieli nurtu monetarystycznego w teorii ekonomii, a nie tradycyjną Keynesowską (nowokeynesowską) wizją zagadnienia.

Introduction

Since the seminal publication of PHILLIPS (1958), one of the unresolved issues of economics is the problem of an impact of undertaken monetary policy on the levels of real economic variables, such as output, employment and the unemployment rate. This issue was for years one of the main sources of controversy between the representatives of various schools of economic thought, including the Keynesians, monetarists and new classical economists. Neither of these competing views could have come up with truly convincing and empirically valid arguments in this discussion, which makes it still an open case (for a wide review see e.g. FORDER 2014).

Another vital issue concerns the normative importance of the aforementioned relationships and the possibility of their use in the process of policymaking. The paper presented here has the aim of filling this gap in existing research through the presentation of new evidence of the money-labour nexus in Poland during the 2000:1–2016:5 period. A proposed framework of analysis takes into account the fact that the investigated economy is a small open one, which results in relative instability of economic processes as well as their higher vulnerability to business cycle fluctuations. In order to account for that, we use the Markov Switching Bayesian Structural Vector Autoregressive (MSBSVAR) model in the vein of SIMS et al. (2008) and HUBRICH and TETLOW (2015).

The paper is organised as follows. Section 2 presents an overview of theoretical views concerning the impact of monetary policy on the real economic variables including the labour market indicators. Section 3 describes the methodology of an econometric model used in order to verify the hypotheses put forward in the theoretical sections. Section 4 has detailed specifications of the data used in our analyses, as well as a discussion of the models'

identification issues and a description of the estimation techniques. In section 5 the results of preformed statistical and econometric analyses are presented, while section 6 gives a conclusion.

Literature review

When reviewing literature on the nexus between the character of undertaken monetary policy and the behaviour of real economic variables we may distinguish between three main theoretical views, which might be dubbed as: new classical, intermediate (or monetarist), and Keynesian. Each of them differs in its assessment of the positive and normative validity of the analysed relationship.

The **new classical view** implies the lack of a causal relationship between the character of monetary policy and the behaviour of real economic variables. It uses the Natural Rate Hypothesis in a version formulated by Lucas (MCCALLUM, NELSON 2011) and is based on the belief that the phenomenon of money illusion is non-existent in an economy in which an agents' expectations are fully rational (LUCAS 1972). In such a case money is superneutral to an economy. Only unexpected monetary policy shocks may have a short-run impact on the level of output and employment, however such a policy will result mainly in the propagation of economic fluctuations around the natural levels of output and employment (LUCAS 1972, SARGENT, WALLACE 1975, SARGENT, WALLACE 1976). As such, the new classical stance may be summarised as denying the existence of a nexus between monetary policy and output, employment, and unemployment in positive terms, as well as the possibility of its utilisation in a normative aspect.

According to the **intermediate view,** the influence of monetary policy on real variables can be exerted only in the short-run. This stance is based either on the quantity theory of money and the idea of a dichotomy between the nominal and real economy (FISHER 1922, MCCALLUM, NELSON 2011), or on the Natural Rate Hypothesis (in the so-called "accelerationist" formulation) which explains the long-run neutrality of money through the phenomenon of money illusion. The intermediate view, emphasized in the works of the classical, neoclassical and monetarist economists, accepts the hypothesis of existence of a nexus between the character of undertaken monetary policy and the level of economic activity, in its positive aspect. However, in the normative aspect, expansive monetary policy is perceived as an inefficient measure of supporting the growth of output and employment, due to the transiency of its effects and inflationary character (ARESTIS, SAWYER 1998).

Finally, at the other extreme, we find the **Keynesian view**, which explains the observed empirical tendency of an economy to operate below the level of full employment with the existence of wage and price rigidities. If wages and prices are rigid, then changes in the level of money supply not only affect the nominal side of an economy, but result also in quantitative adjustments of production, employment and unemployment. Money is non-neutral and there exists a stable relationship between the character of undertaken monetary policy and the level of real economic variables (KEYNES 1964, chap. 22). This idea was further refined in the concept of the Phillips curve (PHILLIPS 1958). From this point of view, the nexus between monetary policy and the level of real economic variables is valid both in the positive and normative aspect. In recent contributions by New Keynesian economists and the representatives of the New Neoclassical Synthesis it is emphasised, however, that an impact of monetary policy on real variables is restricted to the short-run. At the same time, they sustain that it is valid to use monetary policy with a view to increasing the level of economic activity (ARSENEAU, HUGH 2008, THOMAS 2008, BLANCHARD, GALI 2010, GALI 2011a, GALI 2011b). The recent economic crisis did however cast some doubts on the ways and mechanisms that might be used in order to achieve these aims (ARESTIS, SAWYER 2011, 2012, PALLEY 2011).

Due to the fact that the nexus between monetary policy character and the behaviour of real variables was for years one of the central topics of discussion in the field of economics, we find a truly impressive number of empirical studies in this area. As pointed out by TAYLOR (1996), a relatively strong consensus was reached concerning the lack of a long-run relationship. It was achieved through research performed, among others, by BOSCHEN and MILLS (1995), BULLARD and KEATING (1995), MCCANDLESS and WEBBER (1995) and KING and WATSON (1997). Much more disagreement is visible in the works on the character of the short-run relationship. Discussion in this area thrived after the introduction of multivariate structural vector autoregressive (SVAR) models. The search for robust specification of the SVAR system resulted in the adoption of an approach based on the monetary transmission mechanism as one of the basic settings in which analyses of the money-output relationship take place. Various schemes of identification of monetary policy shocks were proposed. Despite significant differences in the structure of the models presented above, the results of the undertaken research confirmed the existence of a money-output nexus in the majority of cases (see e.g. SIMS 1972, 1980, 1986, BERNANKE, BLINDER 1992, BERNANKE, MIHOV 1998, CHRISTIANO et al. 1999, 2005, 2011, SIMS, ZHA 2006, ALTIG et al. 2011). On the other hand, there were only a few studies which extended this research to the labour market (SIMS

1986, BERNANKE, BLINDER 1992, PEERSMAN, SMETS 2001, ALTIG et al. 2011, CHRISTIANO et al. 2011). Although the first results by SIMS (1986) confirmed the existence of a relatively strong influence of monetary policy on the level of unemployment, further studies (BERNANKE, BLINDER 1992, PEERSMAN, SMETS 2001) gave much weaker results. As such, the evidence concerning money and employment seems to be mixed, especially in its normative aspect.

Reviewing the results of SVAR analyses of the monetary transmission mechanism of Poland and the other Visegrad group countries we come to similar conclusions. There exists a widely documented consensus on the existence of the short-run money-output relationship (see, e.g., ANZUINI, LEVY 2007, ELBOURNE, DE HAAN 2009, JAROCIŃSKI 2010, DARVAS 2013), whereas in-depth analyses of the impact of monetary policies on other real economic variables such us employment and unemployment are very rare and erratic. Labour-market-augmented SVARs may be found e.g. in the papers by WRÓBEL and PAWŁOWSKA (2002) for Poland and VONNÁK (2006) for Hungary, however their results are far from being conclusive.

Econometric methodology

As pointed out in the previous section of this article, monetary transmission models formulated within the SVAR framework became the basic tool for monetary policy analysis and assessment. In spite of their good performance in the analyses of large, developed economies, the results obtained within the small open economy framework are unsatisfactory, as they are vulnerable to distortions resulting from a larger instability of economic processes. As a result, estimates suffer from numerous issues, such as: existence of explosive roots, lack of appropriate properties of the error terms or disruptive impulse responses. These deficiencies call, in turn, for use of *ad hoc* measures of improvement of obtained results, such as the introduction of dummy variables or a shortening of the samples (see e.g. KAPUŚCIŃSKI et al. 2014, 2016). As these methods are not satisfactory from the scientific point of view, due to the fact that they do not explain but rather evade the above-mentioned phenomena, in this article it is proposed to use the Markov Switching Bayesian Structural Vector Autoregressive model (MSBSVAR), which is capable of accounting for both the changes in the variances of the analysed processes as well as changes in the structural relationships underlying them.

Following SIMS et al. (2008) and HUBRICH and TETLOW (2015) in our analyses we consider an unrestricted VAR(l, m, n) model of the form:

$$\boldsymbol{y}_t^{'}\boldsymbol{A_0}(s_t^C) = \Sigma_{i=1}^{l}\boldsymbol{y}_{t-i}^{'}\boldsymbol{A_i}(s_t^C) + \Sigma_{j=0}^{m}\boldsymbol{z}_{t-j}^{'}\boldsymbol{C_j}(s_t^C) + \boldsymbol{\dot{\varepsilon}_t}\,\boldsymbol{\Xi}^{-1}(s_t^V) \qquad (1)$$

where:

y is a vector of endogenous variables,

z is a vector of exogenous variables, which are assumed to be at least predetermined and weakly exogenous,

A_0, A_i, C_j are the matrices of appropriate state-dependent parameters, s_t^n for $n = \{C, V\}$ is a latent variable describing the current state of an economy, separately with respect to each of the parameters, s_t^C, and variances, s_t^V.

We assume that the state of an economy depends on a set of political, economic, technological and institutional factors which are subject to the influence of independent shocks that may lead to abrupt changes in the character of observed economic processes. As a result, latent state variables meet the so-called Markov condition and can be modelled as if they were following an irreducible, aperiodic, time-homogeneous and ergodic Markov chain. Drawing from that fact, and following HUBRICH and TETLOW (2015), the variable s_t^n takes on the values from the set $\{1, 2, ..., h^n\}$ and is governed by the first-order Markov chain given by:

$$\Pr(s_t^n = 1 \,|s_{t-1}^n = k) = p_{ik}^n \; i,k = 1, 2, ..., h^n \tag{2}$$

where:

p_{ik}^n is the probability of an economy entering state i, conditional on being in state k in the preceding period and the Markov transition probabilities are given by matrix P, which is constant over time.

For simplicity, assuming that $x_t = [y_{t-1}^{'}, ..., y_{t-l}^{'}, z_t^{'}, ..., z_{t-m}^{'}]$ as well as $A_{-}^{'}(s_t^n) = [A_1^{'}(s_t^n), ..., A_l^{'}(s_t^n), C_0^{'}(s_t^n), ..., C_m^{'}(s_t^n)]$ we obtain an equation of the following form:

$$y_t^{'}A_0(s_t^C) = x_t^{'}A_{-}(s_t^C) + \varepsilon_t^{'}\Xi^{-1}(s_t^V) \tag{3}$$

Further imposing normality restriction on state-dependent errors, with the use of the condition:

$$\Pr(\varepsilon_t \,|Y^{t-1}, Z^t, S^{n,t}, A_0, A_{-}, \Xi) \sim N(0_\eta, I_\eta) \tag{4}$$

where:

Y^{t-1}, Z^t, $S^{n,t}$ are vectors of variables stacked in the time dimension, $N(0_\eta, I_\eta)$ is a multivariate normal distribution with zero mean and unit variance, we obtain an unrestricted Markov-Switching VAR model that can be estimated using the Bayesian procedure proposed by SIMS et al. (2008) and encoded in the dynare software.

The data, identification and estimation techniques

The empirical analyses presented in this paper are based on the monthly data from the 2000:1–2016:5 period. We use the time series of: the industrial production index (IP_t), which serves as a proxy for GDP, and the consumer price index (CPI_t), both obtained from the Stats. OECD database; short-term interest rates (IR_t), approximated by the 1-month WIBOR rate, the real effective exchange rate index ($REER_t$), based on the data on bilateral exchange rates among 42 leading trading partners, as well as the real effective exchange rate of the Eurozone ($REER_t^f$), which serves as a proxy of an exchange rate of the Polish main trading partner, all obtained from the Eurostat database; as well as the world oil price index (P_t^{oil}), given by the Brent crude oil 1-month Forward in EUR index from the ECB Statistical Data Warehouse. Additionally, in order to formulate the labour market block of the model, we use the LFS-based unemployment rate (UR_t) data, obtained from the Eurostat database. Monthly data on employment (E_t) levels were acquired from the transformation of the available LFS data on the unemployment rate and the number of unemployed.

Apart from the abovementioned characteristics of the Polish economy, we do also use the data concerning expectations and sentiments of economic entities in our model, as they might play an important role in amplifying the process of transmission of monetary impulses (see e.g.: NALBAN 2016, WŁODAR-CZYK 2017). In order to account for that an Economic Sentiment Indicator (ESI_t) is used. It is a measure compiled by the Eurostat as an index consisting of the weighted average of 5 sectoral confidence indicators covering: industry, services, construction, retail trade and private consumption. Enlisted sub-indexes are obtained on the basis of a survey sampling about 125,000 EU companies and 40,000 EU consumers every month.

All of the time series used in the following analyses were seasonally adjusted and expressed in annual growth rates (12-month log-differences) marked with lower case letters, which makes them easier to interpret.

In order to analyse impulse responses coming from the VAR models, we had to identify the way in which the shocks to different variables affected the system through imposing appropriate restrictions. There are numerous ways in which that may be done. The most popular identification scheme is the one based on the short-run exclusion restrictions, which originated from the works of SIMS (1972, 1980, 1986). BLANCHARD and QUAH (1989) pioneered the use of long-run identification restrictions, which were used mainly in a discussion of the impact of technology shocks on labour, whereas FAUST (1998) and UHLIG (2005) proposed a scheme based on sign restrictions. All of these identification schemes were however burdened by the fact that there does not exist a unique

and globally binding identification and some of the identifications might additionally be observationally equivalent; then the choice of a correct specification of the model depend primarily on the beliefs and convictions of the researcher. Due to that fact, the Cholesky decomposition, based on the causal ordering of the variables, became gradually one of the most popular identifications, as the amount of discretionary choices in that specification is relatively low and concerns mainly the succession of endogenous variables. It is also used in the research presented in this paper.

In the following section of the article, the results of the estimation of three possible identifications of the MSBSVAR model with the labour market component are presented. Each of them is based on the Cholesky identification scheme, which is specified so as to account for the fact that the Polish economy is a small open one and is characterised by higher sensitivity towards the changes of external economic conditions. We do that through the introduction of a vector of exogenous variables $\boldsymbol{z}_t = [\text{oil}_t \ \text{reer}_t^f]$ (see e.g.: KIM, ROUBINI 2000, GÓRAJSKI, ULRICHS 2016). Their use seems to find justification on theoretical grounds. Commodity prices affecting the real economy are taken into account by monetary authorities when setting the interest rate level and this influences the exchange rate level. Foreign exchange rate shocks have an impact on real economies through the changes of both the exchange rate levels and the terms of trade. As a result they should also be taken into account by the monetary authorities when deciding on the character of the undertaken policy. We treat these variables as strictly exogenous, but they affect all of the other variables of the model, i.e. we put them at the very top of the lower triangle matrix of parameters obtained from the Cholesky decomposition.

Whereas the endogenous part of the model is concerned, output influences both employment and/or unemployment, which in turn have a contemporaneous impact on inflation through the short-run Phillips-curve-type relationship and monetary policy. Monetary policy is formulated on the basis of data concerning the real economic variables and executed through the control of interest rates. It is subsequently reflected by the exchange rate levels and affects all of the other variables with some lag. Resulting identification is thus given by the vectors: $\boldsymbol{x}_t = [\text{oil}_t \ \text{reer}_t^f \ \text{ip}_t \ \text{e}_t \ \text{ur}_t \ \text{cpi}_t \ \text{i}_t \ \text{er}_t]$ in the model in which both the employment and the unemployment rate are taken into account. $\boldsymbol{x}_t = [\text{oil}_t \ \text{reer}_t^f \ \text{ip}_t \ \text{e}_t \ \text{cpi}_t \ \text{i}_t \ \text{er}_t]$ is used in the model for employment only while $\boldsymbol{x}_t = [\text{oil}_t \ \text{reer}_t^f \ \text{ip}_t \ \text{ur}_t \ \text{cpi}_t \ \text{i}_t \ \text{er}_t]$ is used in the model for the unemployment rate only.

As presented by WŁODARCZYK (2017), in small open economies in which the exchange rate pass-through plays a relatively important role, the probability of structural changes in the monetary transmission mechanism during the business cycle is much lower than in the countries in which this transmission

channel is shut down. As it was shown that in Poland the exchange rate plays such a stabilising role, we focus on estimations of the models with changes in volatility only and specifically on the models with three states in volatility, which were proven to best describe the monetary transmission mechanism of the Polish economy. They are estimated using the procedure suggested by Sims et al. (2008). The priors are chosen following Hubrich and Tetlow (2015). Specifically, we use standard Minnesota priors for the monthly data for the elements of the VAR model. Their hyperparameters are given by [0.57, 0.13, 0.1, 1.2, 10, 10]. For the state transition matrix we use the Dirichlet priors of 11.9, which is equivalent to assuming that the expected duration of stay in a given regime, is equal to 20.3 months. In order to obtain posterior modes we use 6 million replications as a burn-in, and leave every 5th of the next 2.5 million replications, which results in 500,000 posterior draws obtained for further analyses.

Results of the econometric analyses

As it was mentioned in the previous section of the paper, we have estimated three versions of the proposed MSBSVAR model of monetary transmission in Poland in the 2000:1–2016:5 period. Each of them differed in the type of labour market variables used. The first of the models was based solely on the data concerning the level of employment, whereas the second used only the unemployment rate. The latter covered both of the abovementioned variables. Despite the fact that the correlation between the employment and unemployment rate was relatively high and reached the level of 0.78 we did not recognize any signs of the existence of multicollinearity issues. The estimates of impulse responses for the first two models were not significantly different from those obtained from the model which covered both of the labour market variables.

We start the presentation of the results of econometric analyses from the assessment of the smoothed estimated regime probabilities of each of these models, shown in Figure 1. Panel *a* presents the results of the model which are based solely on employment level data. We may infer that the estimates are relatively stable as they do not move intertwiningly between the regimes. Furthermore, they are in line with the results obtained by Włodarczyk (2017) in the models that were not accounting for the labour market component. It is also possible to identify the potential reasons of state changes. We may clearly separate the impact of the global economic crisis that was observed between Spring of 2008 and Fall of 2010. There were also two less pronounced spikes of volatility between January 2006 and August 2007 and since mid-2013 until the end of the sample. The first of them might easily be attributed to political
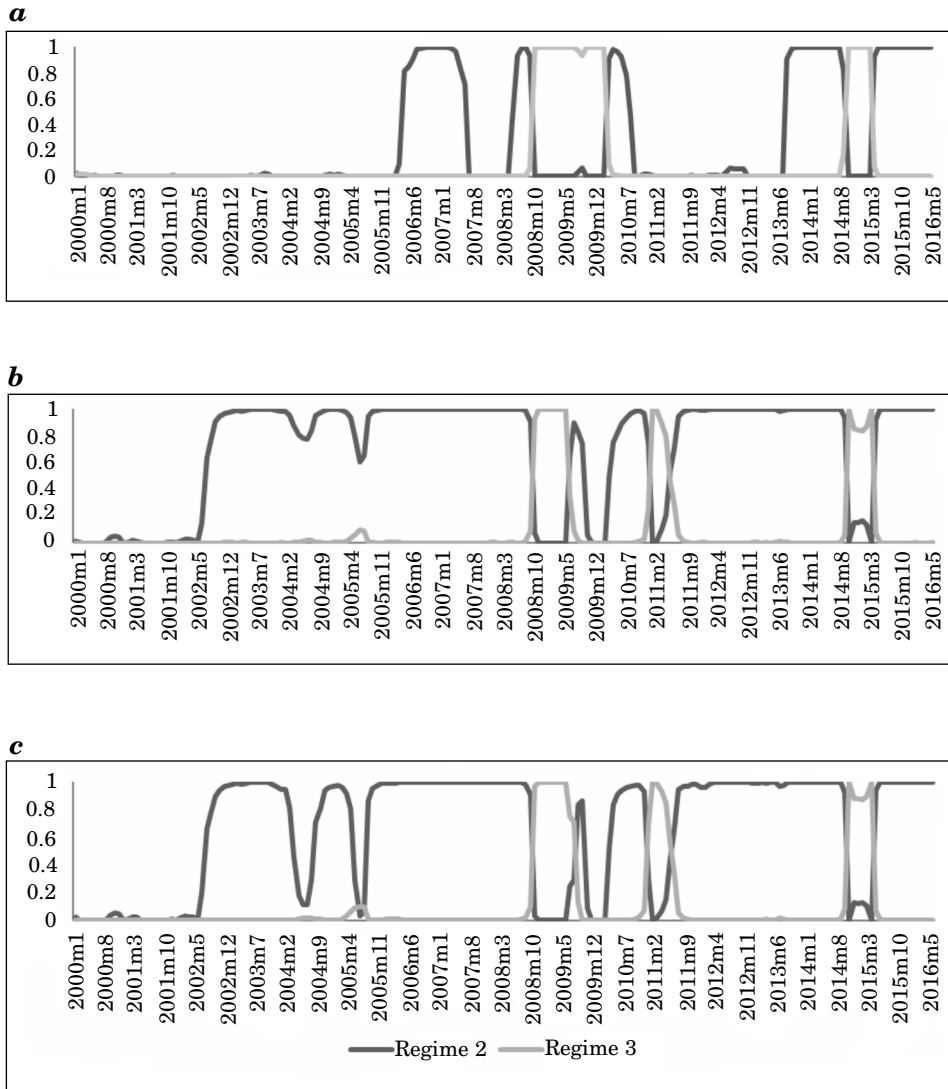
a

b

c

Fig. 1. Smoothed estimated probabilities of regimes from the specifications using: *a* – employment level data only, *b* – unemployment rate data only and *c* – both employment and unemployment rate data
Source: own calculations.

reasons, and specifically to the rules of the first cabinet of the Law and Justice Party. The second one is in turn a compound of geopolitical and political factors, namely the military unrest in Eastern Europe and the process of political elections which culminated in the presidential elections of July 2015; as well as the following parliamentary elections that led to the formation of the second cabinet of the Law and Justice Party.

When the unemployment data are considered (panels *b* and *c*), the model becomes much less stable. It starts to move recursively between the states and it is hard to subscribe these alterations to the fluctuations of economic activity or political changes. Drawing from that, in the following part of the paper we focus on the results coming from the first of the models, leaving the unemployment rate issues for further analyses in the forthcoming papers.
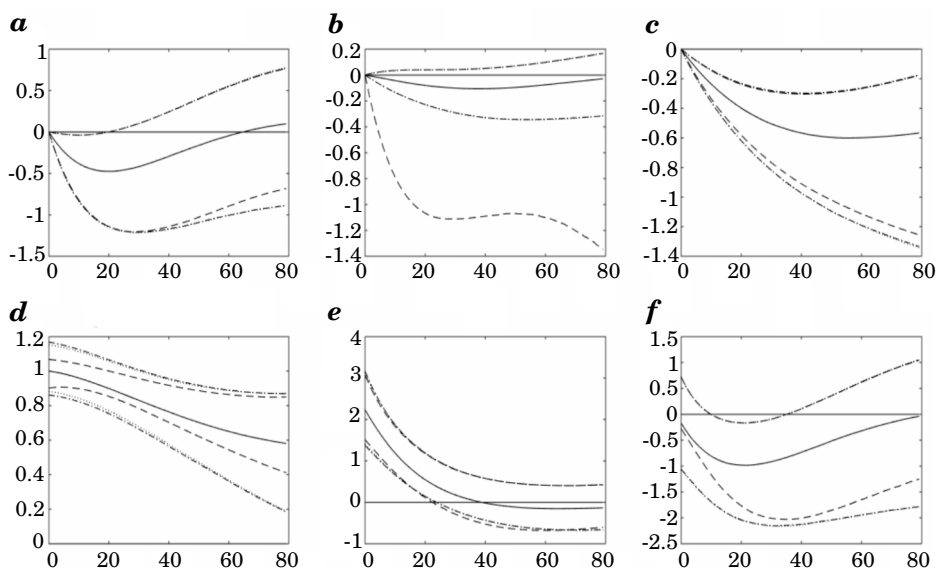

Fig. 2. Impulse responses to the 1 percentage point positive shock to short-term interest rates from the model based on employment level data: *a* – industrial production, *b* – employment, *c* – CPI, *d* – short-term interest rate, *e* - REER, *f* – ESI

Source: own calculations.

Figure 2 shows the impulse response functions obtained on the basis of the model using the data on employment levels. They are presented together with the 84% confidence intervals for appropriate regimes given by the dashed and dotted lines (Regime 1 – dashed line; Regime 2 – dotted line; Regime 3 – dashed and dotted line) and standardized so that they represent a response to a 1 p.p. positive shock to short-run interest rates approximated by a 1-month WIBOR rate. We report the results with regards to the 80 months following the shock.

Obtained responses are fully compatible with economic theory and do not suffer from any of the puzzles frequently reported in similar research papers (see e.g. KAPUŚCIŃSKI et al. 2014, 2016). An unexpected tightening of monetary policy results in the declines of output and inflation and a real effective exchange rate appreciation, as expected by standard economic theory. A fall of

output obtains its maximal value of -0.47% 22 months after an initial shock. The effect on inflation is even longer lasting as it reaches a maximum of -0.6% after 55 months. Exchange rate appreciation has a maximum of 2.23%. The effects of monetary policy tightening on output become insignificant after about 20 months, whereas the exchange rate ends appreciation after about 24 months. The influence of monetary policy tightening on inflation is visible in the economy even 80 months after the shock.

Despite the fact that the tightening of monetary policy affects the level of output, it does not produce a statistically significant reaction in employment, as the confidence intervals overlap zero. Still, if any reaction of employment to the positive 1 p.p. monetary policy shock should be expected then it would be slightly negative, with its magnitude not exceeding -0.15%.

According to the abovementioned results, the tightening of monetary policy results in the fall of confidence of economic entities, especially between the 12th and 35th month after a shock. Such a result might prove the hypothesis put forward by BOYARCHENKO et al. (2016), who stated that due to relatively fresh recollections of hyperinflations and a transformation period as well as numerous issues impeding the stabilisation of the economy, it is relatively difficult for the monetary authorities of the developing countries to earn a "credibility bonus" which would result in the positive reaction of society to the interventions of the monetary authorities.

Conclusion

The article presents the results of an empirical verification of the hypothesis of a short-run impact of undertaken monetary policy on the labour market stance, advocated by the Keynesian/monetarist strand of economic theory. The analyses were performed within a small open economy framework of an MSBSVAR model, using the data concerning Poland in the 2000:1–2016:5 period.

Presented results confirm that there exists a statistically significant nexus between monetary policy and the level of output, inflation and the real effective exchange rate in the Polish economy. In the case of an unexpected tightening of monetary policy, output and inflation would fall, whereas exchange rates would appreciate. There is however no statistically significant reaction with the employment level to the changes of monetary policy which questions the possibility of the normative use of this nexus with a view to improve the labour market stance. In this respect, the results are in line with the monetarist theory and do not follow traditional Keynesian\new Keynesian lines.

The obtained results are free of puzzles, which frequently interfere with the picture of the monetary transmission mechanism that results from traditional SVAR models. This proves that during empirical research we should explicitly take into account the natural instability of economic mechanisms during the business cycle.

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