



ORIGINAL ARTICLE


Citation: Próchniak, M., & Szyszko, M. (2019). The similarity of European central banks in terms of transparency and effectiveness. *Equilibrium. Quarterly Journal of Economics and Economic Policy*, 14(3), 385–404. doi: 10.24136/eq.2019.018

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Received: 3.04.2019; Revised: 19.07.2019; Accepted: 7.08.2019; Published online: 30.09.2019


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The similarity of European central banks in terms of transparency and effectiveness

JEL Classification: E52; E58

Keywords: central bank transparency; forward-looking communication; coefficients of similarity

Abstract

Research background: The previous studies on monetary policy transparency suggest that the dependence between the degree of transparency and monetary policy effectiveness exists. In this examination, we tackle this issue for the most recent sample with the application of novel transparency measure, which is designed to cover forward-looking policy approach.

Purpose of the article: We aim at evaluating forward-looking transparency of the European central banks and juxtapose it with their effectiveness in achieving monetary policy goals: price stability and output stabilization. The sample covers the central banks of the following countries: Sweden, the UK, Czechia, Hungary, Poland, and Romania. We also search for the patterns of similarity in our sample.

Methods: We apply a novel, index-based transparency measure to assess central banks' transparency. We also estimate inflation gap and the output gap. The methods used are based on data and statistical analysis. The comparison of the behaviour of individual central banks is carried out for the variables measuring transparency and inflation and output gaps. The similarity of the performance of individual central banks is assessed with the use of measures of the distance between objects, including our own measure.

Findings & Value added: Our results suggest the existence of different degrees of similarity in the sample, but some common tendencies can be found as well. For example, central banks with comparable transparency degree are found more similar. Novelty of the examination is related to

our methodology: transparency and similarity measures applied and the most recent time span covered.

Introduction

We aim at evaluating forward-looking transparency of the European central banks (CBs) and juxtaposing it with their effectiveness in achieving monetary policy goals: price stability and output stabilization. Inflation targeting (IT) frameworks do not deliver detailed solution about optimal transparency. Each central bank tailors its own communication strategy and decides on the degree of transparency. Two things that can be taken for granted are: rising over time transparency and a shift of CBs communication towards general public. Transparency issues are relevant topic of up-to-date economic discussion due to two reasons. Firstly, recent economic crisis revealed the need to affect expectations of economic agents more effectively. Secondly, monetary policy transparency evolution is a fact. Its effects need further examination.

The study covers two developed economies: Sweden and the UK, and four Central and Eastern European (CEE) countries: the Czech Republic, Hungary, Poland, and Romania. The economies covered in our study are the European Union member states that kept national currencies. The second common denominator of the sample is given by the monetary strategy of inflation targeting that the central banks share. The sample covers late nineties — mid-2018. The starting point of the sample differs across the countries as they launched forward-looking communication at different moments.

Our research methodology covers a novel index-based assessment of the degree of central bank transparency. Our index extends and updates transparency measure elaborated at the beginning of 21st century. It focuses on forward-looking context of communication. Secondly, we examine the achievement of monetary policy goals: inflation and output gap stabilization. Thirdly, we compare the performance of the central banks by assessing similarities between them.

The article is organized as follows. After the introduction, we present a literature review to compare our research against the existing literature on monetary policy transparency. The next section presents our methodology and sample. Then, we discuss both our results and our interpretations of those results. The final section concludes.

Literature review

Monetary policy transparency is commonly defined as an extent of information revealed by the central bank to the public (Geraats, 2002, p. F533). This is the simplest approach, however, it is acknowledged and used in empirical research. It offers the opportunity to operationalize easily qualitative concept of transparency. Once we aim at evaluating a forward-looking transparency of six CBs and discuss their effectiveness having in mind their transparency, we need to proxy the degree of transparency. The index of transparency which is well recognized by monetary policy researchers was presented by Eijffinger and Geraats (2006). It was applied in numerous research to assess the central banks' transparency (Crowe & Meade, 2008; Dincer & Eichengreen, 2014), or to elaborate on more sophisticated measures of transparency (Bajalan *et al.*, 2012). However, this index was compiled at the beginning of the ongoing century. From the point of view of nowadays central banks' practice, it is out-of-date. As a result, the majority of IT central banks has already reached the maximum score. Moreover, the central banks' transparency has evolved: central banks put an effort to clearly communicate their intentions. The notable increase in openness of macroeconomic prospects and the recent advance of forward policy guidance are a fact nowadays (Geraats, 2014b, p. 22). Other authors were also motivated to find an alternative (see an index by Al-Mashat *et al.*, 2018). Our study undertakes similar attempt.

Post-crisis discussion on transparency and communication analyses mostly forward guidance (FG). FG can be discussed as Delphic or Odyssean. The former announces a macroeconomic forecast and likely monetary policy path based on the policymaker's potentially superior information about future macroeconomic fundamentals and its own policy goals (Campbell *et al.*, 2012, pp. 3–4). The forecast is never a commitment. Some CBs and policy researchers identify explicit publication of the forecasts-consistent path of interest rates as forward guidance (see the Sveriges Riksbank descriptions of its policy-making (Sveriges Riksbank, 2017) or the latest study by Svensson (2015)).

The second kind of FG discussed in the literature (Odyssean) offers public commitment of the central bank. It changes directly the expectations of economic agents. The discussion on implementing binding announcements to policy-making is still on. The central bankers rather avoid it or declare a commitment to a specific path.

Finally, we need to discuss the literature on the effects of transparency. A literature review study by Blinder *et al.* (2008, p. 940) concluded that communication has the ability to help achieve central banks' macroeco-

conomic objectives. More recent studies reconfirm this conclusion on theoretical or empirical basis (Siklos, 2011; Dincer & Eichengreen, 2014; Geraats, 2014a, 2014b). A part of the literature deals with the effect of greater transparency on expectations of private agents (Ehrmann *et al.*, 2012; Coenen *et al.*, 2017; Hubert, 2017). Affecting expectations is a mid-step towards policy goals achievement. A majority of studies suggests that the dependence of central bank transparency and macro variables exists. This is why we expect to find such a relationship for our sample as well. We also need to mention that previous research of theoretical and empirical nature remains cautious while interpreting the dependence in terms of causality.

Research methodology

The sample covers: Sweden — Sveriges Riksbank (SR) (1997Q4-2018Q2), the UK — Bank of England (BoE) (1998Q1-2018Q2), the Czech Republic — Czech National Bank (CNB) (2001Q2-2018Q2), Hungary — National Bank of Hungary (NBH) (2001Q3-2018Q2), Poland — National Bank of Poland (NBP) (2004Q3-2018Q2), Romania — National Bank of Romania (NBR) (2005Q3-2018Q2). Starting points differ as the CBs launched more future-oriented communication at different moments.

We apply a research procedure that incorporates:

1. An approximation of central banks forward-looking transparency by means of a novel index.
2. Calculation of the inflation gaps and the output gaps.
3. Cross-country similarity analysis of the transparency and central banks' goals realization.

Our research hypothesis assumes to find more similarities for these central banks that are more convergent in terms of forward-looking transparency. Findings of previous research mostly suggest that greater central bank transparency matters for more effective monetary policy.

Table 1 provides the rules of points attribution for our forward-looking transparency (FRT) index. It covers only publication of the information that is related to economic outlook. Thus we do not include the publication of any framework-building monetary policy information. We assume that at the end of the second decade of 21st century publication of strategy, goal or post-decision announcements is a standard procedure. The index proxies the degree of forward-looking transparency as it incorporates the way how the forecast is communicated, assesses orientation for the future of CBs post-decisions announcements and includes the most recent tool of forward-looking communication — forward guidance. FRT index is calculated

for each central bank separately. Due to the frequency of forecast publication, we used a quarterly frequency of data. The values of the index vary from 0 to 10.

The second step of the research procedure covers examination of the inflation gap and the output gap. Central banks' quadratic loss function minimizes them while attributing weights to inflation and output stabilization. Greater weight for inflation gap minimization is consistent with the central bank announced goals' structure. However, the weights are not usually published. To derive inflation gap defined as the deviation of inflation from targeted level, we confront inflation figures published by national statistical offices with central bank's inflation target. The output gap is calculated as deviation of smoothed GDP from the trend value (in percentage terms). The trend was estimated by Hodrick-Prescott filter. GDP at constant prices, seasonally adjusted, is derived from Eurostat database, then smoothed by 5-period moving average.

Finally, we provide measures of similarity to compare the central banks that we cover in terms of their forward-looking transparency and the achievement of their goals. There are different methods of calculating the similarities and distances between the objects (see e.g. Bernardelli, 2018; Walesiak, 2016). Their application depends, among others, on the type of scale of given variables and acceptable ways of their normalization. Since the variables on the basis of which distances are calculated usually have different ranges, the majority of methods of calculating distances requires the prior normalization of their values. The appropriateness of a given method of normalization depends on whether a variable is measured on an interval or on a ratio scale (Walesiak, 2016, p. 10). The variables of a ratio scale can be subject to all the methods of normalization and calculating the distances, while the methods suitable for the variables of an interval scale are limited.

Three variables are used in our examination: FRT index value, inflation gap, and output gap. The former one is measured on a ratio scale, whereas the latter two ones are expressed on an interval scale. In such a case, to normalize the variables and calculate distances it is necessary to exclude the methods which are proper only in the case of a ratio scale.

From a variety of methods described by Walesiak (2016), we choose two methods of normalizing the variables (standardization and normalization to the [-1;1] range) and one method of calculating the distances between the objects. The adopted methods are not the first-best option to estimate the similarity as the calculated distances are not constrained and range between 0 and infinity. In such a case, while 0 means no distance

(full similarity), it is much more difficult to conclude in terms of dissimilarity (whether the highest distance means full dissimilarity or not).

That is why we propose an alternative measure, developed by us, which in our opinion is better to macroeconomic purposes. It is more robust to outliers. Moreover, after a given critical distance, full dissimilarity is assigned regardless of the distance between the objects.

Let x_1 be the FRT index, x_2 – the output gap, and x_3 – the inflation gap. Let $n1_m$ and $n2_m$ be the normalized values of the variable x_m ($m = 1, 2, 3$). We use two commonly used methods of normalizing the values: standardization ($n1$) and normalization to the $[-1;1]$ range ($n2$). In such a case:

$$n1_{mit} = \frac{x_{mit} - \bar{x}_{mt}}{\text{st.dev.}(x_{mt})}; \quad n2_{mit} = \frac{x_{mit} - \bar{x}_{mt}}{\max_i |x_{mit} - \bar{x}_{mt}|} \quad (1)$$

where i indicates the country ($i = 1, \dots, 6$), t is time ($t = 2005Q3, \dots, 2017Q4$)¹, a bar over a variable means an average value, and st.dev. is the standard deviation. On the basis of the normalized variables, the distances ($d1$ and $d2$) between countries k and l in the period t are calculated according to the Euclidean algorithm given by the following formula:

$$dx_{klt} = \sqrt{\sum_{m=1}^3 (nx_{mkt} - nx_{mkt})^2} \quad (2)$$

where $x = 1, 2$ indicates the method of normalization. The distances $d1$ and $d2$ range from 0 to infinity, although the normalized variable $n2$ is between -1 and $+1$.

Distances are transformed into similarity coefficients according to the following authors' algorithm. Namely, we evaluate similarity coefficients ranging from 0 to 100, where the value of 100 indicates full similarity (no distance), while the value of 0 refers to full dissimilarity (large distance). To transform distances into similarity coefficients, we assume that the highest distance between any two countries in a given quarter is linked with full dissimilarity and the value 0 is given. A zero-distance is linked with full similarity and the value 100 is assigned. The similarity coefficients for the other distances are calculated proportionally. In other words, similarity coefficients $cs1$ and $cs2$ for any pair of countries k and l , calculated on the basis of the distances $d1$ and $d2$, are obtained according to the following formula:

¹ To achieve comparable results, similarity coefficients are calculated for the shorter period for which all the time series are available for all the countries.

$$csx_{klt} = \left(1 - \frac{dx_{klt}}{\max_{i,j,i \neq j} \{dx_{ijt}\}} \right) \times 100 \quad (3)$$

where $i, j = 1, \dots, 6$ indicate the country.

Similarity coefficients $cs1$ and $cs2$ have a few disadvantages. First of all, they are highly influenced by outliers. If one country is highly distant from the majority of other countries, the similarity coefficient for this country is very low, whereas the remaining countries tend to be quite similar (although from the economic point of view they need not be treated as relatively similar). Secondly, in any compared group, the most distant country is interpreted as completely dissimilar (the coefficient is zero), although from the economic point of view it need not be so.

Taking into account the above mentioned shortcomings, we have developed our own formula of the similarity coefficient, denoted as $cs3$. The scale is the same: from 0 (no similarity) to 100 (full similarity). The value of 100 is assigned if a given variable is the same in the two compared countries. The value of 0 is ascribed if a given variable in one country exceeds by three standard deviations or more the value of the same variable in another country, regardless of the direction (standard deviation is calculated for a given variable for a given quarter inside the whole group of the analysed countries). If the difference between the two countries is less than 3 standard deviations, the coefficient is calculated proportionally. In the other words, for each variable m ($m = 1, \dots, 3$), we have:

$$cs3_{mkt} = \begin{cases} \left(1 - \frac{|x_{mkt} - x_{mkt}|}{3 \times \text{st.dev.}(x_{mkt})} \right) \times 100 & \text{if } |x_{mkt} - x_{mkt}| < 3 \times \text{st.dev.}(x_{mkt}) \\ 0 & \text{otherwise} \end{cases} \quad (4)$$

The aggregated similarity coefficient $cs3$ to measure central banks' performance is the arithmetic average of the coefficients calculated for the individual variables.

Once describing the methodology, we need to present three caveats. First of all, we are aware of the disadvantages of index-based measures of transparency. However, even if they are to some extent arbitrary, the literature supports their application for approximation of qualitative aspects of monetary policy. To ensure the objectivity and replicability of our examination, we applied a double cross-check of the transparency estimations. Secondly, we do not aim at interpreting our results in terms of causality. We rather want to deliver a cross-country comparison of the time series and their similarities. Thirdly, we deliver a part of the story about central bank

effectiveness. Similar to other research (Siklos, 2011) we do not present the relations of the broader set of economic variables.

Results

We observe an increase of forward-looking transparency in our sample (Figure 1). Over-time evolution towards greater openness was expected and is in line with central bank practice. Experienced inflation targeters move frontiers of transparency and other central banks mimic newly applied solution. The Czech case is an exception here — the Czech Republic can be classified as an emerging economy, but the CNB is a trendsetter in the field of revealing monetary policy intentions.

Index value evolution is related to the general tendency towards more explicit intention signalling. It is also partially linked to the recent crisis arrival and consequences for monetary policy conduct: communication aimed directly at shaping expectations gained a new role in central bank's toolkit. Steps backward in the degree of transparency are also observed in our sample. In some cases, they result from natural decision of the policy maker to reveal less (the NBH discussed policy-consistent interest rate change only temporarily) or less frequently (the NBP has published three forecasts since 2008). In some other cases, forward guidance was abandoned (the Czech Republic, Poland, the UK).

Due to the limited length of the paper, we do not discuss the evolution of the inflation gap and the output gap in our sample. The most important part of the examination refers to cross-country analysis of similarities.

Differences between various types of similarity coefficients are shown in Figures 2 and 3 on the example of two pairs of countries: Poland and Hungary (Figure 2) and Poland and Sweden (Figure 3). The fluctuations in the degree of similarity of central banks' performance on the basis of all the three coefficients are quite close meaning that all the methods of calculating distances indicate properly the periods of convergence and divergence. However, the coefficient cs_3 , developed by us, points to higher levels of similarities between the two countries. As it has been already described in the methodological section, the coefficients cs_1 and cs_2 often are equal to zero because this value is assigned if a given pair of countries is the most distant in a given quarter. So these measures are very influenced by the distances of other pairs of countries. Figures 2 and 3 show that such an approach is not the best solution. Firstly, at the end of 2006, the coefficients of similarity cs_1 and cs_2 between Poland and Hungary equalled 0, but the difference between these countries equalled only 60% of three standard

deviations (on an average basis among three variables). Similar differences between Poland and Hungary (60% of three standard deviations) were observed in 2010 and 2012, but the values of the coefficients $cs1$ and $cs2$ were much higher than 0 and amounted to around 20. Secondly, the similarity coefficients $cs1$ and $cs2$ between Poland and Sweden indicate full dissimilarity in 2007, 2010 and 2016. However, the difference between these two countries equalled 60% of three standard deviations (as an average for three variables involved) in 2007 and 80% of three standard deviations in 2010 and 2016. Hence, the similarity coefficient $cs3$, calculated according to our formula, is a better measure of the degree of economic similarity of the two countries than the other types of coefficients ($cs1$ and $cs2$).

Table 2 shows the whole period average values of the similarity coefficients calculated according to three methods. The ranking of the most similar countries is comparable for both the $cs1$ and $cs2$ coefficients as well as the $cs3$ coefficient. However, their values differ. Our formula ($cs3$) gives higher levels of similarity because it is free from some weaknesses of the remaining coefficients, discussed above.

It turns out that, on the average basis, the performance of the CEE central banks is relatively similar to that of the Western European central banks. The CNB was closest to the SR (1st rank) and the BoE (2nd rank). This outcome is confirmed by all the three similarity coefficients.

Figures 4–9 show the fluctuations of the similarity coefficients in the 2005Q3–2017Q4 period. It turns out that the degree of similarity of the countries highly fluctuates. This outcome is economically justified. Changes in inflation and output gaps are driven by many factors, not only by the central banks' actions. The target of monetary policy aiming at minimizing inflation and output gaps is supported or outweighed by country-specific fluctuations of the other macroeconomic variables. Hence, the similarity of the central banks' performance of any pair of countries reveals large changes throughout our research horizon.

Figure 4 presents a relatively high conformity between the Czech Republic and Sweden (both leaders of forward-looking transparency). The central banks' performance of these two countries was relatively similar in the last five years, that is after 2013. It is also visible that Czechia was quite akin to the UK in the last years (2nd rank).

Another interesting finding is that in the last few years there was very high similarity between Poland and Hungary. Figures 5 and 6 both indicate that the NBP and the NBH have been the least distant since 2016.

Romania, which is the country that accessed the EU later, is more distant to the remaining countries of the analysed group. The NBR has also persistent and ongoing problems with stabilizing inflation. Even IT imple-

mentation in 2005 did not align inflation to the central bank's target. The similarity coefficients for Romania very rarely exceeded the value of 80% (Figure 7).

High conformity in the last years between the central banks' performance in the two Western European countries is shown in Figures 8 and 9. Although throughout the whole analysed period the distance between Sweden and the UK was not always very small, it diminished significantly recently.

These results can be interpreted as the convergence in central banks' behaviour between the new and old EU member states. The catching-up process between the Central-Eastern and Western Europe has been confirmed in the economic literature in many areas, including narrowing income gap, synchronizing business cycles, equalizing price levels, unifying institutional environment (Próchniak & Witkowski, 2016). These results indicate another area of convergence – namely, the convergence in central banks' performance.

On the average basis, the degree of transparency of the central banks and their efficiency in terms of inflation gap and output gap minimization in the four new EU member states were quite akin to Sweden and the UK, that is the two Western European countries. These outcomes suggest that convergence between Central-Eastern and Western Europe was much broader and took place even in the behaviour and efficiency of the central banks' performance.

Moreover, our ranking of similarities resembles the ranking of central bank's forward-looking transparency: the CNB and SR are the most transparent entities in our sample and they converge more, on average, than the remaining central banks.

In summation, the results are not much stable over time. High fluctuations in the similarity coefficients are due to the fact that the involved variables depend on many factors and it is quite difficult to find a lot of regularities between the countries. However, our method indicates that some common characteristics in central banks' performance can be found. The adopted method allows us to quantify the similarities, which improves the justification of the findings.

Discussion

The commencement of the results' discussion should refer to what we have already presented at the end of methodological section. We do not analyse causality, but the similarities of the CBs' performance in three areas. We

omit other possible economic dependencies and factors affecting CBs' goals realization. However, with the application of the novel index and our own coefficient of similarity, we are able to present the results that generally confirm two findings presented before in economic literature. The first one is that transparency of monetary policy – here: forward-looking transparency of the central bank matters for economic output. The group of less transparent CBs (the BoE, NBH, NBP and NBR) reveals lower average similarities than two remaining CBs constituting more transparent subsample of our research. The differences in transparency are related mostly to the way how macroeconomic forecast is presented and discussed.

The second finding refers to the convergence of CEE economies. We capture this effect by showing high similarity between Central-Eastern and Western European central banks.

Conclusions

In this paper, we aimed at investigating CBs' transparency and their dependence with monetary policy goals' achievement. Our sample covered six economies. Firstly, we presented our index of forward-looking transparency. Secondly, we calculated inflation and output gaps. The most relevant part of the examination covered similarity analysis, which included the application of our own measure overcoming drawbacks of standard similarity coefficients. The results suggest that transparency matters for goals achievement as some clustering of economies with similar degree of transparency was captured. We are also entitled to conclude on the convergence of the economies that we analyse.

The contribution of our examination consists in the application of updated transparency index and a novel similarity measure. Except methodological innovations, we delivered the results for the most recent sample. Some limitations of this examination, that we discussed in more detailed way at the end of Methodology section and while discussing our results, exist but they do not undermine our general conclusions. However, we see the room for further research as the question on the dependence of transparency and CBs' goals achievement is not fully answered either in this study or in literature. The simplest extension of this examination could provide the results for subsamples or other IT central banks. The application of model-based assessments of causality could be the next towards more conclusive results. However, the data set that we have at our disposal and complexity of economic relationships both imply a very cautious interpretation of the results even in the cases of causality examination.

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Acknowledgements

The research project has been financed by the National Science Centre, Poland (project number 2018/31/B/HS4/00164).

Annex

Table 1. Forward-looking transparency index coverage

Question:	Points attribution:
Does the CB explain how it forecasts macroeconomic variables?	1: for revealing forecasting principles including model 0.5: for general description of forecasting tools 0: description not published
How often are the CB's forecasts revealed?	1: at least quarterly 0.5: biannual publication or 2 publications per year 0: less frequent publication
How is the forecasted central path for inflation published?	2: numerically for the entire monetary policy horizon 1: fixed-event publication only (usually at the end of subsequent years) 0: not published
Does the CB reveal the forecast of a real sphere variable?	1: published analogously to the way how the central path of inflation is revealed 0.5: when a real sphere variable is rather an inflation driver 0: no information regarding future development of the real sphere is revealed
Is the policy path revealed?	2: numerically expressed (including a fan chart) policy path for the entire monetary policy horizon 1: only the description of the nearest rates movement 0: the path is not presented
Are the CB's announcements forward-looking?	1: yes, the description of forward-looking factors prevails 0.5: there is an explicit reference to forecasts but it does not dominate post-decision announcement 0: in case of no reference to economic outlook
Is a forward guidance used as communication tool?	2: a fixed-date or conditional forward guidance 1: qualitative FG or Delphic FG 0: no FG announcements

Table 2. Average coefficients of similarity for each pair of countries, 2005Q3–2017Q4

	CZ	HU	PL	RO	SE	UK
Coefficient of similarity <i>cs1</i>						
CZ	100.0	37.6	35.6	19.6	64.1	46.0
HU	37.6	100.0	48.4	35.2	35.5	55.4
PL	35.6	48.4	100.0	38.0	33.6	49.2
RO	19.6	35.2	38.0	100.0	8.9	39.4
SE	64.1	35.5	33.6	8.9	100.0	44.3
UK	46.0	55.4	49.2	39.4	44.3	100.0
Coefficient of similarity <i>cs2</i>						
CZ	100.0	37.3	34.0	20.0	64.9	45.8
HU	37.3	100.0	46.9	35.7	34.6	55.1
PL	34.0	46.9	100.0	39.9	31.4	48.6
RO	20.0	35.7	39.9	100.0	8.8	39.8
SE	64.9	34.6	31.4	8.8	100.0	43.6
UK	45.8	55.1	48.6	39.8	43.6	100.0
Coefficient of similarity <i>cs3</i>						
CZ	100.0	53.9	53.0	40.9	74.4	62.1
HU	53.9	100.0	66.6	53.4	53.0	74.0
PL	53.0	66.6	100.0	58.8	53.1	66.0
RO	40.9	53.4	58.8	100.0	31.2	55.3
SE	74.4	53.0	53.1	31.2	100.0	60.3
UK	62.1	74.0	66.0	55.3	60.3	100.0

Note: For each country given in a row, the grey cell indicates the highest coefficient of similarity. If the difference between the highest coefficient and the 2nd one is less than 3 percentage points, two cells are marked in grey.

Figure 1. Forward-looking transparency indices in the six EU countries

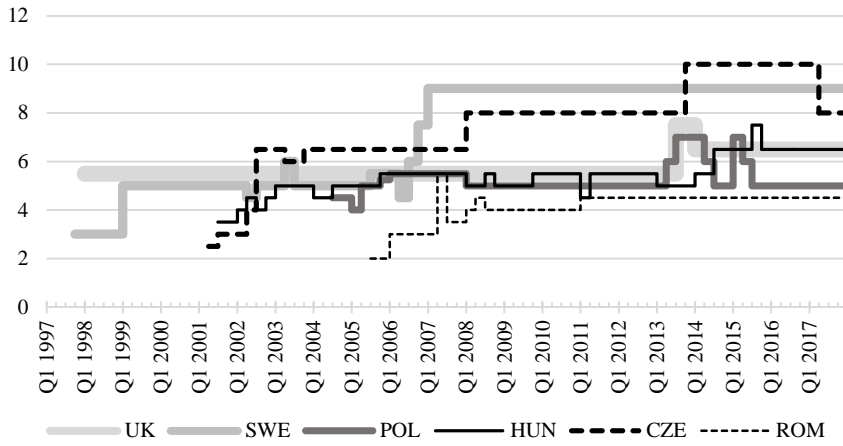


Figure 2. Coefficients of similarity between Poland and Hungary calculated according to three different methods

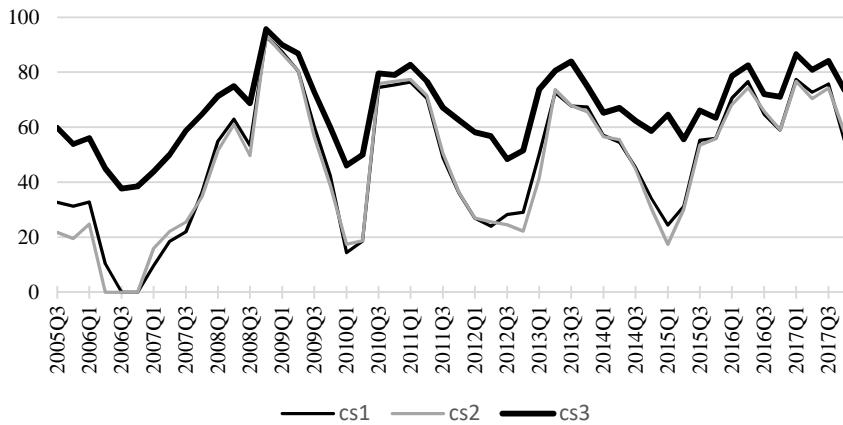


Figure 3. Coefficients of similarity between Poland and Sweden calculated according to three different methods

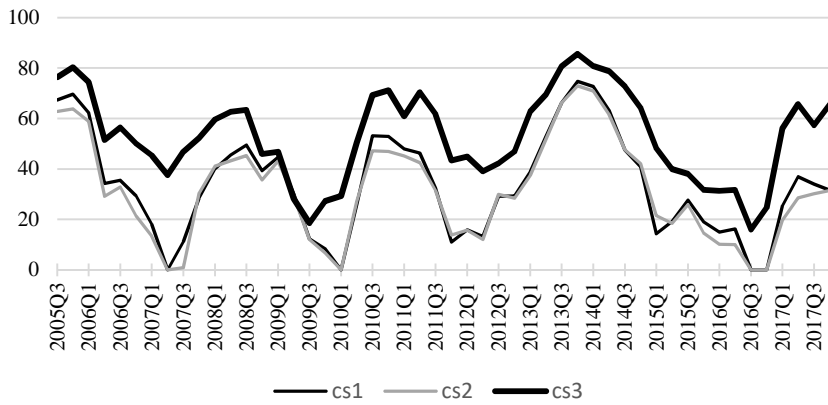


Figure 4. Coefficient of similarity cs3 between Czechia and the reference countries

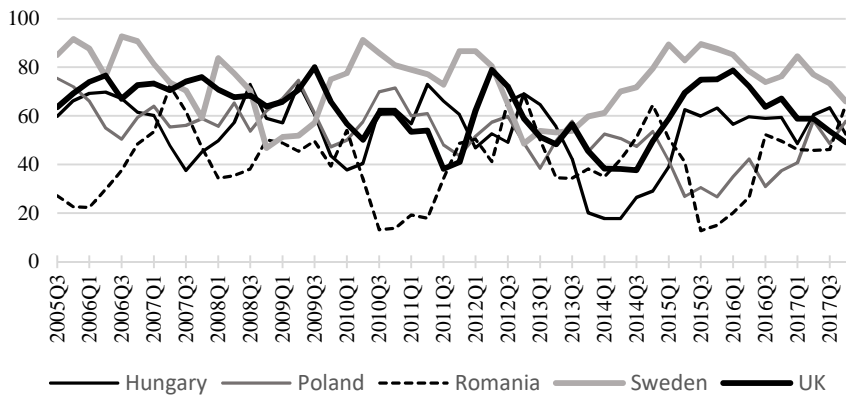


Figure 5. Coefficient of similarity cs3 between Hungary and the reference countries

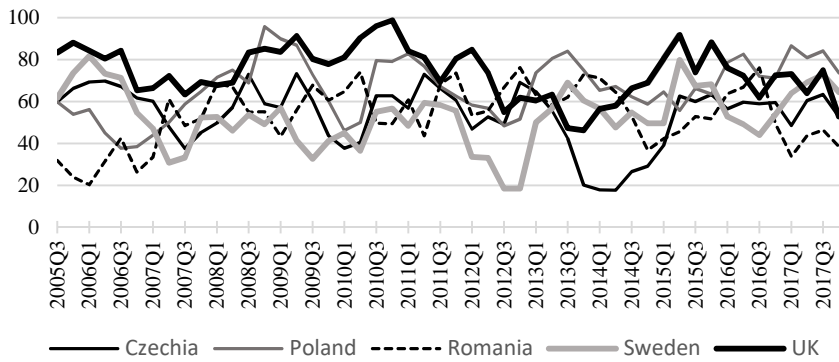


Figure 6. Coefficient of similarity cs3 between Poland and the reference countries

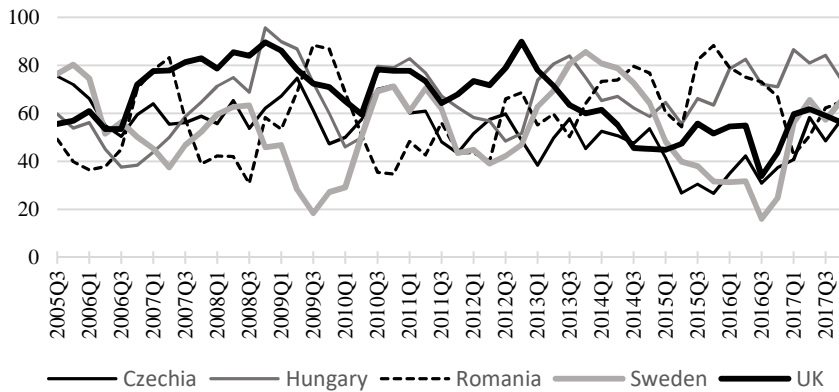


Figure 7. Coefficient of similarity cs3 between Romania and the reference countries

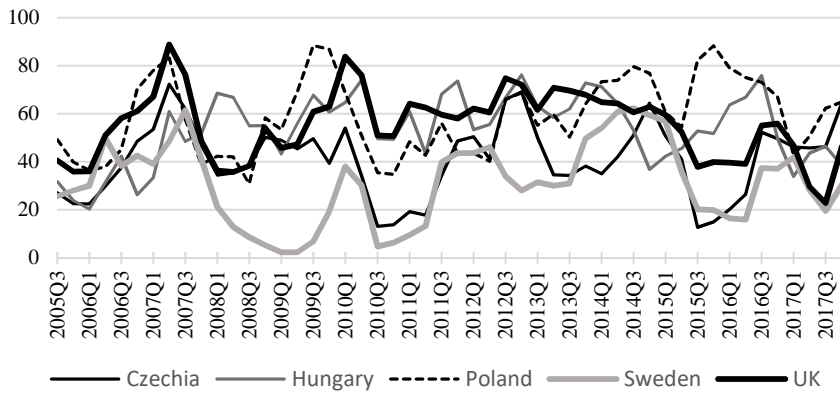


Figure 8. Coefficient of similarity cs3 between Sweden and the reference countries

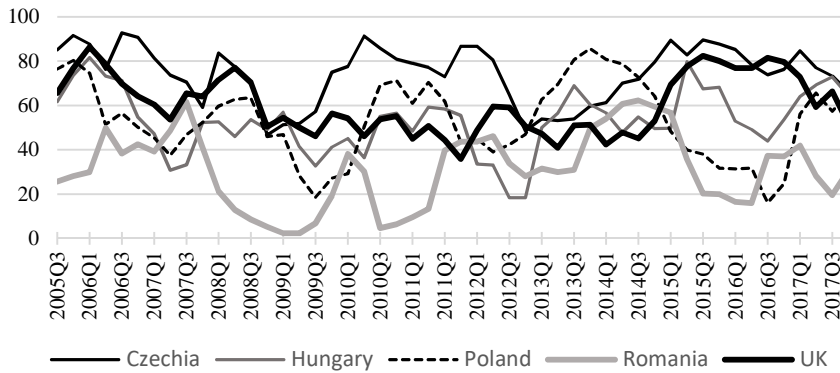


Figure 9. Coefficient of similarity cs3 between the UK and the reference countries

