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Business cycles in EU new member states: How and why are they different?

Marcin Kolasa

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Marcin Kolasa - National Bank of Poland and Warsaw School of Economics; Email: marcin.kolasa@nbp.pl.

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Contents

Abstract

This paper uses the business cycle accounting framework to investigate the differences between economic fluctuations in Central and Eastern European (CEE) countries and the euro area. We decompose output movements into the contributions of four economic wedges, affecting the production technology, the agents' intra- and intertemporal choices, and the aggregate resource constraint. We next analyze the observed cross-country differences in business cycles with respect to these four identified wedges. Our results indicate that business cycles in the CEE countries do differ from those observed in the euro area, even though substantial convergence has been achieved after the eastern EU enlargement. The major differences concern the importance of the intra- and intertemporal wedges, which account for a larger proportion of output fluctuations in the CEE region and also exhibit relatively little comovement with their euro area counterparts.

JEL: E32, F44

Keywords: business cycle accounting; business cycle synchronization

1 Introduction

The eastern enlargement of the European Union (EU) is widely considered as one of the most important political and economic events in modern European history. For the first time, the project of European integration was extended to include former communist countries in Central and Eastern Europe (CEE). The process started with the reunification of Germany in 1990 and was followed by the accession of the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia and Slovenia in 2004, with Bulgaria and Romania joining in 2007. Despite some initial concerns, the eastern enlargement has been widely described as a success, speeding up modernization in the CEE region and its integration with old EU member states.

According to the treaties of accession, all CEE countries are also expected to eventually join the euro area (EA). Three of them, namely Slovenia, Slovakia and Estonia, have already adopted the common currency. However, it has been well recognized in the literature that this last step entails both costs and benefits. According to the optimal currency area theory developed by Mundell (1961) and extended by Alesina and Barro (2002), there are a number of factors that affect a country's suitability for entry into a currency union, one of them being business cycle synchronization. The intuition behind this criterion is simple: if the domestic cycle is highly correlated with that in the rest of the union, then the common interest rate set at an area-wide level will also usually respond in a way contributing to macroeconomic stability at home, hence making the loss of monetary independence less costly.[1] High output comovement within a monetary union is also important from a political economy perspective. As pointed out by Aksoy et al. (2002), divergent economic conditions within the euro area may lead to frequent conflicts within the European Central Bank about the appropriate policies to be pursued, making the decision making process difficult.

Business cycle synchronization within the euro area has been a topic of a number of studies, see de Haan et al. (2008) for an extensive survey of the main findings. Fidrmuc and Korhonen (2006) offer a related meta-analysis on CEE countries. The general conclusion from this literature is that correlation of business cycles in the new EU member states with the euro area is high. As regards more recent contributions, Darvas and Szapáry (2008) point out that while high synchronization has been achieved for output and exports, there is relatively low comovement for consumption and services. Bencik (2011) documents increased synchronization of CEE and EA

[1] It has been well recognized in the literature that the optimal currency area criteria are endogenous (Frankel and Rose, 1998). In particular, increased trade integration that follows adoption of a common currency may lead to more tightly correlated business cycles between the union members, tilting the balance in favor of monetary integration.

business cycles after the EU entry, and even tighter comovement during the financial crisis.[2]

The papers surveyed above use one of the following two empirical strategies. The first is based on extracting cyclical information from standard macroeconomic time series using popular filtering techniques (e.g. Hodrick-Prescott or Band-Pass filters) and reporting the correlations or coherence statistics. The other common approach is to use time series models (e.g. structural vector autoregressions or the Kalman filter) to identify demand and supply shocks. However, as neither of these empirical strategies is based on a fully-specified macroeconomic model, they cannot be used to shed light on a number of questions that might be considered important from the policy making perspective. These include i.a. the role of particular types of economic frictions in driving the observed business cycles and their cross-country synchronization.

This paper takes a step to fill this gap by looking at the business cycles in the new EU member states through the lens of the business cycle accounting (BCA) framework proposed by Chari et al. (2007b). This setup is based on a simple dynamic stochastic general equilibrium business cycle model with time-varying wedges that affect the production technology, the agents' intra- and intertemporal choices, and the aggregate resource constraint, hence resembling productivity, labor and investment taxes, and government purchases, respectively. By taking the model to the data one can measure the wedges, which can be next fed back into the model to assess their role in driving economic fluctuations. Since, by construction, all four wedges account for all of movements observed in the data, the exercise described above can be treated as an accounting procedure.

Chari et al. (2007b) apply the BCA framework to US data in order to identify promising classes of quantitative business cycle models. In this paper, our focus is on five CEE economies (the Czech Republic, Hungary, Poland, Slovakia and Slovenia) and the euro area. Applying the BCA setup to these countries allows us to decompose the observed cross-country differences in business cycles with respect to the four identified wedges. In particular, we are able to show which wedges are crucial for the observed output comovements between the CEE countries and the EA, and hence to shed some light on the sources of business cycle synchronization.

While the wedges identified with the BCA framework have economic interpretation, they still can be seen as reduced-form since they summarize the effects of various primitive shocks and frictions that may be included in more detailed models. For example, if the data is generated from a stochastic model with sticky wages, fluc-

[2]Papers focusing on the Polish economy include Skrzypczyński (2008) and Krajewski and Piłat (2012).

tuations in the labor wedge obtained by applying the BCA will be driven not only by labor market shocks, but also reflect sluggish adjustment of wages to other shocks. To disentangle these effects, one would need to build a model with shocks and frictions explicitly defined. In the context of business cycle synchronization analysis, this path is followed by Jondeau and Sahuc (2008), who estimate a three-country dynamic stochastic general equilibrium (DSGE) model for France, Germany and Italy and test the cross-country differences in structural parameters and correlation of shocks. Kolasa (2009) uses a richer two-country DSGE model to investigate the heterogeneity between Poland and the euro area.

However, the results of such a highly structural exercise are model-specific and can be distorted by model misspecification.[3] The BCA framework, while limited by its inability to identify primitive driving forces, has the advantage of being more flexible as it encompasses a large class of models, with various types of shocks and frictions. Overall, the analysis proposed in this paper provides more structural evidence on forces behind cross-country output comovement than standard filtering methods widely used in the literature, at the same time being less restrictive than studies based on fully-fledged DSGE models.

Our main findings indicate that business cycles in the CEE countries do differ from those observed in the EA. This is despite substantial convergence has been achieved since the eastern EU enlargement. In both regions, the bulk of output fluctuations and its observed cross-country synchronization can be attributed to the efficiency wedge. The major differences concern the importance of the intra- and intertemporal wedges, which account for a relatively larger share of movements in the CEE region and also exhibit relatively little comovement with their EA counterparts.

The rest of the paper is structured as follows. Section two presents a model of our prototype economy. Section three describes the data and estimation issues. Section four discusses the main results. Section five concludes.

[3]Del Negro et al. (2007) provides evidence that standard DSGE models are seriously misspecified.

2

2 Model

We design the prototype economy as in Chari et al. (2007b). It is populated by a continuum of representative households, who maximize expected utility over consumption and labor. Perfectly competitive firms maximize profits from selling goods, using labor and capital as inputs. The government purchases final goods, financing the expenditures with taxes levied on households. There are four wedges in the economy, modeled as stochastic processes: the efficiency wedge A_t, the labor wedge $\tau_{l,t}$, the investment wedge $\tau_{i,t}$, and the government wedge g_t.

The problem of a typical household is to maximize discounted lifetime utility

$$E_0 \sum_{t=0}^{\infty} \beta^t \left[\frac{c_t^{1-\sigma}}{1-\sigma} - \frac{l_t^{1+\varphi}}{1+\varphi} \right] \tag{1}$$

subject to the budget constraint

$$c_t + (1+\tau_{i,t}) i_t = r_t k_t + (1-\tau_{l,t}) w_t l_t + T_t \tag{2}$$

and the capital accumulation law of motion

$$k_{t+1} = (1-\delta) k_t + i_t \tag{3}$$

where c_t denotes consumption, l_t is labor, i_t is investment, k_t is capital stock, T_t is net lump sum transfers, w_t is the wage rate, r_t is the rental rate on capital, β is the discount factor, σ is the inverse of the intertemporal elasticity of substitution, φ denotes the inverse of the Frisch elasticity of labor supply, and δ is the depreciation rate.

Firms maximize profits

$$y_t - w_t l_t - r_t k_t \tag{4}$$

subject to the production function

$$y_t = A_t k_t^{\alpha} l_t^{1-\alpha} \tag{5}$$

where y_t denotes output and α is its elasticity wrt. capital.

The solutions to the households' and firms' problems imply the following first-order conditions

$$c_t^{\sigma} l_t^{\varphi} = (1-\alpha)(1-\tau_{l,t}) A_t k_t^{\alpha} l_t^{-\alpha} \tag{6}$$

$$c_t^{-\sigma}(1+\tau_{i,t}) = \beta E_t \left\{ c_{t+1}^{-\sigma} \left[(1-\delta)(1+\tau_{i,t+1}) + \alpha A_{t+1} k_{t+1}^{\alpha-1} l_{t+1}^{1-\alpha} \right] \right\} \tag{7}$$

The first one given by equation (6) combines the leisure-consumption choice made by the households with firms' labor demand. It states that in equilibrium the marginal rate of substitution must be equal to the marginal product of labor, adjusted by the labor wedge. The second first-order condition (7) merges households' Euler equation describing their consumption-investment decisions with firms' capital demand, and implies equalization of the (investment wedge adjusted) rate of return on capital investment to households' rate of time preference.[4]

The equilibrium of the economy can be summarized by equations (3), (5), (6), (7) and the aggregate resource constraint

$$y_t = c_t + i_t + g_t \tag{8}$$

The wedges are assumed to follow a first-order vector autoregressive (VAR) process

$$s_t = V s_{t-1} + \varepsilon_t \tag{9}$$

where $s_t \equiv \left[\begin{array}{cccc} \ln A_t - \ln A & \tau_{l,t} - \tau_l & \tau_{i,t} - \tau_i & \ln g_t - \ln g \end{array} \right]'$, V is a 4×4 matrix of VAR coefficients, ε_t is a 4×1 vector of zero-mean shocks, assumed to be i.i.d. over time and distributed normally with covariance matrix Q, while variables without time subscripts denote the steady state levels.

As discussed by Chari et al. (2007b), each of the wedges can be interpreted as representing the sum of distortions to the relevant equilibrium condition in the prototype economy. The efficiency wedge A_t looks like total factor productivity and hence its fluctuations capture disturbances to technology, but also various frictions that affect aggregate factor utilization. The labor wedge $\tau_{l,t}$ resembles a tax rate on labor income and represents any frictions distorting the intratemporal equilibrium condition (6), which relates the marginal product of labor to the marginal rate of substitution between leisure and consumption. A typical example of such a distortion is wage and price stickiness (Woodford, 2003) or search and matching frictions on the labor market (Hall, 1997). The investment wedge, modeled as a tax on savings, can be thought of as resulting from distortions to the intertemporal condition (6). These can reflect e.g. constraints in financing investment (Brzoza-Brzezina et al., 2012) or price stickiness (Sustek, 2011). Finally, the government wedge resembles public spending and captures any shocks affecting the resource constraint (8). If mapped into an open economy, this wedge reflects, apart from government purchases of goods and services, also international trade flows.

[4]The investment wedge could be alternatively represented as a tax on capital income rather than on investment purchases. As shown by Chari et al. (2007a), the quantitative results for the US economy under these two representations are essentially identical.

3 Estimation

We estimate the log-linearized version of the model separately for the euro area and each of the five CEE countries (the Czech Republic, Hungary, Poland, Slovakia and Slovenia),[5] using four macroeconomic variables: output (measured as real gross domestic product), labor (total employment), investment (real gross capital formation, which includes change in inventories), and the sum of government consumption (real final consumption expenditure of general government) and trade balance (real net exports of goods and services). All data are taken from Eurostat. The sample starts from 1995q1 and ends 2011q4, except for the Czech time series that are available as from 1996q1. Since the theoretical model is stationary, we remove linear trends from the logs of all data used in estimation.

As in Chari et al. (2007b), we calibrate the structural parameters of the model and estimate only the VAR process for the wedges. Our calibration is summarized in Tables 1 and 2. For all countries, we choose the same parametrization of households' preferences, production function and capital accumulation, using standard values from the literature. The steady state levels of investment and government wedges are calibrated such that our model matches the country-specific steady state shares of investment, and of the sum of government spending and net exports in GDP, respectively.[6] Finally, the VAR system (9) is estimated using a standard maximum likelihood procedure for dynamic stochastic general equilibrium models with rational expectations.[7]

The following discussion of our main findings will be based on two parts of estimation output. One is a country-by-country set of time series of realized wedges. These are easily obtained as the estimation relies on the Kalman filter which produces smoothed series of all unobserved variables. The second portion of results is decomposition of fluctuations in selected macrovariables into contributions attributed to individual wedges. These components are obtained by simulating the prototype economy with one wedge at a time. More specifically, and following Chari et al. (2007b), in these exercises we keep the estimated VAR process unchanged, thus allowing the wedges that are shut down (i.e. kept constant in the model's

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[5]Other EU new member states, i.e. Bulgaria, Estonia, Latvia, Lithuania and Romania, are excluded mainly due to data limitations.

[6]These steady state shares are approximated by the 1995-2011 (1996-2011 for the Czech Republic) averages, calculated using Eurostat data. Note that the steady state levels of efficiency and labor wedges do not show up in the log-linearized equations and hence need not be calibrated.

[7]The estimation is done with the Dynare package, version 4.2.5 (Adjemian et al., 2011). The maximum likelihood procedure used by Dynare ensures that the estimated VAR system is stationary. It also allows to parametrize the variance-covariance matrix Q in terms of the standard errors of shocks and their cross-correlation, which guarantees that it is positive semi-definite. Detailed parameter estimates for each country are reported in the Appendix available upon request.

equilibrium conditions) to affect the forecasts of the wedge that is included. This ensures that the expectations of the wedge that is allowed to fluctuate coincide with those in the economy that includes all wedges.

4

4 Results

4.1 Sources of business cycle fluctuations

We start the discussion of our results by investigating to what extent the business cycles in the CEE region differ from that observed in the euro area. Figures 1 to 6 plot for each country the cyclical component of output together with its components that can be attributed to the four individual wedges.[8]

Starting with the euro area, one can note that the efficiency wedge alone accounts for the bulk of output fluctuations: the model's prediction when only this wedge is included follows very closely the actual output data. The labor wedge is also important in explaining the output movements, though to a much smaller extent than the efficiency wedge, particularly during the recent financial crisis. In contrast, with the investment wedge alone, the output path generated from the model is smoother and it actually comoves negatively with the data. In particular, this wedge is essentially not able to account for any decline in economic activity observed in 2008 and 2009. Finally, the contribution of the government wedge to output fluctuations is negligible over the whole sample. These findings for the euro area are consistent with those reported by Chari et al. (2007b) for the US economy as they also find that the efficiency and labor wedges together account for essentially all of the business cycle fluctuations, with a tertiary role of the investment wedge and none of the government wedge.

Turning now to the CEE region, the following observations can be made. First, and similarly to the EA case, the efficiency wedge can be identified as a dominant source of output fluctuations. However, the fit of the model's predictions with this wedge alone to the actual data looks somewhat worse, especially for Poland and (to lesser extent) Hungary. Second, the output components attributable to the labor and investment wedges are much more erratic in the CEE region and their volatility is relatively higher than in the euro area. In this respect, the Czech Republic seems to be an outlier in the region as the business cycle characteristics in this country resemble more those observed in the EA. Third, the negative comovement of actual output and its path obtained with the investment wedge alone is not as pronounced in the CEE countries as it was the case in the EA. Interestingly, the investment wedge does seem to have played some role in accounting for the recovery after the Great Recession, especially in the Czech Republic and Slovakia. Finally, as in the euro area, the government wedge plays a negligible role in output fluctuations of all CEE countries.

[8] All results presented below are based on series detrended using the Hodrick-Prescott filter. The findings for two other macroeconomic variables that we use as observables in our estimation, i.e. labor and investment, are summarized in the Appendix available upon request.

These observations are more formally summarized in Tables 3 and 4, presenting respectively the volatility and cyclical position of output components resulting from fluctuations in the individual wedges. Overall, compared to the euro area, business cycles in the CEE countries exhibit more volatility, and are to a larger extent driven by movements in the labor and investment wedges, suggesting more rigidity in labor and capital markets. Among all countries in the region, the Czech Republic stands out as most similar to the EA in terms of sources of output fluctuations.

4.2 Business cycle synchronization

Having analyzed the sources of economic fluctuations in the CEE region, we now use the BCA framework to address their synchronization with the euro area business cycle. As can be seen in Figure 7, there is a substantial comovement between the cyclical component of EA GDP and its counterparts in the CEE countries. Moreover, the degree of synchronization is clearly growing over time, an issue we address in the next section.

The BCA setup allows us to decompose this comovement into the contributions of individual wedges. The correlations of the wedges and the corresponding output components with their EA counterparts are summarized in Table 5.

For all CEE economies, the bulk of comovement with EA output can be attributed to the efficiency wedge. Except for Slovakia, this comovement is also positively affected by synchronized fluctuations in the labor wedge. The investment wedge does not significantly contribute to output comovement between the CEE region and the EA, the only exception being Slovenia. As the impact of the government wedge movements on output is negligible in all economies, so is its ability to account for the observed cross-country comovement in GDP.

Summing up, our results indicate that the labor and investment wedges in the CEE countries not only account for a larger portion of economic fluctuations than in the euro area, but also they are the main sources of cyclical divergences between the two regions. In contrast, a high degree of synchronization can be observed for the efficiency wedge. Bearing in mind the caveat that the BCA framework does not provide a mapping from the wedges to primitive shocks and frictions, the following interpretation can be ventured. On the one hand, there seems to be an important common factor behind disturbances (e.g. technology or aggregate demand shocks) hitting the EA and the CEE region, and manifesting themselves in fluctuations of productivity and factor utilization. On the other hand, these disturbances transmit very differently through local labor and capital markets (possibly due to nominal and real rigidities), or shocks and frictions originating in these markets have sizable country-specific components.

4.3 Convergence of business cycles

One of the common features of the analyzed CEE countries is that they share similar historical experience as all of them are ex-communist economies. While it may be argued that by 1995, which is the beginning of our sample, most of the initial transition shock has already died out, the integration of this block with Western Europe was surely a long-lasting process. In particular, it was only in 2004 when the five CEE economies joined the EU. Therefore, there are reasons to expect that the CEE business cycle properties and its synchronization with the euro area were not constant over the period of our analysis.

To address this issue, we split our sample into two parts: 1996-2003 and 2004-2011, which roughly correspond to the pre and post EU accession periods. The business cycle characteristics over these two subsamples are reported in Table 7, while Table 8 summarizes the subsample differences in business cycle synchronization.

It is clear that while the relative importance of individual wedges in accounting for output fluctuations in the euro area was rather stable, there are dramatic differences across the two subsamples for most of CEE countries. In particular, the relative contributions of the wedges to output fluctuations and their correlation with actual output in the CEE region resemble more those in the EA if we look at the data starting from 2004. This is particularly visible for Hungary and Slovenia. The degree of output synchronization with the euro area has also dramatically increased in all CEE countries after they joined the EU. As Table 8 reveals, this increase can be traced down to tighter comovement of all wedges except for the government wedge, which does not play any important role in output fluctuations anyway.

It has to be noted, however, that important differences between the EA and the CEE region still prevail despite the observed convergence of the business cycles. In particular, even in the second subsample the output fluctuations in the CEE countries are to larger extent driven by movements in the labor and investment wedges. Moreover, the comovement of these wedges with their EA counterparts is still low in some countries, most notably in Hungary and in Slovakia.

5 Conclusions

In this paper we have tried to shed more light on the differences between the business cycles in the CEE countries and the euro area. To this end, we have applied the business cycle accounting framework, which allowed us to decompose the observed cyclical differences into the contributions of four economic wedges, affecting the production technology, the agents' intra- and intertemporal choices, and the aggregate resource constraint.

Our results indicate that the business cycles in the CEE countries do differ from those observed in the EA, even though substantial convergence has been achieved since the eastern EU enlargement. The major differences concern the importance of the intra- and intertemporal wedges, dubbed labor and investment wedges, which account for a larger proportion of output movements in the CEE region and also exhibit relatively little comovement with their EA counterparts.

Our findings have a number of policy implications. Galí et al. (2007) show that the labor wedge can be used to measure the efficiency costs of business cycles. Hence, a high contribution of this wedge to output fluctuations observed in the CEE countries suggests that business cycles can be more costly in this region. Our results also indicate that a further increase in business cycle synchronization between the CEE countries and the EA would require more comovement of labor and investment wedges across the two regions, which points at the need for tighter integration of labor and capital markets within the EU.

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Tables and figures

Table 1: Common parameters

Parameter	Value	Description
β	0.99	Discount factor
α	0.35	Capital share
δ	0.025	Capital depreciation rate
σ	2	Inverse of intertemporal elasticity of substitution
φ	2	Inverse of Frisch elasticity of labor supply

Table 2: Country-specific steady state ratios

Ratio	Country					
	EA	CZ	HU	PL	SI	SK
Gov. spending and net exports share in GDP	21.3	20.8	21.4	14.9	17.3	15.3
Investment share in GDP	20.0	26.4	22.2	20.7	25.3	25.0

Table 3: Standard deviations of output components of wedges

Output components	Country					
	EA	CZ	HU	PL	SI	SK
Raw						
All wedges (data)	1.29	1.88	1.55	1.37	2.27	2.51
Efficiency wedge alone	1.23	2.12	1.40	1.26	2.57	2.39
Labor wedge alone	0.58	0.92	1.08	1.44	1.47	1.92
Investment wedge alone	0.32	0.49	0.91	0.80	1.03	1.46
Government wedge alone	0.05	0.07	0.23	0.26	0.12	0.27
Normalized						
All wedges (data)	1.00	1.00	1.00	1.00	1.00	1.00
Efficiency wedge alone	0.96	1.13	0.91	0.92	1.13	0.95
Labor wedge alone	0.45	0.49	0.69	1.05	0.64	0.77
Investment wedge alone	0.25	0.26	0.59	0.58	0.45	0.58
Government wedge alone	0.04	0.04	0.15	0.19	0.05	0.11

Note: The statistics are for series detrended with the Hodrick-Prescott filter.

Table 4: Correlations of output components of wedges with output

Output components	Country					
	EA	CZ	HU	PL	SI	SK
Efficiency wedge alone	0.96	0.96	0.88	0.78	0.83	0.95
Labor wedge alone	0.61	0.04	0.13	0.38	0.15	0.17
Investment wedge alone	-0.87	-0.43	0.21	0.05	-0.40	-0.15
Government wedge alone	0.45	0.21	-0.11	-0.77	-0.18	0.48

Note: The statistics are for series detrended with the Hodrick-Prescott filter. The critical value of the correlation coefficients is 0.25 at the 5% level and 0.29 at the 1% level.

Table 5: Correlations of wedges and output components with the euro area

Wedge / output component	Country				
	CZ	HU	PL	SI	SK
Wedges					
Efficiency wedge	0.78	0.69	0.51	0.85	0.61
Labor wedge	0.14	0.32	0.38	0.64	0.02
Investment wedge	0.10	-0.30	0.08	0.46	-0.13
Government wedge	-0.13	0.19	0.04	0.26	-0.19
Output components					
All wedges (data)	0.82	0.77	0.60	0.84	0.56
Efficiency wedge alone	0.80	0.68	0.51	0.85	0.63
Labor wedge alone	0.28	0.25	0.37	0.71	0.11
Investment wedge alone	0.26	-0.27	0.11	0.53	-0.03
Government wedge alone	-0.09	0.18	0.04	0.13	-0.27

Note: The statistics are for series detrended with the Hodrick-Prescott filter. The critical value of the correlation coefficients is 0.25 at the 5% level and 0.29 at the 1% level.

Table 6: Normalized standard dev. of output components of wedges - subsamples

Output components	Country EA	CZ	HU	PL	SI	SK
1996-2003						
Efficiency wedge alone	0.82	1.27	1.87	1.00	1.40	0.90
Labor wedge alone	0.63	0.53	2.45	1.03	1.17	0.97
Investment wedge alone	0.30	0.31	2.13	0.63	0.92	0.73
Government wedge alone	0.08	0.05	0.48	0.18	0.14	0.14
2004-2011						
Efficiency wedge alone	0.99	1.08	0.83	0.76	1.11	0.97
Labor wedge alone	0.40	0.48	0.48	1.08	0.58	0.68
Investment wedge alone	0.24	0.24	0.39	0.48	0.39	0.52
Government wedge alone	0.02	0.03	0.11	0.20	0.04	0.09

Note: The statistics are for series detrended with the Hodrick-Prescott filter.

Table 7: Correlations of output components of wedges with output - subsamples

Output components	Country EA	CZ	HU	PL	SI	SK
1996-2003						
Efficiency wedge alone	0.92	0.96	0.46	0.83	-0.01	0.94
Labor wedge alone	0.73	-0.28	-0.29	0.15	0.12	0.36
Investment wedge alone	-0.79	-0.27	0.44	0.23	0.08	-0.29
Government wedge alone	0.33	0.26	-0.16	-0.73	0.74	0.17
2004-2011						
Efficiency wedge alone	0.97	0.96	0.96	0.70	0.98	0.95
Labor wedge alone	0.58	0.14	0.28	0.74	0.16	0.09
Investment wedge alone	-0.90	-0.48	0.24	-0.34	-0.57	-0.08
Government wedge alone	0.69	0.15	-0.18	-0.84	-0.71	0.67

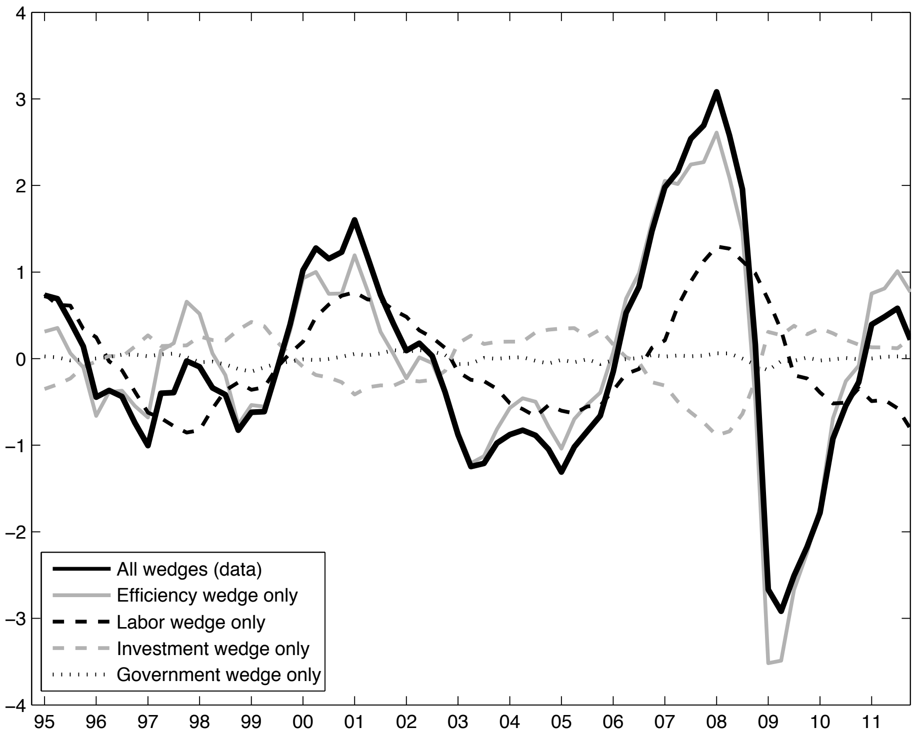
Note: The statistics are for series detrended with the Hodrick-Prescott filter. The critical value of the correlation coefficients is 0.35 at the 5% level and 0.40 at the 1% level.

Table 8: Correlations of output components with the euro area - subsamples

Wedge / output component	Country CZ	HU	PL	SI	SK
1996-2003					
All wedges (data)	0.41	0.44	0.45	0.30	-0.48
Efficiency wedge alone	0.38	0.19	0.38	0.21	-0.14
Labor wedge alone	-0.73	0.26	-0.13	0.50	-0.44
Investment wedge alone	-0.43	-0.20	-0.03	-0.11	-0.24
Government wedge alone	-0.12	0.53	0.44	0.58	-0.72
2004-2011					
All wedges (data)	0.92	0.84	0.81	0.93	0.85
Efficiency wedge alone	0.93	0.79	0.82	0.95	0.80
Labor wedge alone	0.72	0.25	0.85	0.81	0.45
Investment wedge alone	0.55	-0.35	0.28	0.81	0.07
Government wedge alone	-0.02	-0.31	-0.72	-0.66	0.35

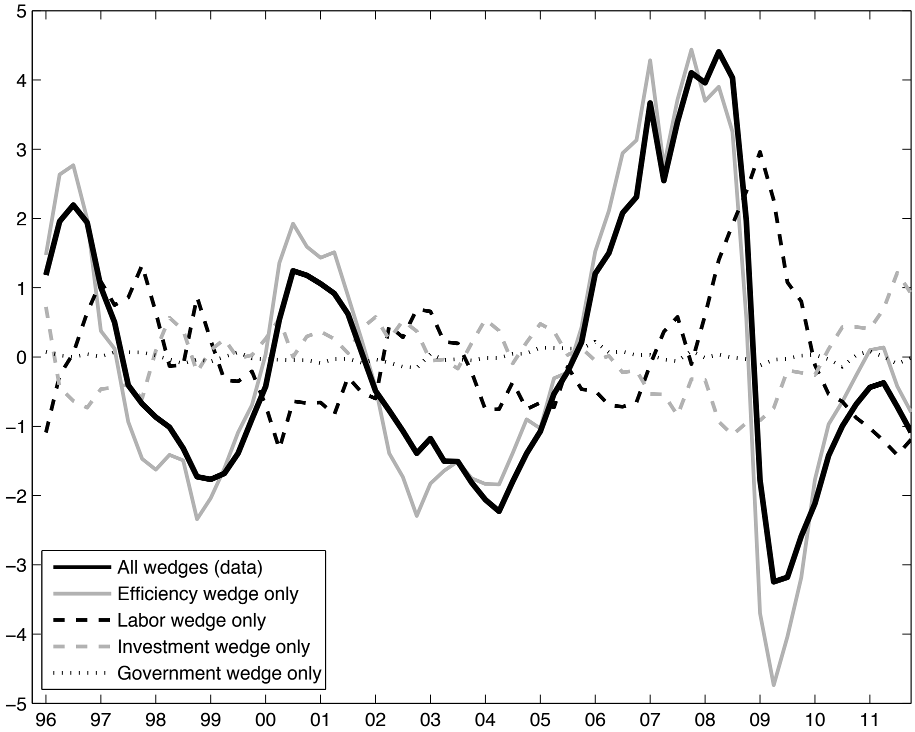
Note: The statistics are for series detrended with the Hodrick-Prescott filter. The critical value of the correlation coefficients is 0.35 at the 5% level and 0.40 at the 1% level.

Figure 1: Output components - euro area



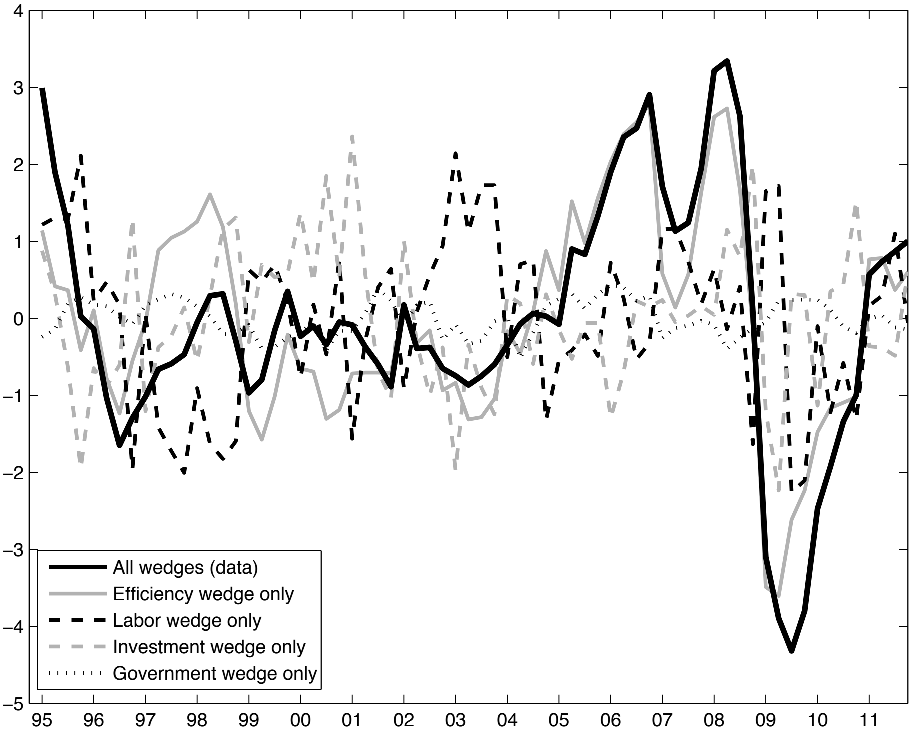
Note: The series are detrended with the Hodrick-Prescott filter.

Figure 2: Output components - Czech Republic



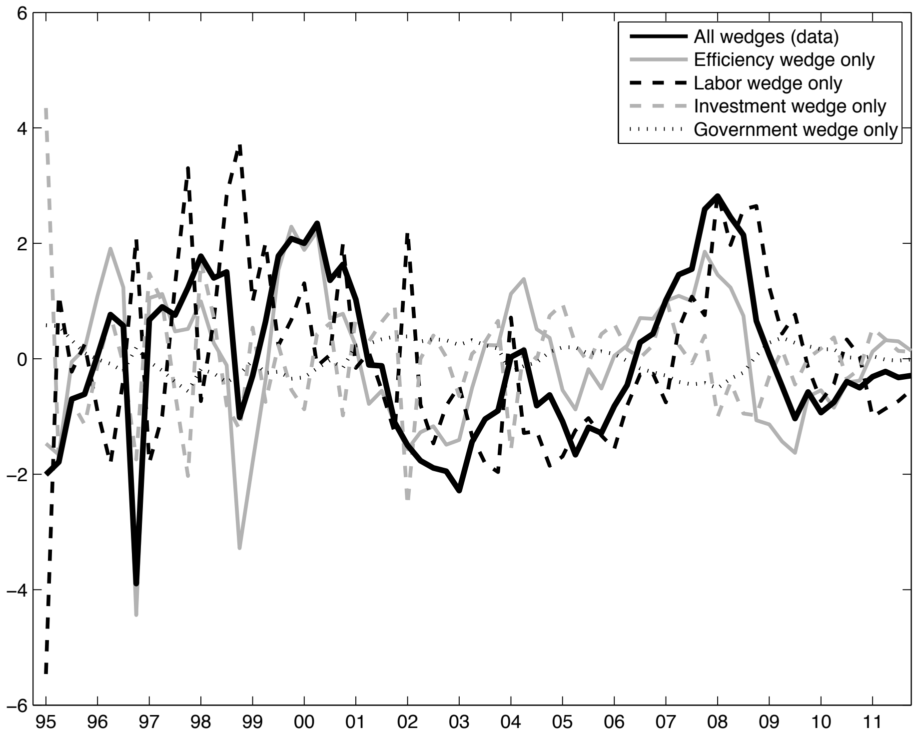
Note: The series are detrended with the Hodrick-Prescott filter.

Figure 3: Output components - Hungary



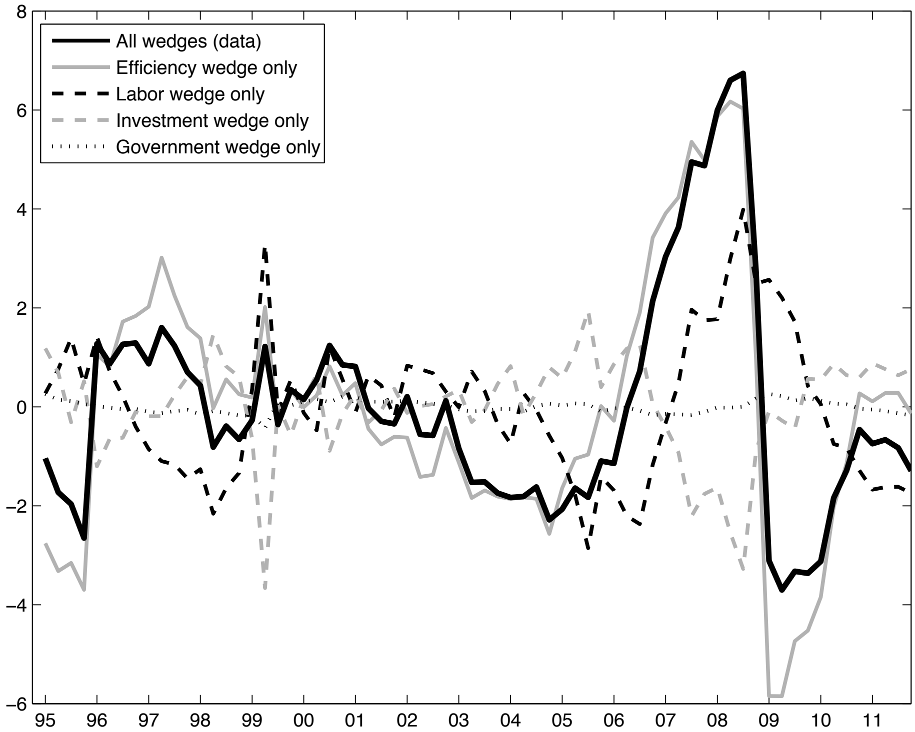
Note: The series are detrended with the Hodrick-Prescott filter.

Figure 4: Output components - Poland



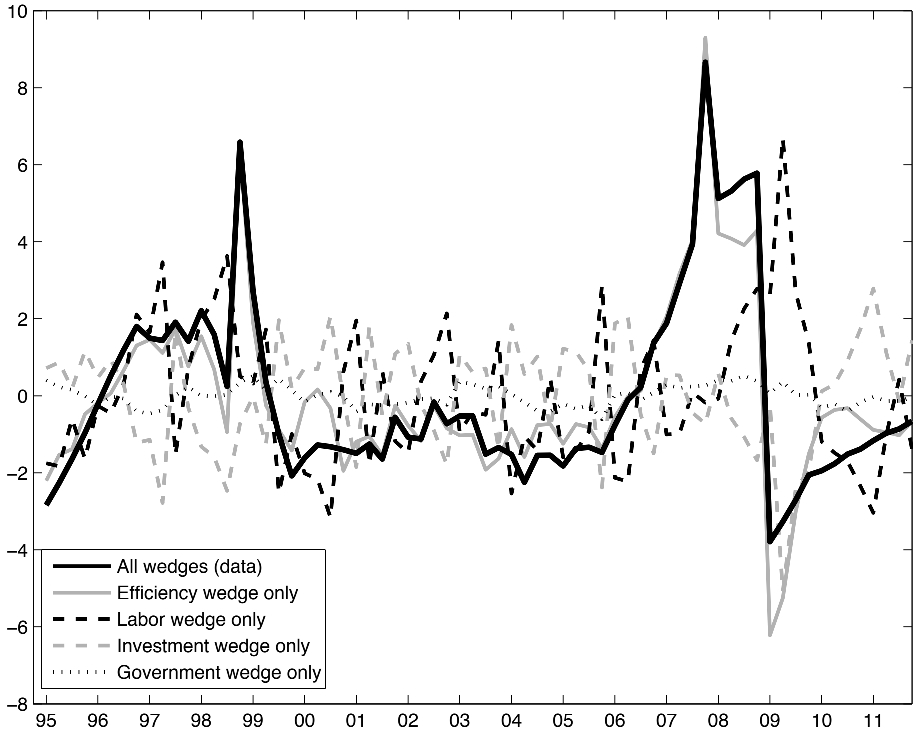
Note: The series are detrended with the Hodrick-Prescott filter.

Figure 5: Output components - Slovenia



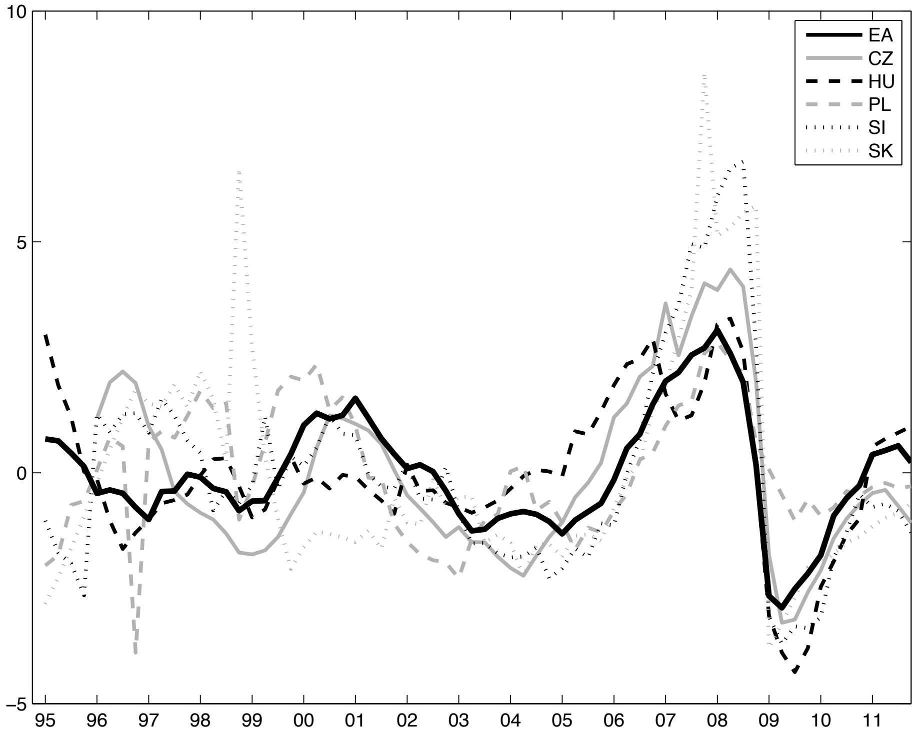
Note: The series are detrended with the Hodrick-Prescott filter.

Figure 6: Output components - Slovakia



Note: The series are detrended with the Hodrick-Prescott filter.

Figure 7: Output



Note: The series are detrended with the Hodrick-Prescott filter.