An Econometric Macro-model of Transition: Policy Choices in the Pre-Accession Period

Ray Barrell, Dawn Holland and Nigel Pain

NIESR

2 Dean Trench Street

Smith Square SW1P 3HE

e-mail: dholland@niesr.ac.uk rbarrell@niesr.ac.uk npain@niesr.ac.uk

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Abstract:

This paper analyses current policy choices facing the candidate countries for EU accession using newly developed econometric macromodels of Poland, Hungary, the Czech Republic, Slovenia and Estonia. The models allow for endogenous growth, and they have been incorporated into an existing global econometric model (NiGEM). This allows long-term projections to be made consistently with expected developments in other economies and allows full feedbacks with the rest of the world so that we can understand impacts on existing EU members as well as the candidate countries. This paper has several novel features, in that we use modern panel data techniques on short time series data in order to construct models of a number of economies. In constructing the models, we have taken special care to consider the roles of openness and foreign investment on productivity and growth. Different policies toward growth and the enhancement of technology transfer are analysed using the models, and policy advice on the accession and integration are made.

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I. Introduction

A key factor that brought about the fall of the centralised system in Central and Eastern Europe was the failure of the command economies to keep pace with economic growth and living standards prevailing in the developed market economies. The abandonment of the centralised system was expected to bring about rapid improvements in efficiency, as the barriers to foreign technology were lifted and privatization and restructuring started to enable them to compete in the market-oriented world. This was expected to lead to sustained high rates of growth, allowing rapid convergence with the average output per capita prevailing in the European Union.

The speed of convergence depends on the initial conditions in each country and on the general economic environment as well as the institutions and policies adopted in each country. The rate of growth can be expected to be endogenous and influenced by factors such as the success of attracting and exploiting new technologies and ideas from abroad via foreign investment. In this paper we explore the prospects for growth using newly-developed macroeconometric models for the Czech Republic, Poland, Hungary, Slovenia and Estonia. These five countries are expected to be among the first to join the EU, and their size and proximity indicate that they will have the most pronounced impact on the existing EU members. The models allow for endogenous growth, and they have been incorporated into an existing global macroeconometric model (NiGEM). This allows long-term projections to be made consistently with expected developments in other economies and allows full feedbacks with the rest of the world so that we can understand the economic relationships between existing EU members and the candidate countries.

The primary aim of this work has been to aid policy makers in the conduct of monetary and fiscal policy, within a framework that allows for analysis of increasingly close links between the accession economies and the rest of Europe. Policy makers are in urgent need of appropriate tools to assess the overall impact of policy decisions on these economies, as the accession process is in many ways a new one without a relevant historical precedent on which to base economic decisions. We believe that a sound macro-econometric model is useful for guiding these decisions.

The model is based on a sound theoretical structure, and key behavioural relationships are econometrically estimated so that they are data consistent. Modelling economies that are undergoing structural change is always difficult, because it constrains the information available from time series. The key relationships in the model are parameterised using panel data evidence for the five transition economies. This allows us to pool quarterly data across the five countries, greatly increasing the number of observations available to us and significantly improving the quality of estimates. We impose common parameters across

countries where justifiable, but allow for country-specific parameters where there is evidence of significant differences in behaviour. This allows the model to reflect the different institutional structures in each economy.

In constructing the models, we have taken special care to consider the roles of openness and foreign investment on productivity and growth. We have used the model to analyse the importance of economic liberalisation and access to flows of technology through FDI. Under our baseline scenario, liberalisation of trade, financial markets, institutional structure and the legal system converge towards average levels in the European Union gradually over time. If this process can be completed more quickly, this will improve efficiency, attract higher levels of FDI and increase growth levels. Our work suggests that economic liberalisation is clearly important for improving growth prospects in the medium term in the accession countries, and particularly points to the need for policies to encourage FDI.

We also consider the fiscal policy stance and choice of exchange rate regime within a rational expectations framework. These are major policy issues facing the EU accession economies. A fiscal contraction would lead to a small fall in output and a significant depreciation of the exchange rate under a flexible exchange rate regime. It would also lead to a small temporary rise in prices as the effect of the depreciation feeds through. This pattern is common in small open economies with large trade elasticities. The fiscal multiplier would be higher under a fixed exchange rate regime, as interest rates are restrained by the open-arbitrage condition. This has important implications for consistency of fiscal policy within the ERMII if a sharp fiscal contraction is required to meet the fiscal guidelines associated with EMU membership.

Section II of this paper describes the underlying economic structure of the model; section III reports the key econometric results; section IV looks at the role of economic liberalisation; section V examines the fiscal policy stance under different exchange rate regimes; and the final section concludes.

II. Economic Structure of the Model

Small macro-models of Poland, Hungary, the Czech Republic, Slovenia and Estonia have been incorporated into an existing global econometric model, NiGEM. NiGEM is a large-scale quarterly macroeconomic model of the world economy. The model is essentially New-Keynesian in its approach, in that agents are presumed to be forward-looking, at least in some markets, but nominal rigidities slow the process of adjustment to external events. It has complete demand and supply sides, and there is an extensive monetary and financial sector. Linkages between countries take place through trade, through interacting financial markets and through international stocks of assets. By incorporating the models into an existing global

model, we ensure that growth projections are consistent with our estimates of world growth, and allow full feedbacks with the rest of the world in response to policy shifts.

As far as possible, the same theoretical structure is applied to all countries in NiGEM, except where clear institutional or other factors prevent this. As a result, variations in the properties of each country model reflect genuine differences emerging from estimation, rather than different theoretical approaches. One of the key differences between the models of the accession economies and the standard NiGEM structure is the important role played by FDI, which is modelled explicitly within the foreign asset system. FDI has been shown to play an important role in enterprise restructuring in transition economies. It has an impact on labour productivity, trade patterns, and the level of fixed investment. We have, therefore, incorporated a supply side model of FDI and modelled the effects of FDI on the domestic economy.

The underlying economic structure of the model is relatively standard. Domestic demand, aggregate supply and the external sector are linked together through the wage-price system, income and wealth, the financial sector, the government sector and competitiveness. The supply-side of the economy is centred around a production function that determines factor demands. Wages are determined by a simple bargaining process over the share of labour in total output. Domestic prices are determined as a mark-up over production costs, which are a weighted average of domestic production costs and import prices. The mark-up is based on the elasticity of demand, which is determined as a pro-cyclical function of the business cycle, captured by capacity utilisation. The wage-price system affects competitiveness and income and wealth. Competitiveness feeds into the external sector, while income and wealth feed into domestic demand through private consumption. The wage-price system also affects total government receipts and expenditure through indirect taxes and transfers to households.

The external sector feeds into domestic demand through the impact of net foreign assets and interest income on household income and wealth, while domestic demand feeds back into the external sector as a determinant of imports and FDI. FDI affects domestic demand through investment, aggregate supply through productivity and the external sector through both exports and imports. The financial sector affects domestic demand through the impact of interest rates on investment and consumption, and feeds into the government sector through interest payments on government debt. The government sector feeds into consumption through the stock of government debt, which affects household wealth, and income tax, which feeds into real disposable income.

In order to undertake effective policy analysis we have to be able to use the assumption that agents can look forward and that expectations are rational. This in turn requires that agents use the implications of the model in their expectations formation. The use of rational

expectations for policy analysis requires that the modeller construct a coherent forward base of about 20 years to run off. It is also important that the model being used contains an equilibrium growth path and has the feedbacks to return to that real equilibrium. Otherwise the model would not be able to find a solution.

The basic framework of the equations on the model is presented below. All variable definitions are given in Appendix A. In section III, the key behavioural equations and the policy options on the model are described in more detail.

Aggregate Supply

Capacity utilisation is given by the ratio of actual to potential output:

$$CU = f(Y, KP + KG, E, FDIS) \quad (1)$$

Total employment grows in line with employees in employment:

$$E = f(EE, LF) \quad (2)$$

Labour demand is derived from the production function:

$$EE = f(FDIS, COMP/EE, P, Y) \quad (3)$$

Government sector capital stock depends on government investment:

$$KG = f(GI) \quad (4)$$

Private sector capital stock is generally derived from the production function, although the model includes an option for a simple accelerator model for investment:

$$KP = f(FDIS, USER, Y) \text{ or } f(PSI, KPDEP) \quad (5)$$

Domestic Demand

Consumption is determined by real disposable income, real net wealth and short-term interest rates:

$$C = f((PI\text{-}TAX)/CED, NW/CED, R3M) \quad (6)$$

Investment is generally determined as the change in the capital stock, although the model includes an option for a simple accelerator model for investment:

$$PSI = f(KP, KPDEP) \text{ or } f(FDIS/Y, Y, KPDEP, LR) \quad (7)$$

Wage-Price System

The consumer expenditure deflator runs off the consumer price index:

$$CED = f(CPI) \quad (8)$$

The wage equation is a bargain between employers and employees:

$$COMP = f(EE / Y, P, FDIS, U, CPI, Time) \quad (9)$$

Non-administered prices are a weighted average of import prices and producer prices consistent with the production function:

$$CPINA = f(MTAX /(C * CED), COMP/E, EE/Y, FDIS, PMA, CU) \quad (10)$$

Unit labour costs move in line with wages, adjusted for technological developments through FDI:

$$ULT = f(COMP/EE, FDIS) \quad (11)$$

The user cost of capital is determined by interest rates and corporate taxes as a share of profits:

$$USER = f(R3M, LR, PY, CTAX, Y*PY, COMP) \quad (12)$$

Income and Wealth

Financial liabilities of households grow in line with disposable income:

$$LIABS = f(PI-TAX) \quad (13)$$

The current flow of miscellaneous assets acts as a residual to ensure that total private savings equals the current net acquisitions of financial wealth. The existing stock of non-liquid miscellaneous assets is revalued according to equity price movements:

$$MISC = f(DEBT, LIABS, EQP, Y*PY) \quad (14)$$

Net financial wealth of households depends on the stock of government debt, net foreign assets, miscellaneous assets and financial liabilities of households:

$$NW = f(DEBT,RX*(GA-GL), MISC, LIABS) \quad (15)$$

Other personal income is determined by net interest payments from abroad, government interest payments and nominal GDP:

$$OPI = f((IPDC-IPDD)*RX, GIP, Y*PY) \quad (16)$$

External Sector

External transfers are based on an historical moving average of real transfers in domestic currency:

$$BPT = f(CED, RX) \quad (17)$$

The average return paid on foreign liabilities is governed by world levels:

$$EQPR = f(WDGL, WDIPDD) \quad (18)$$

The real stock of foreign direct investment depends on demand, relative unit labour costs and risk levels:

$$FDIS = f(TFE, RULT, EBRD, CED, Y) \quad (19)$$

Half the current account balance flows onto gross foreign assets, which increase at a steady rate over time. An adjustment term is included to ensure that world assets equals world liabilities:

$$GA = f(CBV, TIME, WDGA, WDREV) \quad (20)$$

Gross foreign liabilities are revalued by the exchange rate, and grow at a steady rate over time. Half the current account balance flows off of gross foreign liabilities:

$$GL = f(CBV, RX, TIME) \quad (21)$$

Interest payments received from abroad depend on the stock of assets and the average return on foreign assets:

$$IPDC = f(GA, ROR) \quad (22)$$

Interest payments paid abroad depend on the stock of foreign liabilities, the average return on foreign liabilities, the stock of government debt held abroad and average interest payments on government debt:

$$IPDD = f(DEBT, EQPR, GIP, GL, RX) \quad (23)$$

Imports of goods depend on domestic demand, the relative price of imports and the stock of FDI relative to domestic demand:

$$MGI = f(TFE, PMG/CED, MTAX/(C * CED), FDIS/TFE) \quad (24)$$

Imports of services depend on domestic demand and relative prices:

$$MSER = f(TFE, CED, RX, REFEX) \quad (25)$$

The goods import price depends on the import price of manufactured goods, world commodity prices and the exchange rate:

$$PMA = f(PMG, WDP, RX) \quad (26)$$

The import price of manufactured goods depends on the world export price of manufactured goods and the exchange rate:

$$PMG = f(WDPXG, RX) \quad (27)$$

The goods export price depends on the export price of manufactured goods and world commodity prices:

$$PXA = f(PXG, WDP) \quad (28)$$

The import price of manufactured goods depends on domestic consumer prices and the world export price of manufactured goods:

$$PXG = f(MTAX/(C*CED), CED, WDPXG, RX) \quad (29)$$

The average return received on foreign assets is governed by world levels:

$$ROR = f(WDGL, WDIPDD) \quad (30)$$

Exports of goods depend on external demand, the real effective exchange rate and the stock of FDI relative to domestic demand:

$$XGI = f(FDIS/TFE, REFEX, S) \quad (31)$$

Exports of services depend on external demand, the real effective exchange rate and exports of goods:

$$XSER = f(CED, REFEX, RX, S, XGI) \quad (32)$$

Public Sector

Corporation tax grows in line with nominal GDP:

$$CTAX = f(Y*PY) \quad (33)$$

The change in the stock of government debt is equal to the budget deficit less the issuance of high powered money, which is proxied by the change in nominal GDP:

$$DEBT = f(BUD, Y*PY) \quad (34)$$

Government interest paymenst are determined by the stock of government debt and long-term interest rates:

$$GIP = f(DEBT, LR) \quad (35)$$

Miscellaneous tax grows in line with nominal consumption:

$$MTAX = f(C, CED) \quad (36)$$

Income tax grows in line with personal income, adjusted by the deviation of the government budget deficit from its target:

$$TAX = f(PI, Y^*PY, GBRT\ \ GBR) \quad (37)$$

Government transfers to households depend on the price level and unemployment rate:

$$TRAN = f(CED, U) \quad (38)$$

Financial sector and competitiveness

Equity prices are determined by profits relative to the capital stock, interest rates and a risk premium on equities. They can be either forward-looking or backward-looking:

$$EQP = f((Y^*PY- COMP^*E/EE)/KP, R3M, PREM, KP) \quad (39)$$

The interest rate premium is determined by the deviation of the current balance ratio from its target:

$$IPREM\ = f(CBR-CBRT) \quad (40)$$

Long-term interest rates are driven by short-term interest rates, and can be either forward-looking or backward-looking:

$$LR = f(R3M) \quad (41)$$

The real effective exchange rate is given by the real consumer exchange rate in the home country relative to a weighted average of competitors' real consumer exchange rates:

$$REFEX\ = f(RX, CED, WDRX, WDCED) \quad (42)$$

Relative unit labour costs are given by domestic unit labour costs relative to a weighted average of competitor's unit labour costs:

$$RULT = f(ULT, RX, WDRULT) \quad (43)$$

There are a number of monetary policy rule options to determine short-term interest rates (R3M) and exchange rates (RX). These are described in more detail in the next section.

Identities

Government budget surplus:

$$BUD = TAX + MTAX + CTAX - TRAN - GIP - GC*CED/100 - GI*PY/100 \quad (44)$$

Current balance ratio to GDP:

$$CBR = CBV*RX/(Y*PY/100)*100 \quad (45)$$

Current account balance:

$$CBV = XGV - MGV + XSER - MSER + IPDC - IPDD + BPT \quad (46)$$

Consumer price index:

$$CPI = CPINA*NASHARE + CPIA*(1-NASHARE) \quad (47)$$

Government budget ratio to GDP:

$$GBR = BUD/(Y*PY/100)*100 \quad (48)$$

Import of goods (value):

$$MGV = \alpha_1*MGI*PMA/RX \quad (49)$$

Imports of goods and services (volume):

$$MVOL = \alpha_2*MGI + \alpha_3*MSER*RX/CED*REFEX \quad (50)$$

Gross personal income:

$$PI = OPI + TRAN + COMP \quad (51)$$

GDP deflator:

$$\frac{PY}{PY_{-1}} = \left(\frac{PMA}{PMA_{-1}}\right)^{\frac{-MVOL}{Y}} \left(\frac{CED}{CED_{-1}}\right)^{\frac{TFE-XVOL}{Y}} \left(\frac{PXA*RX}{PXA_{-1}*RX_{-1}}\right)^{\frac{XVOL}{Y}} \quad (52)$$

Total final expenditure:

$$TFE = C + DS + PSI + GC + GI + XVOL \quad (53)$$

Unemployment:

$$U = (LF\text{-}E)/LF*100 \quad (54)$$

Exports of goods (value):

$$XGV = \alpha_4 * XGI * PXA \quad (55)$$

Exports of goods and services (volume):

$$XVOL = \alpha_5 * XGI + XSER * RX / CED * 100 \quad (56)$$

Real GDP:

$$Y = C + DS + PSI + GC + GI + XVOL - MVOL \quad (57)$$

Exogenous variables

CBRT	*CPIA*	*CRAWL*	*DS*
EBRD	*GBRT*	*GC*	*GI*
KPDEP	*LF*	*NASHARE*	*PREM*

III. Estimated Equations

The behavioural equations were all estimated using panel data evidence for the five accession economies. We impose common parameters across countries where justifiable, but allow for country-specific parameters where there is evidence of significant differences in behaviour. This allows the model to reflect the different institutional structures in each economy. A fixed-effects model is adopted, allowing a separate intercept for each country to capture country differences in the levels of variables. We impose a dynamic error-correction structure on the estimated equations, which allows the model to adjust gradually towards equilibrium in response to a shock. This is particularly important for models of transition economies, where markets may take extended periods to clear.

Supply Side

Labour demand and the wage-price system are determined by the supply-side of the model, which is based on a CES production function that allows for endogenous productivity growth.

Employee Demand

The equation for employees in employment is the core labour demand curve. It allows for endogenous technical progress, as the pace of technical change is positively related to the stock of inward FDI. Inflows of FDI can modernise and expand the stock of physical and human capital in the economy, helping to fill 'object gaps'. By bringing access to foreign

technology and management techniques, and by making available products and processes that embody foreign knowledge, FDI also help to close 'idea gaps'. These advancements may spillover into the domestic economy, as local firms adopt the technologies demonstrated by foreign firms and hire workers and managers who have been trained in foreign firms.

To allow for the impact of FDI on productivity, we have incorporated a labour demand equation such as the one developed in Barrell and Pain (1997). We assume an underlying CES production function with constant returns to scale:

$$Y = \gamma[\delta K^{-\rho} + (1-\delta)(EEe^{\lambda t})^{-\rho}]^{-1/\rho} \tag{58}$$

Here γ and δ are production function scale parameters, t represents technical progress, the elasticity of substitution (σ) is given by 1/(1+ρ) and K represents the total capital stock (KP+KG). If ρ=0, production is characterised by a unit elasticity of substitution, and equation (58) evaluated at the limit is equivalent to a Cobb-Douglas production function. Labour augmenting technical progress is captured by the parameter λ. We derive the labour demand equation using the factor demand condition, which equates the marginal product of labour to its mark-up real price.

$$\beta(W/P) = dY/dEE = (\gamma)^{-\rho}(1-\delta)(Y)^{(1+\rho)}(EEe^{\lambda t})^{-(1+\rho)}e^{\lambda t} \tag{59}$$

where W is the average hourly wage (COMP/EE), P is output price at factor costs and β denotes the profit margin. This reduces to a log-linear factor demand equation of the form:

$$\begin{aligned} \ln(EE/Y) &= (\sigma \ln((1-\delta)/\beta) + (\sigma-1)\ln(\gamma)] + (\sigma-1)\lambda t - \sigma \ln(W/P) \\ &= \alpha_1 + (\sigma-1)\lambda t - \sigma \ln(W/P) \end{aligned} \tag{60}$$

Technical progress (t) is modelled as an endogenous process. The framework developed in Grossman and Helpman (1991) suggests that technological progress is driven by the introduction of new products discovered in the research sector. The nature of foreign investment is likely to increase this rate of discovery, as it introduces new technologies and business practices. Thus labour-augmenting technical progress is expressed as:

$$\lambda t = \lambda_{fdi} \ln(FDIS) \tag{61}$$

We substitute equation (61) into equation (60) and estimate in error-correction format to capture the short-term and long-term impacts.

$$\begin{aligned} \Delta \ln(EE/Y) = \; & \alpha_{1i} - \gamma_1[\ln(EE/Y)_{-1} + \sigma \ln(W/P)_{-1} - (\sigma-1)* \\ & \lambda_{fdi} \ln(FDIS)_{-1}] + dynamics + \varepsilon \end{aligned} \tag{62}$$

Looking at the first-order condition given by equation (60), it is clear that an estimation of equation (62) by OLS will suffer from endogeneity bias. We, therefore, estimate the equation jointly with the wage and the price equations described below.

Prices

Following Barrell *et al* (1996), we define the first-order condition price variable as output price at factor cost. Rearranging equation (60) to solve for P gives us the long-run underlying equation for output price at factor costs.

$$\ln(P) = \alpha_2 + \ln(W) + (\frac{1}{\sigma})\ln(\frac{EE}{Y}) - (\frac{\sigma - 1}{\sigma})\lambda_{fdi}\ln(FDIS) \tag{63}$$

This variable is not explicitly modelled within our system, but is modelled implicitly by substitution within the consumer price system. We distinguish between administered consumer prices and non-administered consumer prices within the model (see Ashworth *et al*, 2001). Non-administered consumer prices (CPINA) are assumed to be a weighted average of output price at factor costs (P) and import prices (PMA). P and PMA are adjusted by the indirect tax rate (ITR=MTAX/(C*CED)).

$$\ln(CPINA) = \eta\ln(P) + (1-\eta)\ln(PMA) + \ln(1+ITR) \tag{64}$$

The implicit assumption made by this relationship is that all price administration occurs at the market level and is not reflected in the factor cost data. We estimate the dynamic version of equation (64). Prices are adjusted by a cyclical measure (ΔCU), which captures upward pressure on prices as the level of spare capacity declines.

$$\begin{aligned}\Delta\ln(CPINA) = \alpha_{2i} + \gamma_2[&\ln(CPINA)_{-1} - (1-\eta)\ln(PMA)_{-1} - \ln(1+ITR)_{-1} \\ &-\eta\ln(W)_{-1} - \frac{\eta}{\sigma}\ln\left(\frac{EE}{Y}\right)_{-1} + \frac{\eta(\sigma-1)}{\sigma}\lambda_{fdi}\ln(FDIS)_{-1}] + \delta\Delta CU \\ &+\Delta\ln(1+ITR) + dynamics + \varepsilon\end{aligned} \tag{65}$$

Wages

The wage equation is based on a very simple bargaining model, whereby workers and firms bargain over the share of labour in total output. The real wage demanded by workers is assumed to be inversely related to the unemployment rate, which shifts the labour supply curve. An additional feature that we have incorporated into the wage equation is that the relative bargaining power of workers and firms is allowed to adjust over time. In the early years of transition, firm restructuring and high levels of economic uncertainty prevented the labour market from functioning according to market principles. Nominal wage indexation and excess wage taxes meant that wages were largely determined by the price level, rather than

underlying economic fundamentals. This gave an artificially high weight to the implied bargaining power of workers, which has decreased over time.

To account for this shift, we pre-multiply the weight on the firm bargain by a function of time. Following experimentation, we adopted a logarithmic function of time, which converges towards a stable bargaining position in the long-run. This allows wages to follow the consumer price index more closely in the early years of transition, but ultimately a more even bargaining position is achieved.

$$\begin{aligned}\Delta \ln(W) = {} & \alpha_{3i} + \gamma_3 \left[\ln(W)_{-1} - \ln(CPI)_{-1} - \varphi U_{-1}\right] \\ & + \gamma_4 * \ln(Time)\left[\ln(W)_{-1} - \ln(P)_{-1} + \frac{1}{\sigma}\ln\left(\frac{EE}{Y}\right)_{-1} - \frac{\sigma - 1}{\sigma}\lambda_{fdi}\ln(FDIS)_{-1}\right] \\ & + dynamics + \varepsilon\end{aligned} \quad (66)$$

We estimate the labour demand equation jointly with the wage equation and the main price equation under a fixed-effects panel framework. Country-specific intercepts and dynamic terms were included in estimation, but are not reported here for reasons of space.

Parameter estimates:

	Labour Demand Equation	**Price Equation**	**Wage Equation**
σ		0.43 (3.8)	
λ		0.10 (2.8)	
φ			-0.02 (1.9)
η		0.50 (9.3)	
δ		0.20 (2.5)	
γ	-0.07 (2.3)	-0.38 (6.3)	-0.13 (3.8)
γ_4			-0.002 (3.8)
R^2	0.03	0.14	0.58
SE	1.4%	5.6%	2.3%
Sample		1993q3-1999q4	

We estimate the elasticity of substitution between labour and capital at about 0.4. The parameter is significantly less than one, which indicates that a Cobb-Douglas production function would be an inappropriate model of the production process in these economies. The magnitude of the parameter is comparable to estimates for OECD countries in Barrell *et al* (1996). The technical progress parameter is estimated at 0.1, which suggests that a 1 per cent rise in the real stock of FDI is associated with an 0.04 per cent rise in labour productivity. This is comparable to estimates for a panel of 11 transition economies in Holland and Pain (1998).

The parameter on unemployment in the wage equation is estimated at –0.02. This is somewhat higher than generally expected. This may reflect the transitional restructuring of firms, with real wages falling and unemployment rising as firms adjust towards a more competitive position.

The weight on domestic prices in the non-administered consumer price equation is estimated at 0.5. This indicates that 50 per cent of movements in the consumer price level are attributable to import prices. This share is somewhat higher than generally found in larger economies, but in line with what we would expect for a small open economy. Prices are the fastest variables to adjust in response to external shocks, followed by wages. Labour demand adjusts more slowly, which suggests that we are likely to see a high level of labour hoarding in the short- to medium-term in response to a negative shock.

Self employment

We have assumed that self-employment comprises a constant share of total employment. In a country like Poland, it is sensible to allow this share to decline over time to capture the shift from private agriculture to industry and services. However, in other countries it may be more appropriate to assume that this share is growing over time as entrepreneurial culture develops. The distinction between self-employed and employees is not always treated consistently across countries, especially in agriculture, as it is often unclear how members of co-operatives have been classified. Therefore, we have opted for a constant self-employment ratio, which can be adjusted by adding a residual to the total employment (E) equation.

Domestic Demand

Consumption

Private consumption is modelled as a function of real personal disposable income and the real stock of personal sector financial wealth. Real personal disposable income depends on the domestic price level, labour demand and nominal wages as well as fiscal policy. Financial wealth depends on net foreign asset holding, holdings of money and equities, domestic government debt, less loans to households. We impose long-run homogeneity of degree 1 in income and wealth. This implies that the consumption-income ratio and the wealth-income ratio are constant in the long-run, and ensures that the savings rate is untrended. The short-term interest rate enters the equation to capture the return to savings.

$$\Delta \ln(C) = \alpha_i - \lambda[\ln(C_{-1}) - \beta_1 \ln(RPDI_{-1}) - (1-\beta_1)\ln(RNW_{-1}) - \beta_2 R3M_{-1}] + dynamics + \varepsilon \quad (67)$$

where RPDI is real personal disposable income ((PI-TAX)/CED) and RNW is real net financial wealth (NW/CED).

Parameter estimates:

λ	0.11	(3.7)
β_1	0.90	(18.3)
β_2	-0.006	(2.9)
$\overline{R}^2$	0.44	
SE	1%	
Sample	1994Q1-1999Q4	

We find a weight of about 90 per cent on real disposable income, while changes in real financial wealth have a smaller impact on consumption. A rise in interest rates restrains consumer expenditure, due to the higher returns to savings and greater costs of borrowing.

Investment

The model includes two options for modelling the capital stock. It is possible to use a simple accelerator model for investment. The capital stock is then calculated as cumulated investment, allowing a constant depreciation rate over time. We include the real stock of FDI relative to GDP in the investment equation, to capture the higher level of fixed capital investment undertaken by foreign firms.

$$\begin{aligned}\Delta \ln(PSI) = \quad & \alpha_i - \lambda[\ln(PSI_{-1}) - \ln(Y_{-1}) - \beta_1 LR_{-1} - \beta_2 \ln(FDIS/Y)_{-1} \\ & -\beta_3 \ln(KPDEP)_{-1}] + dynamics + \varepsilon\end{aligned} \tag{68}$$

Parameter estimates:

λ	0.61	(5.5)
β_1	-0.009	(1.9)
β_2	0.32	(5.6)
β_3	0.50	(2.2)
$\overline{R}^2$	0.29	
SE	13.5%	
Sample	1994Q1-1999Q4	

The preferred equation for investment is less commonly used in models, but has a much sounder theoretical structure, as the capital stock equation is fully compatible with the underlying production function, mirroring equation (62). We separate the capital stock into "domestic" capital stock and "foreign" (or FDI based) capital stock, where foreign capital stock is equal to the inward stock of FDI.

$$\begin{aligned}\Delta \ln(KP - FDIS) = \quad & \alpha_i - 0.002[\ln(KP - FDIS)_{-1} - \ln(Y)_{-1} + \sigma \ln(USER)_{-1}] \\ & +0.8\Delta \ln(KP - FDIS)_{-1} + 0.06\Delta \ln(Y) + \varepsilon\end{aligned} \tag{69}$$

We have not attempted to estimate a domestic capital demand equation, due to insufficient and inadequate data. Our estimates for OECD countries indicates that it generally takes 9-10 years for half of a shock to GDP to fully feed through into the capital stock. A shock to the cost of capital tends to take even longer to feed through. Given our short time span of data, it is unlikely that we will find a sensible estimate of the speed of adjustment in response to external shocks. We have calibrated the dynamic terms using average estimates for advanced market economies. The parameter for the elasticity of substitution (σ) is taken from the wage-price system. Investment is then just the change in the capital stock, adjusted for depreciation.

External Sector

Exports of Goods

Export volumes depend upon world demand, relative prices and the stock of inward foreign direct investment (FDI), following the approach of Pain and Wakelin (1998). Foreign affiliates have been shown to engage in relatively high levels of trade with their parent companies, which encourages both imports and exports. In addition, technologies introduced by foreign firms may raise the variety and quality of goods produced, strengthening external demand.

$$\begin{aligned}\Delta \ln(XGI) = \quad & \alpha_i - \lambda[\ln(XGI_{-1}) - \ln(S_{-1}) - \beta_1 \ln(REFEX_{-1}) \\ & -\beta_2 \ln(FDIS_{-1} / TFE_{-1})] + dynamics + \varepsilon\end{aligned} \tag{70}$$

Parameter estimates:

λ	0.13	(4.3)
β_1	-3.15	(4.2)
β_2	0.70	(6.1)
SUR estimates		
Sample	1995q1-1999q4	

A unit elasticity is imposed on demand, which implies that the country share of world exports is independent of the level of world trade itself. A one per cent increase in the real stock of FDI relative to total final expenditure is associated with an 0.7 per cent increase in the volume of exports. This is somewhat higher than estimates for Ireland in Barrell and te Velde (2000), and estimates for the UK, Germany, France, Sweden and the Netherlands in Pain and Wakelin (1998).

Imports of Goods

Import volumes depend upon domestic demand, the real import price, the real stock of inward foreign direct investment and time.

$$\Delta \ln(MGI) = \alpha_i - \lambda[\ln(MGI_{-1}) - \ln(TFE_{-1}) - \beta_1 \ln(RPM_{-1}) - \beta_2 Time - \beta_3 \ln(FDIS_{-1} / TFE_{-1})] + dynamics + \varepsilon \quad (71)$$

where RPM is real import prices (PMG/CED).

Parameter estimates:

		Slovenia	**Estonia**
λ	0.13 (4.4)		
β_1	-0.62 (4.3)		
β_2		-0.007 (6.5)	-0.013 (4.1)
β_3	0.24 (7.0)		
$\overline{R}^2$	0.39		
SE	2.7%		
Sample	1994q1-1999q4		

A unit elasticity is imposed on demand, which implies that the import share of domestic demand is independent of the level of demand. In Slovenia and Estonia there is a significant negative parameter on time, which restrains the impact of the rise in the FDI ratio over longer periods of time. A one per cent rise in the real stock of FDI relative to TFE is associated with a ¼ per cent increase in import volumes. The elasticity on imports is smaller than that on exports, which indicates that an increase in the FDI ratio, holding all else equal, will improve net trade.

Exports of Services

Services trade consists of trade in financial and professional services, transport, travel, and government services. The demand for exports of services is generally determined by foreign income and a competitiveness indicator. Trade in goods may also be included in the equation, if transport services account for a significant share of a country's service exports. Foreign income is measured as goods imports into the other major economies, as this will capture any structural shift effecting the demand for services imports, such as increased globalisation. The demand elasticities are imposed at 1.0.

$$\Delta \ln(XSERV) = \alpha_i - \lambda[\ln(XSERV_{-1}) - \ln(S_{-1}) - \beta_1 \ln(REFEX)_{-1} - \beta_2 \ln(XGI)_{t-1}] + dynamics + \varepsilon \quad (72)$$

where XSERV is the volume of service exports (XSER*RX/CED).

Parameter estimates:

λ	0.16	(4.5)
β_1	-0.12	(1.1)
β_2	0.18	(4.9)
SUR estimates		
Sample	1992q1-1999q4	

The direct impact of competitiveness on service exports is much smaller than the impact on goods exports. However, a loss of competitiveness will have a secondary impact on services, as the subsequent contraction of exports of goods will restrain services trade.

Imports of Services

The demand for service imports is determined by the importer's income and a competitiveness measure.

$$\Delta \ln(MSERV) = \alpha_i - \lambda[\ln(MSERV_{-1}) - \beta_1 \ln(TFE_{-1}) - \beta_2 \ln(REFEX_{-1})] \quad (73)$$
$$dynamics + \varepsilon$$

where MSERV is the volume of service imports (MSER*RX/CED*REFEX).

Parameter estimates:

λ	0.78 (7.3)
β_1	0.93 (6.4)
β_2	0.48 (2.4)
$\overline{R}^2$	0.42
SE	11.4%
Sample	1994Q1-1999Q4

Imports of services tend to be more sensitive to changes in competitiveness than exports of services, while the reverse is true for trade in goods.

FDI

The dependent variable used in estimation is the real stock of FDI. We impose a long-run unit elasticity on total final expenditure, so that the ratio of the stock of FDI to total final expenditure is constant if we hold all other factors fixed. We relate the FDI ratio to a measure of risk and unit labour costs relative to the rest of the world, so that a permanent improvement in competitiveness permanently increases the stock of FDI in the host economy. Risk is captured by the degree of transition as estimated by the EBRD. The transition variable is an exogenous input into the projections. It is the country score judged by the EBRD on the basis of trade, financial and legal liberalisation. In the final section we will explore the extent to

which changing the assumption over the speed of further liberalisation endogenously changes the speed of convergence.

$$\Delta \ln(FDIS) = \alpha_i - \lambda[\ln FDIS_{-1} - \ln TFE_{-1} - \beta_1 \ln RULT_{-1} - \beta_2 EBRD_{-5}] + dynamics + \varepsilon \quad (74)$$

Parameter estimates:

λ	-0.05 (4.8)
β_1	-0.82 (2.4)
β_2	0.58 (1.9)
β_2	-0.14 (2.1)
β_3	0.08 (2.2)
$\overline{R}^2$	0.82
SE	2.0%
Sample	1994q1-1999q3

The stock of FDI adjusts very slowly in response to shocks. This is expected as the FDI stock equation reflects the relocation decision. Economic liberalisation has a positive impact on FDI. There is also a dynamic role for a measure of risk, which is a composite of economic liberalisation, growth and inflation. Inflows of FDI increase as risk levels come down.

Manufacturing Export Price

Manufacturing export prices generally depend on a weighted average of domestic prices converted to dollars and competitors' export prices. We impose both short-run and long-run homogeneity of degree one in prices.

$$\Delta \ln(PXG) = \alpha_i - \lambda[\ln(PXG_{-1}) - (1-\beta_1)\ln(WDPXG_{-1}) - \beta_1 \ln(CED/RX)_{-1}] + dynamics + \varepsilon \quad (75)$$

Parameter estimates:

λ	0.0523 (2.3)
β_1	0.0
SUR estimates	
Sample	1994q1-1999q4

We find a weight of unity on competitors' export prices, indicating a lack of market power in determining export prices. However, we find a dynamic role for domestic prices. The dynamic response of Polish export prices to domestic price changes is weaker than in the other four economies. This reflects the structure of exported goods.

Monetary Policy Options in the Model

The model can run under are a number of different monetary policy options. There are two main scenarios to choose from regarding exchange rate policy: fixed exchange rates or flexible exchange rates. Fixed exchange rates can either be fixed at a constant rate to the euro, as in Estonia for most of the last decade, or can allow a constant rate of depreciation within a crawling peg regime, as followed in Hungary until recently. Flexible exchange rates respond to expected changes in relative interest rates, to ensure the UIP condition holds, after allowing for an interest rate premium. We assume that there is a premium on accession country interest rates, to reflect higher levels of risk relative to the Euro Area. Expectations can be either forward-looking or backward-looking.

Exchange Rate Equations

If a country is in or shadowing EMU, the exchange rate moves in line with the euro/dollar exchange rate (ELRX).

$$RX = RX_{-1} * ELRX / ELRX_{-1} \tag{76}$$

A 'fixed' exchange rate with a crawling peg regime allows a steady rate of depreciation against the euro.

$$RX = RX_{-1} * CRAWL * ELRX / ELRX_{-1} \tag{77}$$

Forward-looking floating exchange rates solve the open arbitrage condition, allowing an interest rate premium.

$$\begin{aligned} \ln(RX) = \; & \ln(RX_{+1} * ELRX / ELRX_{+1}) \\ & - 0.25 * \ln((100 + R3M) * 100 / ((100 + ELR3M) * (100 + IPREM))) \end{aligned} \tag{78}$$

Backward-looking floating exchange rates also solve the open arbitrage condition, allowing an interest rate premium.

$$\begin{aligned} \ln(RX) = & \ln(RX_{-1} * ELRX / ELRX_{-1}) \\ & + 0.25 * \ln((100 + R3M_{-1}) * 100 / ((100 + ELR3M_{-1}) * (100 + IPREM_{-1}))) \end{aligned} \tag{79}$$

Interest Rates

Within a flexible exchange rate regime, all the standard NiGEM options are available for interest rate rules. We adopt simple policy rules, where the policy instrument is expressed as a function of the deviation of the target variable from its target value. Simple feedback rules limit the amount of information that is taken from the model and thereby reduce the

complexity of the rule considerably. The standard policy rules can all be derived from the following general rule:

$$R3M_t = \gamma_1(\pi_t - \pi_t^*) + \gamma_{21}(P_t - P_t^*) + \gamma_{22}(Y_t - Y_t^*) \tag{80}$$

where R3M is the short term interest rate, π is the expected inflation rate, P is the log of the price level, Y is the log of real GDP and * denotes target variables. The table below reports the default parameter values for the standard rules. These can all be adjusted.

	Parameter values		
	γ1	**γ21**	**γ22**
Combined nominal GDP and inflation targeting	0.75	50	50
Nominal GDP targeting	0	50	50
Inflation targeting	0.75	0	0
Taylor rule	1.5	0	50

Interest rates are fixed to Euro Area rates if the country is inside the Euro Area. In some instances, we may wish to run simulations holding interest rates and exchange rates fixed, so we also include a fixed interest rate and exchange rate option.

Within a fixed exchange rate regime, the above options will not necessarily ensure that the UIP condition holds. We have, therefore, developed a special interest rate rule, which is the inversion of the exchange rate open arbitrage condition. This allows the interest rate to jump in forward-looking mode. This is particularly useful for a crawling peg system, where the rate of the crawl acts as the monetary policy instrument. A change to the rate of crawl will cause interest rates to jump in the first period of the simulation.

The inverted forward-looking open arbitrage condition allows an interest rate premium.

$$\begin{aligned} R3M = {} & (RX_{+1} / RX * ELRX / ELRX_{+1})^4 * (100 + ELR3M) \\ & *(100 + IPREM)/100 - 100 \end{aligned} \tag{81}$$

The inverted backward-looking open arbitrage condition treats the expected change in the exchange rate as the rate of crawl.

$$R3M = CRAWL^4 * (100 + ELR3M) * (100 + IPREM)/100 - 100 \tag{82}$$

Interest rate premium

We have defined the interest rate premium as a constant, plus a fraction of the deviation of the current account balance ratio from its target. The parameter on the current account deviation (DUMCBRT) is set to 0.5 by default, but can be adjusted.

$$IPREM = 4 - DUMCBRT * (CBR - CBRT) \quad (83)$$

If DUMCBRT is set equal to zero, the interest rate premium is constant and does not affect the simulation properties of the model.

IV. Economic Liberalisation and FDI

Medium term growth prospects are constructed around a number of exogenous assumptions that we have made. The following variables are determined exogenously: government consumption, labour force, index of liberalisation and administered price inflation. Changes to these assumptions will change growth potential and convergence prospects for the economies. This is where policy may have a role to play in determining the rate of convergence. Below we experiment with changes in the rate of liberalisation and we go on to look at the importance of FDI to these economies. In the next section we experiment with changes in the level of government consumption.

Speed of trade, financial and legal liberalisation

The EBRD indicates that there are still improvements to be made in liberalising the financial institutions in all five countries. A concerted effort to speed the process along will improve the convergence prospects in the transition economies. On our baseline scenario, liberalisation of trade, financial markets and the legal system is expected to eventually attain levels equivalent to the European Union. If this process can be completed more quickly, this will improve efficiency, attract higher levels of FDI and increase growth levels. In this section we consider the impact of completing this process by 2005.

The index of liberalisation acts as a measure of country risk. As a country becomes more efficient, labour markets will work better and the size of the government sector will decline relative to the private sector. Lower risk will attract higher levels of FDI and increase productivity, thereby reducing unit labour costs. Lower unit labour costs also attract higher inflows of FDI, deepening the impact.

As an example we have speeded liberalisation in Poland, allowing the transition indicator to achieve its maximum level by 2005, rather than in 2016, as on our baseline (Figure 1).

As a result the FDI stock grows more rapidly than it would otherwise have done, as can be seen from Figure 2 below, and it reaches its equilibrium earlier than on our baseline. Output growth is also more rapid than it would have been (Figure 3), and after a dozen years output is 3 per cent higher than on our baseline. This would allow Poland to achieve feasible convergence some years earlier than it would otherwise have done. It is clear from the charts below that the evidence suggests that the effects of further liberalisation are likely to feed through only slowly, as indeed have the effects of the liberalisation that has taken place so far.

Figure 1. Increase Speed of Liberalisation in Poland

EBRD absolute difference from baseline

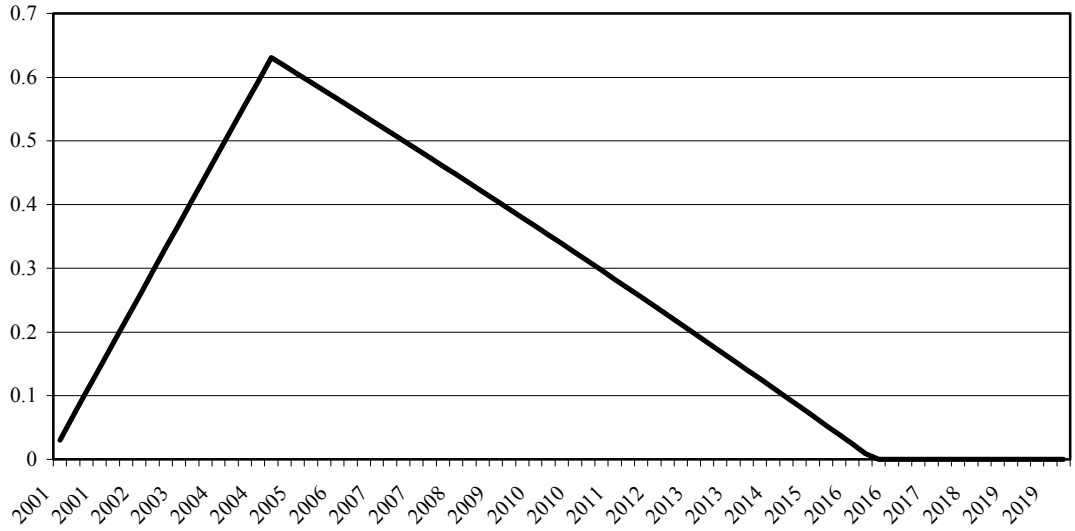


Figure 2. Impact of Faster Liberalisation on FDI Stock

FDIS percentage difference from baseline

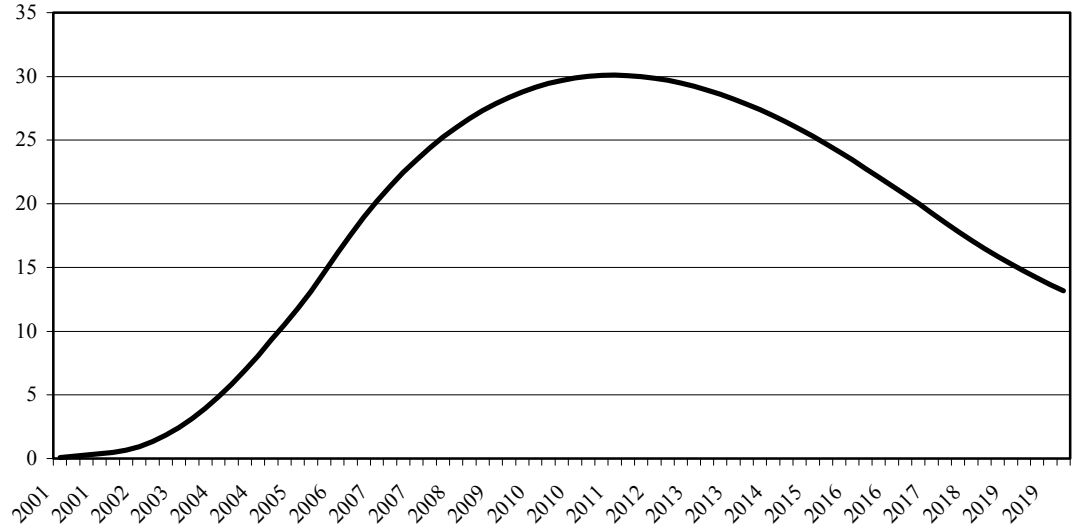
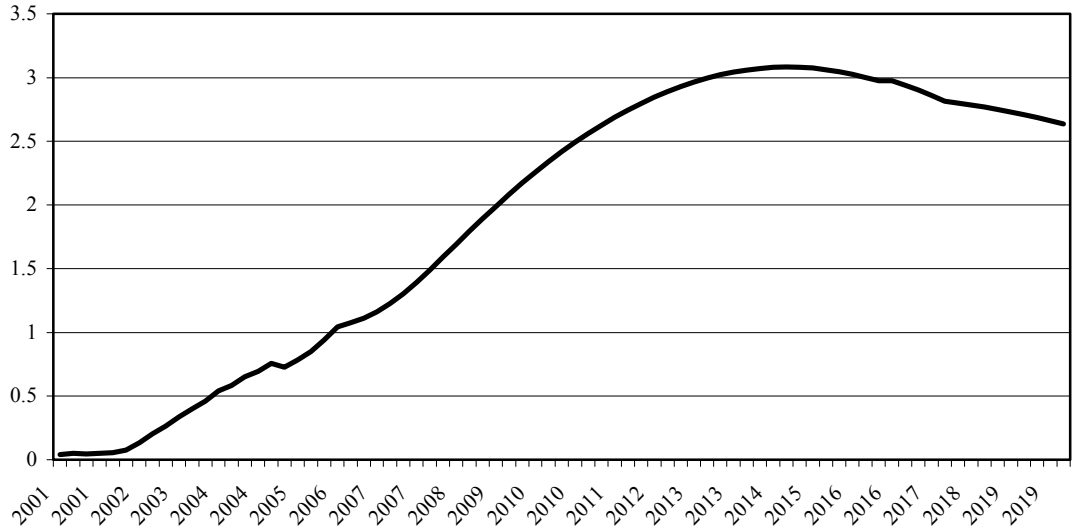


Figure 3. Impact of Faster Liberalisation on GDP

Y percentage difference from baseline



Importance of FDI

We have emphasised the importance of FDI in constructing the models of Poland, Hungary, Slovenia, Estonia and the Czech Republic. We can quantify this importance to the convergence prospects of these economies by undertaking a simulation in which these flows increase, expanding the real stock of FDI by about 60 per cent after 15 years (Figure 4).

Figure 4. Increase the Stock of FDI

FDIS percentage difference from baseline

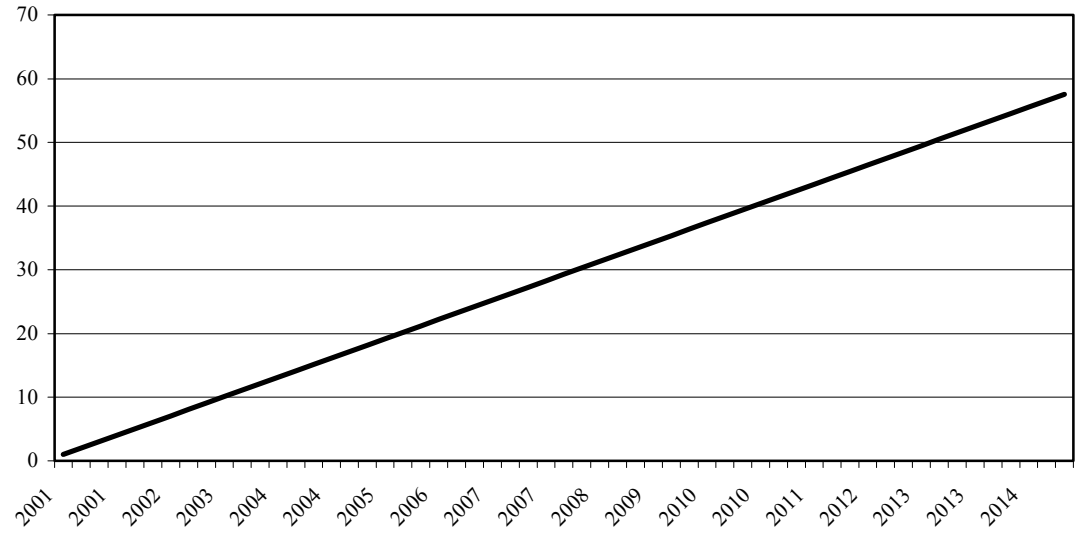
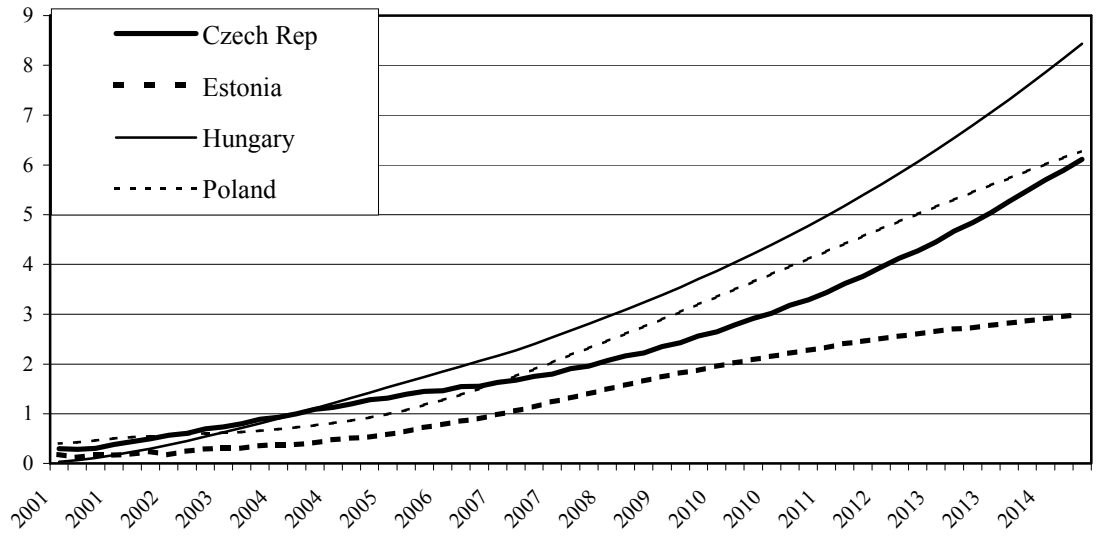


Figure 5. Impact of a Rise in the FDI Stock on GDP

Y percentage difference from baseline



The initial impact on GDP is small (Figure 5), but then begins to build up. After 15 years GDP is almost 8% above base in Hungary and about 6 per cent above base in Poland and the

Czech Republic, as can be seen below. All economies benefit from the rise in their stock of FDI, but the larger the initial stock the greater the impact this percentage change has on the level of output, and hence in our simulations the largest impact is in Hungary and Poland.

The FDI stock builds up cumulatively, adding to the stock of capital, but the effects on productivity build up slowly through the labour demand curve. Given that the effects of FDI build up slowly, early liberalisation will have a slow impact on GDP. If the impact effect of FDI on imports is particularly large then it is possible that the initial effects of an increase in the growth of the stock of FDI could be a reduction in GDP. We do not observe this, but the slow initial impact of the FDI increase reflects the impact on imports even within this model. The scale of the change in GDP from increasing FDI is much larger than that achieved by increased liberalisation.

V. Fiscal Policy in a Forward Looking World

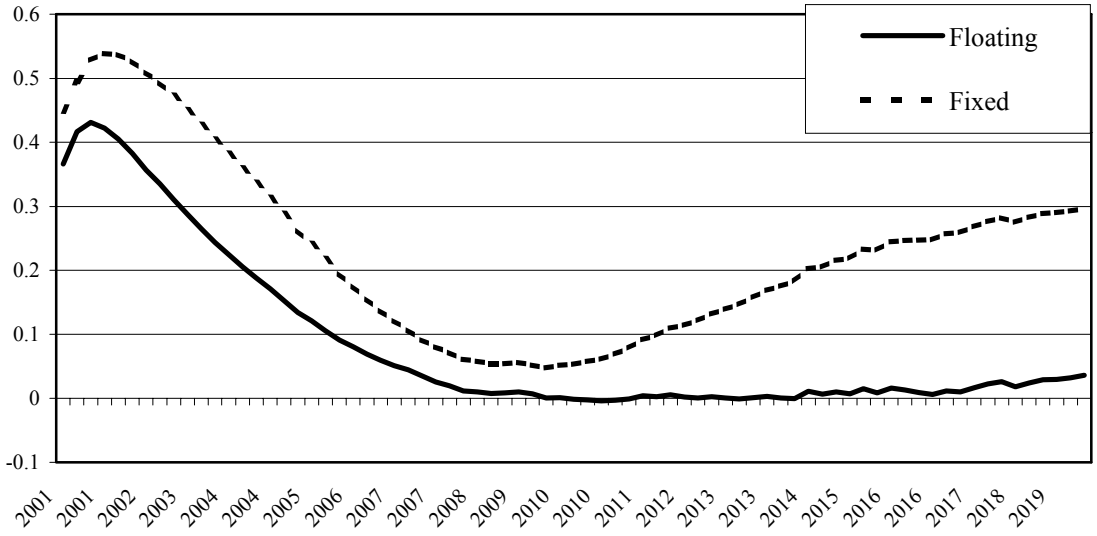
It is of course important to use our models to analyse current policy problems as well as to analyse the determinants of growth. There are policy choices to be made by each of the countries of the region, and at present discussions of their fiscal policy stance and compatibility with alternative exchange-rate regimes are particularly relevant. We can use our forward looking models to look at the implications of, say the fiscal multiplier of the recent shift in Hungary from a crawling peg to a floating exchange rate regime. We can also look at the effects of fiscal policy in each of Hungary, the Czech Republic and Poland where some fiscal action may be required before accession, as fiscal deficits are either large, especially in the Czech Republic, or could become so. We have not reported the shocks for Estonia, as they have a fixed exchange rate regime, and hence the thought experiment is of less interest. As with the FDI shock, we do not repeat it for Slovenia because it is less relevant for that country where convergence is almost complete.

In each of the shocks reported below we have a standard Taylor Rule in place that feeds back on output and inflation, and in the longer term direct taxes adjust to achieve a given government budget deficit target. This solvency rule ensures that no fiscal policy Ponzi games can be played in these countries. Our default is that the exchange rate and the long term interest rate are forward looking, and follow the arbitrage path over time. A shock should cause these variables to ‘jump’ in the first period. We could use a crawling peg and hence make the short term interest rate a jumping variable, but we do not do that here as all the candidate countries currently target inflation or have currency boards.. In each case we raise government consumption by one percent of GDP and look at the profile for output and other variables.

We first look at a fiscal multiplier for Hungary in 'backward' mode with fixed interest rates and exchange rates, and then we repeat the shock with forward looking financial markets and with a monetary policy rule in place (Figure 6). The crowding out effects of an increase in interest rates in response to a fiscal impulse clearly exist, as the multiplier falls by 20% in the first year when they are introduced. However, in neither case is the multiplier much above a half, with the crowding out we observe coming almost entirely from the very open nature of the economy. Not only does a lot of the increase in demand leak into imports, but also any positive impact on prices and competitiveness has a large effect on trade, as competitiveness elasticities are relatively high. The existence of rational expectations and a policy response mean that after a solvent fiscal shock the economy returns to its supply determined equilibrium, which is does not quite manage in the backward looking no response diagnostic simulation.

Figure 6. Fiscal Multiplier in Hungary with Fixed and Floating Exchange Rates

Y percentage difference from baseline



Our next three simulation are all solved in full forward mode, with the exchange rate jumping in response to the fiscal expansion because interest rates respond. The Hungarian and Czech exchange rates both jump by about ½ percent and the interest rate jumps by 0.2 percent (Figures 7 and 8). Output in both countries increases by around 0.4 percent. The Polish economy is a little more closed, in part because it is larger, and as a result the multiplier is larger with output rising by 0.6 percent (Figure 9). The interest rate response is therefore also larger, and the exchange rate jumps by 1.0 percent, as compared to 0.4 and 0.55 percent for the Czech Republic and Hungary respectively.

It is interesting that in these small open economies with a Taylor Rule prices do not rise in response to the shock. A fiscal shock raises demand, closes the output gap, and puts upward

pressure on interest rates. As a result the exchange rate appreciates (the dollar rate falls) and this puts downward pressure on prices. The fall in inflation is not, with our parameters in the policy rule, enough to offset the effects of output. Clearly this result can be changed by changing the rules, but the parameters we use are standard ones.

Figure 7. Impact of Fiscal Expansion on Hungarian Key Indicators

percentage difference from baseline (absolute difference for interest rates)

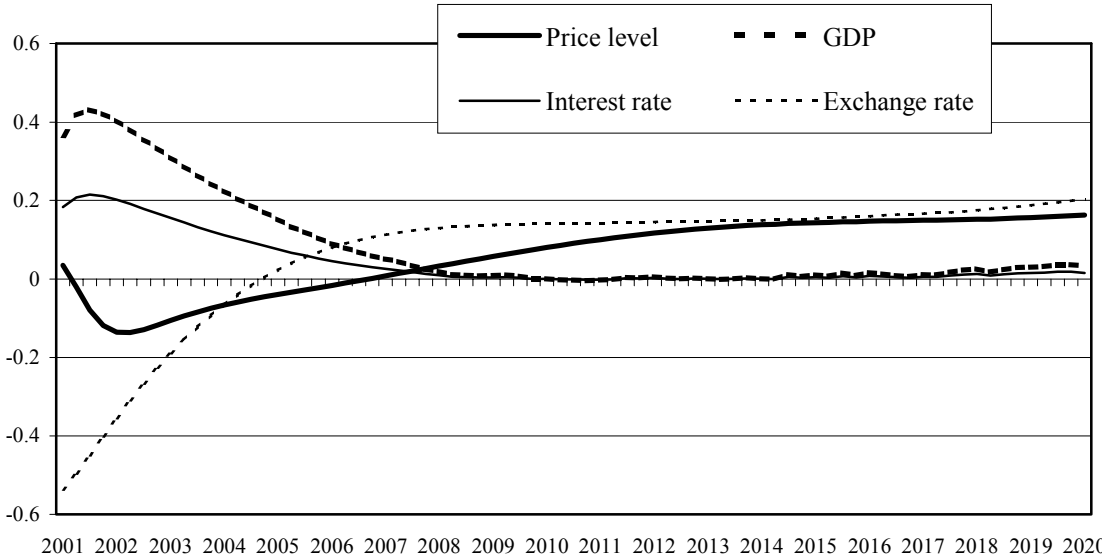


Figure 8. Impact of Fiscal Expansion on Czech Key Indicators

percentage difference from baseline (absolute difference for interest rates)

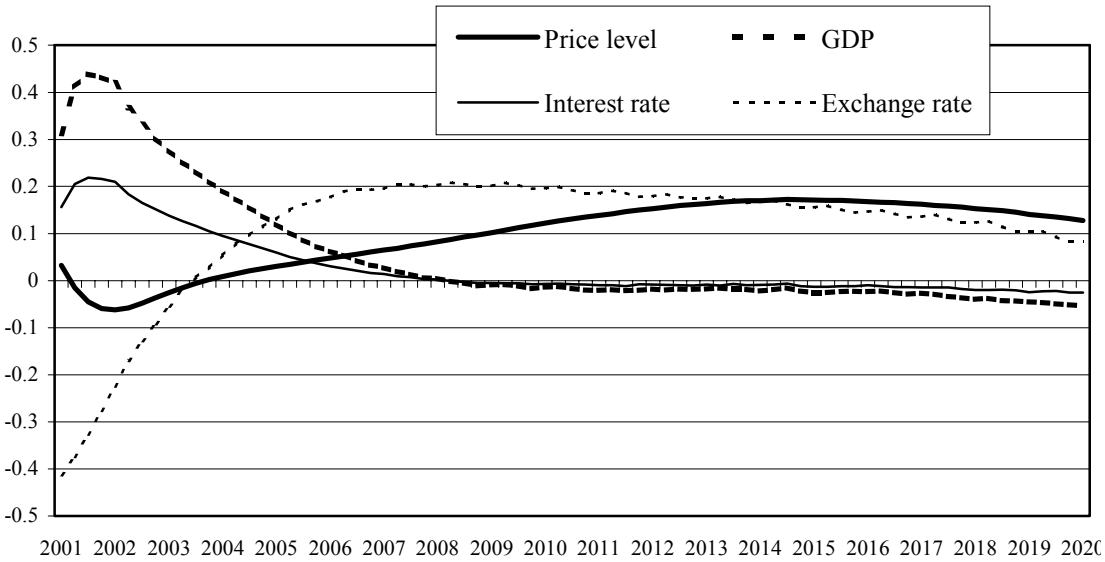
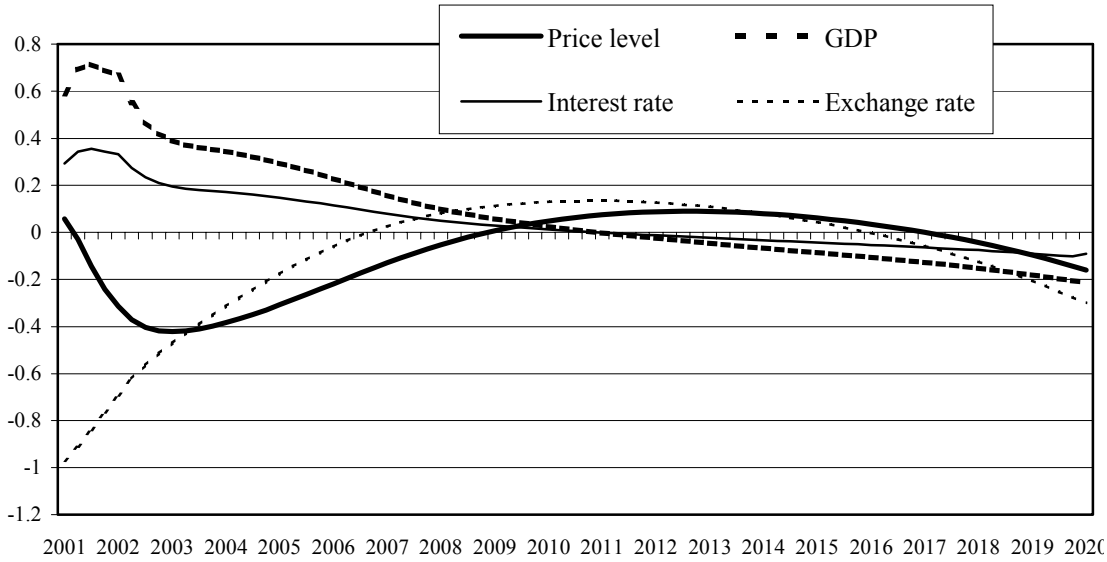


Figure 9. Impact of Fiscal Expansion on Polish Key Indicators

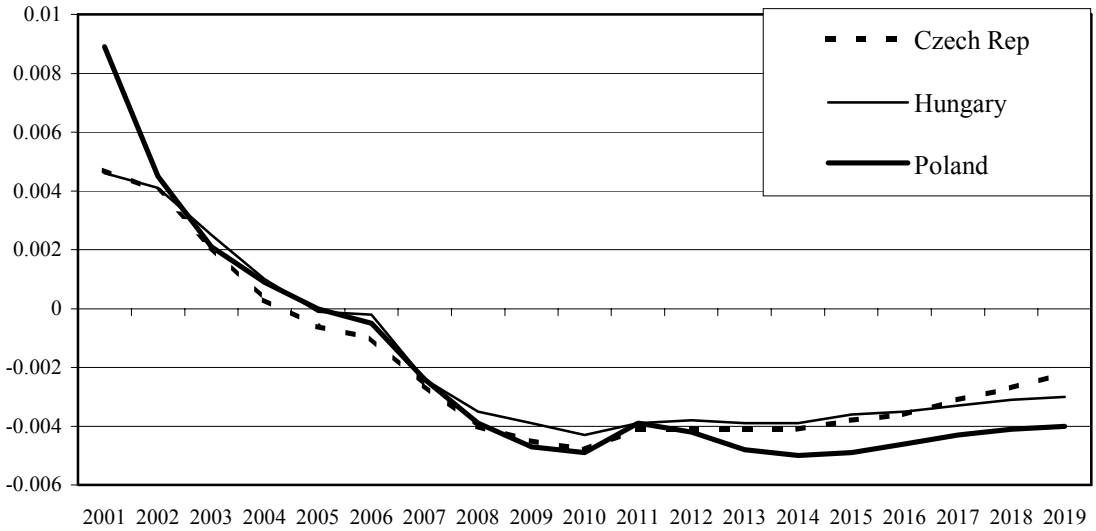
percentage difference from baseline (absolute difference for interest rates)



The impact on the EU of a fiscal expansion in one of the accession countries is small. Poland has a slightly bigger impact on the EU initially, given its size. Output in the EU expands slightly in the first five years after the shock, but ultimately the impact on output is contractionary reflecting higher inflation and the consequent rise in interest rates.

Figure 10. Impact of Accession Country Fiscal Expansion on EU GDP

percentage difference from baseline



VI. Conclusions

This paper analyses current policy choices facing the candidate countries for EU accession using newly developed econometric macromodels of five EU accession candidates. The models allow for endogenous growth, and they have been incorporated into an existing global econometric model (NiGEM). This allows long-term projections to be made consistently with expected developments in other economies and allows full feedbacks with the rest of the world so that we can understand impacts on existing EU members as well as the candidate countries. The models were constructed using panel estimates, imposing common parameters across countries where justifiable, but allowing for country-specific parameters where there is evidence of significant differences in behaviour. This allows the model to reflect the different institutional structures in each economy. In constructing the models, we have taken special care to consider the roles of openness and foreign investment on productivity and growth.

The models can be used for short-term forecasting as well as for various forms of policy analysis. In order to undertake effective policy analysis we have to be able to use the assumption that agents can look forward and that expectations are rational. Our fiscal policy analyses utilise these assumptions, which are central to the analysis of one of the major policy problems facing these economies. Under a flexible exchange rate regime, a fiscal contraction would lead to a small fall in output and a significant depreciation of the exchange rate. It would also lead to a small temporary rise in prices as the effects of the depreciation feeds through. This pattern is common in small open economies with large trade elasticities. Hence the implications for the Czech Republic, which suffers from a large budget deficit, of meeting the fiscal guidelines associated with EMU membership may not be as severe as they first appear.

The use of rational expectations for policy analysis requires that the modeller construct a coherent forward base for about 20 years to run off. In order to find a solution, it is also important that the model contains an equilibrium growth path and has the feedbacks to return to that real equilibrium. This allows us to use the model to look at the determinants of growth and undertake policy analyses on medium term issues. Our work has identified a need for policies to encourage FDI in the economies. Increasing the speed of financial liberalisation can help achieve this goal. Economic and financial liberalisation is one of the areas that the EBRD indicates is still in need of improvement in order for the economies to attain a structure of advanced market economies. Our work has helped quantify the importance of these measures to medium-term growth prospects. Speeding the pace of economic liberalisation will help attract foreign direct investment to these economies, raising productivity and growth. A 25 per cent rise in the stock of FDI over 15 years is associated with a 3 per cent rise in the level of output.

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Appendix A. Variable Definitions

BPT	Balance of payments transfers, US$ Mn
BUD	Gen. government budget surplus, Mn domestic currency
C	Private consumption, 1995 prices, Mn domestic currency
CBR	Current balance as % of GDP
CBRT	Current balance Target
CBV	Current balance, US$ Mn
CED	Consumer expenditure deflator, 1995=100
COMP	Total compensation, Mill domestic currency
CPI	Total CPI
CPIA	Administered CPI
CPINA	Not administered CPI
CRAWL	Crawling PEG rate
CTAX	Corporation tax receipts, mn domestic currency
CU	Capacity Utilisation
DEBT	Government debt stock, mn domestic currency
DS	Stock building, mn 1995 domestic currency
E	Total employment, Thousands
EBRD	Average EBRD Indicator
EE	Employees in employment, Thousands
ELR3M	Euro Area Short-Term Interest Rate
ELRX	Euro Area Exchange Rate
EQP	Equity prices, 1994=100
EQPR	Rate of return on foreign liabilities
FDIS	Stock of FDI, real domestic prices
GA	Gross foreign assets, US$ Mn
GBR	Government balance, per cent of GDP
GBRT	Target government budget ratio
GC	Gov. consumption, mn 1995 domestic currency
GI	Gov. investment, mn 1995 domestic currency
GIP	Government interest payments, Mill domestic currency
GL	Gross foreign liabilities, US$ Mn
IPDC	Interest, profit, dividend Cred, US$ Mn
IPDD	Interest, profit, dividend Deb, US$ Mn
IPREM	Interest rate premium
KG	Capital stock, public sector, 1995 domestic currency
KP	Capital stock, private sector, 1995 domestic currency
KPDEP	Depreciation rate
LF	Labour force, civilian, Thousands
LIABS	Gross liabilities personal sector, Mn domestic currency
LR	Long term interest rate
MGI	Imports of goods, volume, 1994=100
MGV	Imports of goods, value, US$ Mn
MISC	Miscellaneous financial assets, mn domestic currency
MSER	Imports of services, US$ Mn
MTAX	Miscellaneous Taxes, mn domestic currency
MVOL	Imports of goods and servs, mn 1995 domestic currency
NASHARE	Non-Administered share of CPI

NW	Net wealth, personal sector, mn domestic currency
OPI	Other personal income, Mill domestic currency
P	Output price at factor costs
PI	Personal income, Mill domestic currency
PMA	Imports of goods, AVI, domestic currency 1994=100
PMG	Import price of manuf, domestic currency 1994=100
PREM	Equity price risk premium
PSI	Private Sector Investment, Mn 1995 domestic currency
PXA	Exports of goods, AVI, US$, 1994=100
PXG	Export price of manuf, US$, 1994=100
PY	GDP deflator, 1995=100
R3M	3 month interest rates
REFEX	Real effective exchange rate, 1994=100
ROR	Rate of return on foreign assets
RULT	Unit labour costs relative to CEE, 1994=1
RX	Exchange rate, units per US$
S	Export markets index, 1994=100
TAX	Personal tax, Mill 1995
TFE	Total final expenditure, mn 1995 domestic currency
TRAN	Transfers, mn domestic currency
U	Unemployment, % rate
ULT	Trend unit labour costs, Domestic curr, 1994=100
USER	Real user cost of capital
WDCED	Weighted Average Of Global CED's
WDGA	Global Sum Of Gross Assets
WDGL	Global Sum Of Gross Liabilities
WDIPDD	Global Sum Of Interest Payments
WDP	Weighted Average Of World Commodity Prices
WDPXG	Weighted Ave Of Global Manufacturing Export Prices
WDREV	Revalation Of Global Liabilities
WDRULT	Weighted Average Of Global ULT's
WDRX	Weighted Average Of Global Exchange Rates
XGI	Exports of goods, volume, 1994=100
XGV	Exports of goods, value, US$ Mn
XSER	Exports of services, US$ Mn
XVOL	Exports of goods and servs, Mn 1995 domestic currency
Y	G.D.P., Mill. domestic currency 1995 prices