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OFFSHORING, RELOCATION AND THE SPEED OF CONVERGENCE IN THE ENLARGED EUROPEAN UNION****

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ABSTRACT: Economic convergence of the new member states (NMS) of the EU towards the old EU countries (EU-15), not only in terms of real income, but also in nominal terms, is of paramount importance for the whole of the EU. We build a dynamic CGE model, starting from the Balassa-Samuelson two-sector framework, but modify and enlarge it with forward-looking investment, consumption, and labour mobility behaviour to address several other issues like welfare and sustainability in terms of foreign indebtedness. At the same time we evaluate the impact of convergence on the EU-15 countries also, by endogenising offshoring and the related FDI flows from them to the NMS. Thereby we identify various effects of relocation and globalisation on the EU-15 enlarging the standard set of effects of globalisation and demonstrate the key role of their dynamic nature in the process of convergence. We find that in a general equilibrium setting fears of large adverse effects of a relocation of EU-15 manufacturing to the NMS are not well founded. In contrast, offshoring appears to be a win-win case for both the EU-15 and the NMS in terms of real income. The convergence of the NMS is fairly rapid, but will involve a persistent rapid inflation rate.

KEY WORDS: Convergence, relocation, new member states, EU-15

JEL codes: F15, F21, F43

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TIIVISTELMÄ: EU:n uusien jäsenmaiden taloudellinen konvergenssi kohti vanhoja (EU-15) ei ainoastaan reaalitulojen, vaan myös hintojen ja palkkojen osalta on tärkeä kysymys koko EU:lle. Rakennamme dynaamisen yleisen tasapainon dynaamisen mallin lähtien liikkeelle Balassan ja Samuelsonin kahden sektorin mallista, mutta lisäämme ja muunnamme sitä eteenpäin katsovilla investointien, kulutuksen ja työvoiman liikkuvuuden yhtälöillä, jotta voimme käsitellä muitakin kysymyksiä kuin kasvua ja inflaatiota kuten hyvinvointia ja ulkoista velkaantuneisuutta. Niinikään tarkastelemme konvergenssin vaikutusta EU-15 -maihin tekemällä endogeenisiksi tuotannon ulkoistuspäätökset ja niihin liittyvät suorien sijoitusten virrat EU-15 -maista uusiin jäsenmaihin. Tällä tavalla identifioimme tuotannon siirron vaikutukset ja laajennamme sen kirjallisuudessa tavanomaisesti eriteltyjä vaikutuksia ja kuvaamme niiden dynaamista roolia konvergointiprosessissa. Tulosten mukaan pelot tuotannon ulkoistamisesta EU-15 -maista uusiin jäsenmaihin ja sen laajoista haitallisista vaikutuksista eivät ole perusteltuja. Päinvastoin saamme tuloksen, että ulkoistaminen tuottaa molemmille alueille hyötyä reaalitulojen muodossa. Uusien jäsenmaiden konvergenssi on suhteellisen nopea, mutta pitää sisällään melko sitkeän inflaatiokehityksen.

ASIASANAT: konvergenssi, tuotannon ulkoistaminen, uudet jäsenmaat, EU-15

JEL koodit: F15, F21, F43

1 INTRODUCTION

Globalisation is the key economic driving force in today's world, leading to intensified international economic integration on a global scale. This process contains, as previous trends of integration, a truly dynamic pattern with forces leading to shifts in the centres of gravity of global economic activity, but at the same time also a process of convergence both in real and nominal terms which may be beyond previous comparison. Imagine as a final outcome a widespread convergence of the global economy in terms of income levels. This possibility would in effect turn around many aspects of the current global economic scene that are based on wide disparities in incomes and costs. This means that the globalisation process has to be analysed using two central approaches: finding out the general equilibrium at the level of the global economy and in a time dimension in order to be able to depict its subsequent path.

Also in research on European integration the focus has shifted from the effects of EU enlargement to the evaluation of convergence in income levels and inflation differentials of the new member states (NMS) towards the old (EU-15).[1] This process is of paramount importance to the NMS, but it is also important for the homogeneity of the Union and of substantial significance to the EU-15 countries as well, where a concern has emerged that industry relocation to the new member countries, where production costs are much lower, may pose a threat to the former.[2]

It is straightforward and commonplace to make basic mechanical calculations of the catching-up process of the new member countries towards the EU-15. More analytical approaches attempt to evaluate the role of trade and integration on growth and, consequently, convergence of the NMS' income levels towards those of the old EU countries. In this line of research there are, on the one hand, purely empirical studies that are usually based on cross-country growth regressions where the integration and trade effects are usually captured by different dummy variables or openness measures (e.g. Dollar 1992, deMelo, Panagariya and Rodrik 1993, Edwards 1993, Harrison 1995, Sachs and Warner 1995 and Henrekson, Torstensson and Torstensson 1996, and more recently, Kaitila 2004, Noguer and Siscart 2005 and Chang, Kaltani and Loayza 2005). The conclusion on the role of regional economic integration behind growth is somewhat ambiguous in this literature but, in general, trade openness and economic growth are in a positive relationship with each other. Moreover, there is evidence that trade openness has an effect on income disparities. Ben-David (1996) and Ben-David and Kimhi (2000) provide evidence that an increase in the extent of trade among groups of countries tends to decrease intra-group income disparities and increase the speed of convergence. Furthermore, by breaking up the groups into pairs, Ben-David and Kimhi find that exports from a poorer country to a richer one and imports from a richer country to a poorer one have boosted convergence. This result is relevant also in the context of European integration especially after the Eastern enlargement.[3]

The studies listed above are normally made in terms of real income per capita only. But of equal significance for the EU-15 and firms offshoring their activities to low-cost countries is

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1 See e.g. Kaitila, Alho and Nikula (2007) for a recent aggregative analysis of convergence in a European context.

2 See Euroframe (2005), OECD (2007a,b) and Denis, Mc Morrow and Röger (2007) for surveys on globalisation and relocation issues.

3 For an extensive survey on theoretical and empirical convergence literature, see De La Fuente (2000) and in the context of EU integration Kaitila (2003).

nominal convergence in relative wages and prices, i.e. real appreciation. The inflationary development in the new member countries is also vital, e.g., from the point of view of ECB monetary policy and the entrance of the new member countries into the Economic and Monetary Union. See Figures 1 and 2 on real and nominal convergence to date.[4]

The basic tool for such a comprehensive evaluation of convergence is the seminal Balassa-Samuelson model (or the Scandinavian model of inflation, see Klau and Mihaljek 2003), which divides the economy into two sectors, the open (tradable goods and services) and closed sector (non-tradable goods and services). This is also the starting point in our paper. We, however, modify and extend the basic model in several ways, i.a., with the key result in empirical growth literature, which states that the GDP growth rate is not constant over time, but that it is positively related to the initial gap in income levels so that poorer countries grow faster than wealthier ones, i.e. there is so-called β-convergence (see e.g. Barro 1991). Taking this fact into account has a major impact on our view of the speed of future convergence of the NMS.

But altogether, this basic framework is still deficient in discussing many important issues of convergence. Capital accumulation is an important element to consider. FDI inflows have been an important channel for the NMS to acquire modern technology and business practices but also to finance their often large current account deficits so that the new member countries have not themselves had to finance the whole burden of their capital accumulation. This has delivered a marked welfare gain to them. Accordingly, we shall endogenise cross-border factor flows, both capital flows through FDI and labour flows through migration, and allow for spillovers on total factor productivity through FDI from the EU-15 to the NMS. Related to this, Baldwin and Seghezza (1996a,b) discuss and analyse trade-induced investment-led growth, which combines old growth models and new trade (imperfect competition) models, and trade-induced productivity-led growth, which combines new growth models with new trade (imperfect competition) models. These papers argue that there is strong evidence of the former, having the Iberian EU enlargement as an example, but do not find strong evidence or obvious examples of the latter. The Eastern enlargement and the development in the NMS fits the former potentially as well.

The impact of the Eastern enlargement on the EU-15 and the NMS has been evaluated in a computable general equilibrium framework earlier by e.g. Baldwin, Francois and Portes (1997), Keuschnigg and Kohler (2002), Heijdra, Keuschnigg and Kohler (2004), Sulamaa and Widgrén (2004) and Vaittinen (2000, 2004). Keuschnigg and Kohler (2002) and Heijdra, Keuschnigg and Kohler (2004) built a dynamic model, and Vaittinen used a dynamic version of GTAP, whereas Baldwin, Francois and Portes, and Sulamaa and Widgrén used a static version of the GTAP model. A common conclusion in all these studies is that the old EU countries obtain relatively small gains from EU enlargement even in the long run, but the NMS obtain considerable gains especially in the long run and when all integration effects, i.e. trade liberalisation, increasing foreign investment, EU budget transfers and migration, have been taken into account. In Vaittinen (2004) the long-run gain in NMS' GDP that is due to the first three effects is 15 per cent. Outward migration decreases the impact to 8 − 13 per cent, depending on the propensity to migrate. From the point of view of the EU-15 the figures are a loss of 0.2 per cent and a gain of 0.2 − 1.5 per cent, respectively. The study thus indicates GDP convergence between the EU-15 and NMS although that is not the prime purpose of this study by Vaittinen.

In the extension to the basic framework, we consider not only the income path, but also the consumption behaviour of the new member countries by introducing a forward-looking

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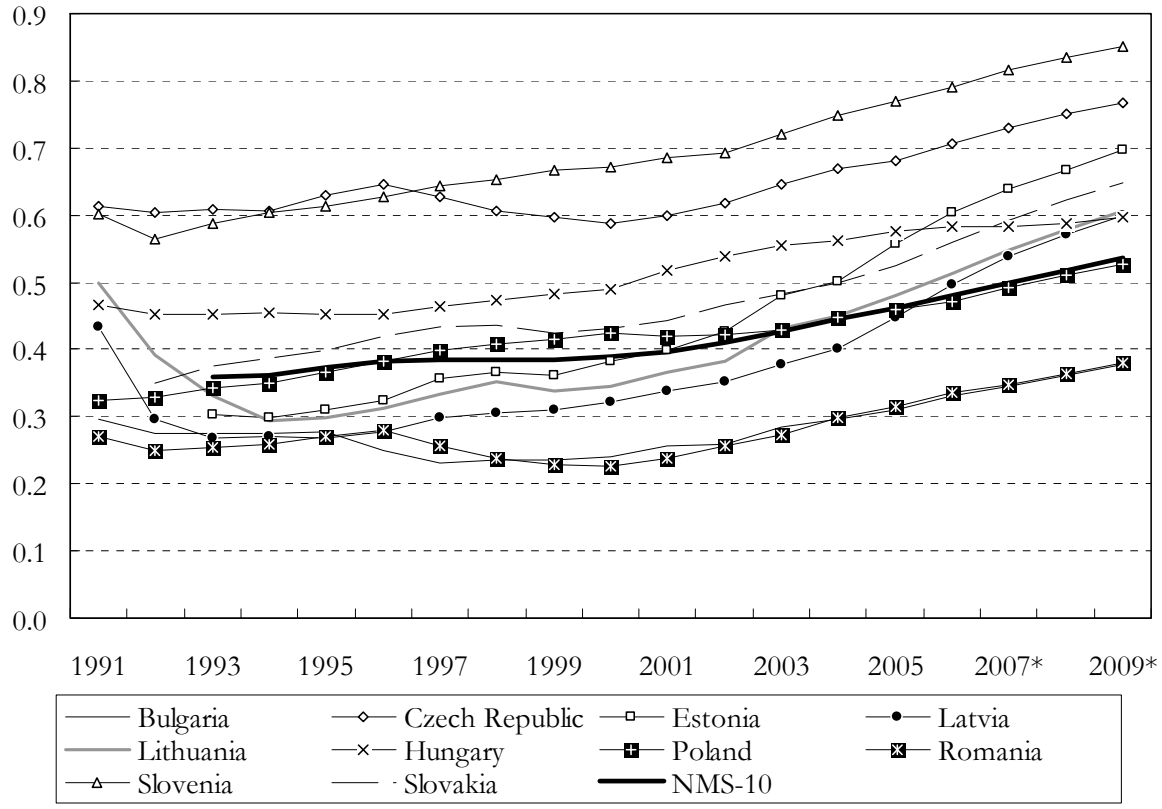
[4] Throughout the paper we refer with the term NMS, as in Figures 1 and 2, to the average of the 10 new member states joining the EU in 2004 and 2007, except Cyprus and Malta, which solution is caused by data limitations concerning the latter countries.

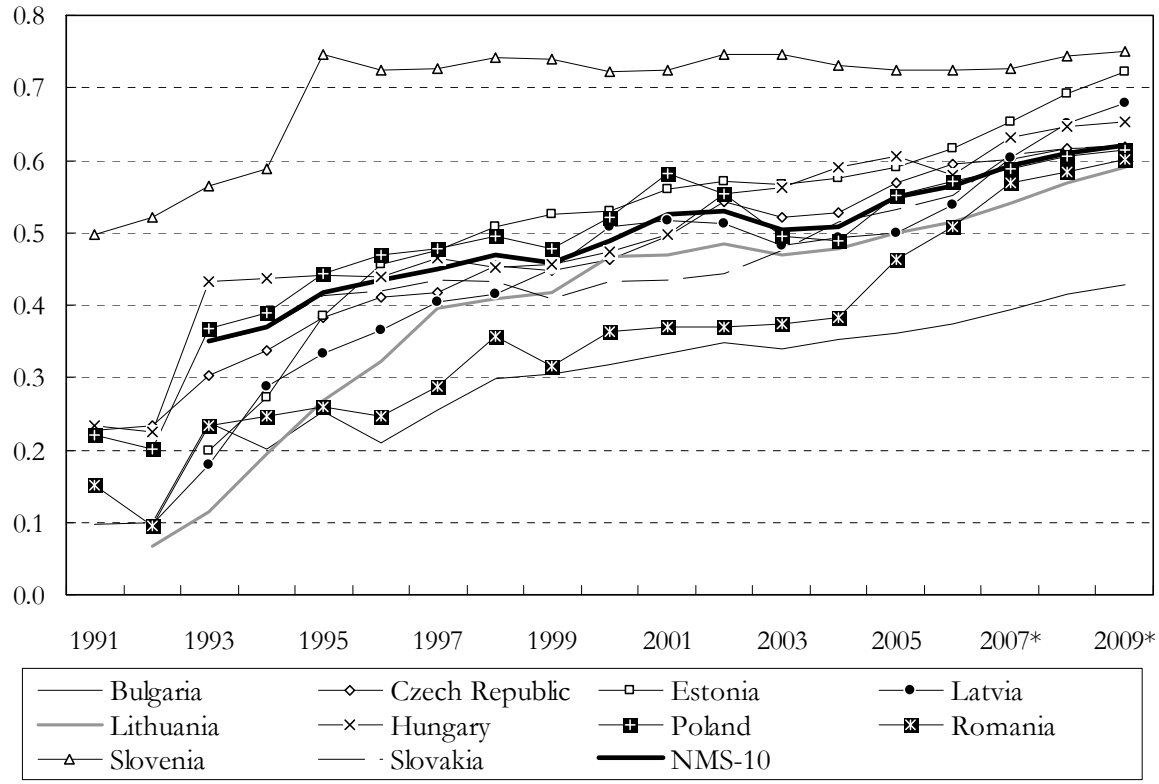
consumption function. This is important in the sense that a part of the consumers in the new member countries discount the future path of convergence of their real wage rise in their consumption behaviour already today, which leads to initial current account deficits. This way we are able to tackle the important sustainability issue of convergence in terms of foreign indebtedness of the NMS, but at the same time it also has an effect on resource allocation within the NMS and thereby on growth and inflation, as we shall see below. As indicated by van de Klundert and Smulders (2001) international lending and borrowing can have an impact on convergence and overtaking of the rich countries by the poorer. The argument runs in the manner that the rich countries start to invest abroad and not in the home economy which will shift capital accumulation and lead to overtaking by the poorer partner. Here we widen this possibility in the sense that borrowing leading to intensive consumption of the non-traded goods can also lead to slower convergence.

Figure 1. Real convergence: GDP per capita (at PPP) in the NMS, EU-15 = 1



Source: European Commission.

Figure 2. Nominal convergence: Price level (ratio of current exchange rate to PPP exchange rate) in the NMS, EU-15 = 1



Sources: OECD; International Monetary Fund, World Economic Outlook Database.

Our next extension is to build a framework to evaluate the impact of NMS convergence on the EU-15 countries, a typically neglected issue in the Balassa-Samuelson context. In the analysis of the economic relations between the EU-15 and the NMS, the aim of this paper is to take recourse to the recent approaches of outsourcing, the theory of trade in tasks, see Grossman and Rossi-Hansberg (2006a,b) and Baldwin (2006), and enlarging this analysis by adding some new effects of international outsourcing, and especially specifying these in a structural numerical framework, and analysing their effects both on the home and recipient countries of offshoring.

This new theory of globalisation has identified three basic effects related to international outsourcing: productivity, job and price effects. These are typically analysed using a two factor framework, distinguishing skilled and non-skilled workers, but they can be identified also in the case of a single type of labour as remarked with respect to productivity by Baldwin (2006, 39). The productivity effect emerges because labour can be allocated to its most productive use and the productivity of the outsourced labour is thereby enhanced. The price effect is derived from the fact that the price of the output, the cost of which is reduced, will also go down. The job effect simply tells that outsourcing displaces workers from their previous jobs and will lead to a downward adjustment in real wages. In contrast to these seminal papers, we endogenise the offshoring decisions as called for in OECD (2007b), and distinguish offshoring both in the final and intermediate goods so that we explicitly model here the vehicles of offshoring through vertical and horizontal FDI flowing from the EU-15 to the NMS. In addition, we explicitly model the role of capital input, so far omitted from an explicit consideration in the connection of offshoring. Thereby, we are able to identify some further effects of globalisation. The main one is the competitiveness effect which stems from the fact that increased outsourcing to low-cost coun-

tries leads to an increase in productivity and profitability of the EU-15 firms. The firms can use this increase in their capital investment to improve their access in the global markets. On the other hand, horizontal and vertical FDI linked to offshoring will lead to an increase of the supply of tradables from the enlarged EU to the global markets, which is the price effect. Labour mobility is the last interaction between the regions to be analysed. In addition, we simultaneously analyse the effects of offshoring also on the recipient country, an item usually neglected in these analyses so far.

Altogether, our analysis gives a richer picture of the globalisation process, although in the explicit modelling we analyse the convergence process of the enlarged European Union. All in all, a dynamic two-region CGE model with forward-looking consumption, investment, FDI, offshoring and labour mobility decisions is built with elements of endogenous growth, as FDI inflow boosts total factor productivity in the NMS.

In order to analyse more closely the relocation and offshoring issue, we build two scenarios of convergence with the aid of our two-region CGE model: the baseline where we allow offshoring and the FDI stock to grow in response to the lower cost in the NMS. We contrast this to an alternative scenario where the FDI stock of the EU-15 in the NMS remains in real terms throughout the period to 2030 at the level where it was in 2005. The key results of this exercise are that an inflow of FDI and more intensified offshoring is a win-win case, where both the EU-15 and NMS gain, the latter more, in terms of GDP and real income. The effects on GDP are very small for the EU-15, but clearly higher in terms of national income. This helps to put the likely magnitude of international outsourcing activities within Europe in its proper place as a factor influencing the European economy. However, there is a polarisation in this connection so that increased offshoring leads to a slight reduction in real wages in the EU-15 and a more marked rise in profits.

The paper is organised as follows. In Section 2 we formulate a more complete model than the basic Balassa-Samuelson model for the NMS with endogenous capital accumulation, forward-looking consumption behaviour and labour mobility. In Section 3, we combine the EU-15 countries into the model by considering what effects the relocation of production into the new member countries will have on the EU-15. Section 4 outlines the global linkages and Section 5 presents the calibration of the model and the key results of the convergence simulations. Section 6 concludes.

2 A DYNAMIC CGE MODEL OF NMS CONVERGENCE

The Balassa-Samuelson two-sector model is the standard tool to analyse both real and nominal convergence as it links them neatly together. This is also our starting point. However, as stated above, this framework is fairly simple and does not allow for elaboration of several key aspects of convergence. For example, it does not explicitly deal with optimal growth, capital accumulation and foreign FDI flows, nor the internal resource allocation between the sectors identified in the model, i.e. the open (tradables, T) and closed (nontradables, N). Although output is very important, welfare is based more on consumption, which is typically optimised intertemporally. Also labour migration and the impact of convergence on the point of reference, here the EU-15, are ignored. These are all very important issues linked to the convergence path of the NMS and justify the construction of a more articulated growth model for the two regions.

We build a neoclassical growth model retaining the two sectors in the new member countries with all markets operating under perfect competition and full employment. We separate the production sectors so that output in the sheltered sector is based on domestic demand. Capital and labour is used in both sectors. We incorporate forward-looking behaviour in decisions involving intertemporal choice with respect to consumption, investment and labour mobility. However, the decision on capital input in the sheltered sector follows passively from output in this sector.

Total production (GDP) in the NMS is the sum of four items: production by domestic firms in the open and sheltered sectors, and production linked to both horizontal and vertical FDI by EU-15 firms operating in the NMS. There are thus two types of firms in the open sector in the NMS, domestic and foreign owned, while in the nontradable sector there are only domestic firms. The structure of production in the model is depicted in Figure 3. The items related to FDI are elaborated in more detail in Section 3.

We define a Cobb-Douglas production function for the domestic tradable (T) sector with Q_T being production, K_T capital stock, L_T labour input and A_T total factor productivity (TFP),

$$Q_{Tt} = A_{Tt}F(K_{Tt}, L_{Tt}) = A_{Tt}K_{Tt}^{\alpha}L_{Tt}^{1-\alpha}\ , \tag{1}$$

where $0 < \alpha < 1$. Optimal investment behaviour is given under the following quadratic cost of adjustment AC_T, see Hall (2004), to be

$$\begin{aligned} AC_{Tt} &= \frac{a_T}{2}\left(\frac{I_{Tt}}{K_{T,t-1}} - \delta\right)^2 P_{Tt}K_{T,t-1} \\ I_{Tt} &= K_{T,t-1}\left(\frac{\lambda_{Tt}-1}{a_T} + \delta\right) \\ \lambda_{Tt} - 1 &= \left[\rho_t - (r_{Tt} + \delta)\right] + (1 + r_{Tt})^{-1}(\lambda_{T,t+1} - 1), \end{aligned} \tag{2}$$

where I_T is investment, P_T the price of tradables, λ_T the shadow price of capital, a_T the cost of adjustment parameter, δ the rate of depreciation, ρ the real rate of return (marginal product) on the current capital stock and r_T the real interest rate measured in prices of tradables. We assume that there are no adjustment costs related to labour input.

The internal resource allocation between the two production sectors is important for the convergence process and takes place through the factor markets simply as follows. The demand for labour and capital in the nontradable sector are based on the demand for the domestic goods produced in this sector. The demand for the consumer goods produced by the open and closed sectors is based on an instantaneous CES preference function, which implies that

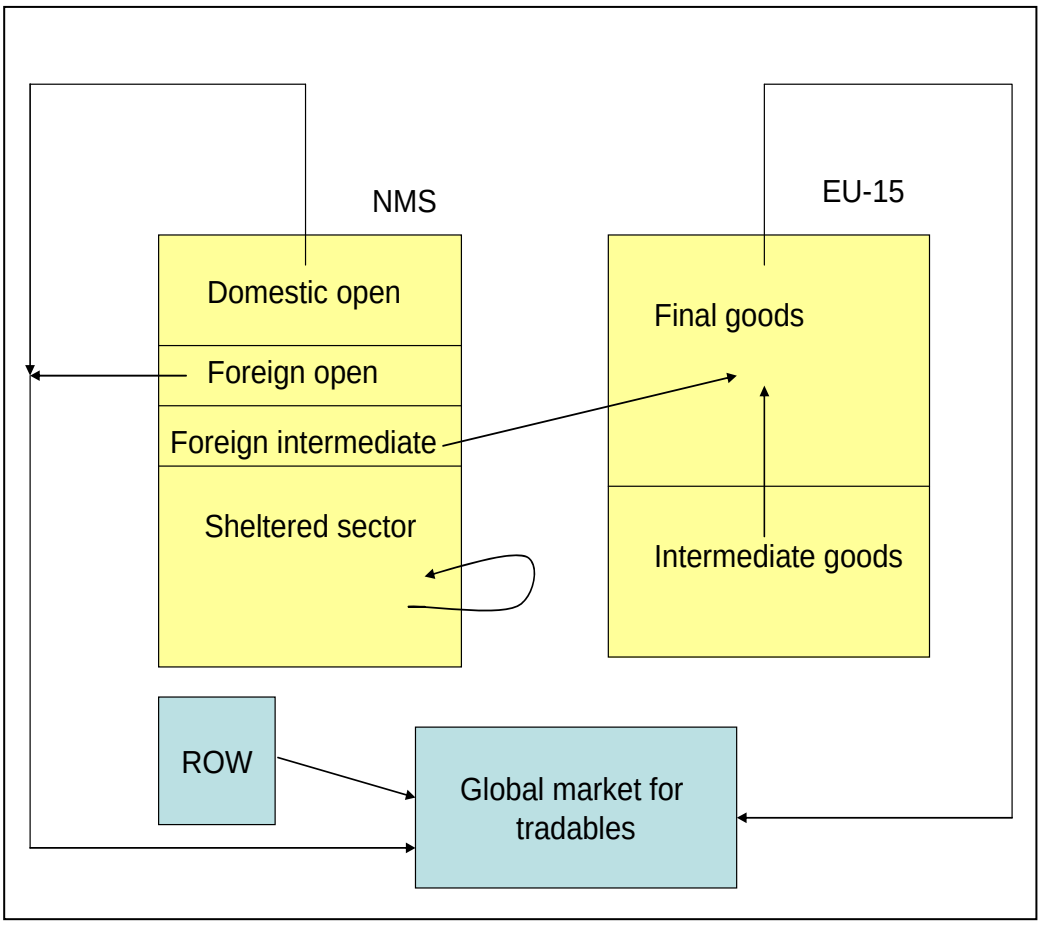
$$Q_{Nt} = \tau_N C_t \left[\frac{P_{Nt}}{P_t}\right]^{-\varphi}, \tag{3}$$

where Q_N is the production of non-tradables, C is aggregate consumption, determined by intertemporal optimisation, see below, $0 < \tau_N < 1$ is the preference parameter, φ the elasticity of substitution in consumption, P_N the price on non-tradables and P is the aggregate price level. The labour input L_N and capital input K_N in the closed sector are then based on the demand for factors,

$$L_{Nt} = \frac{l_{Nt}Q_{Nt}}{A_{Nt}}, K_{Nt} = \frac{k_{Nt}Q_{Nt}}{A_{Nt}}, \tag{4}$$

where l_N and k_N are the unit factor requirements and A_N is the total factor productivity in the nontradables sector. The domestic factor allocation between the sectors takes place without frictions so that the remainder of the labour force in the NMS, not employed in the sheltered sector, is employed in the open sector. The NMS can export the rest of their open sector production, i.e. the part that is not consumed at home, at the international (world market) price level P_T, which is elaborated in Section 4.

Figure 3. The overall production structure and product flows in the model



It is important to recognise that the future convergence path of the NMS is taken into account, not only by firms in their investment behaviour, but also by local consumers. Next, we will specify forward-looking consumption behaviour, based on intertemporal optimisation. This is important because consumers in the NMS, or a part of them, discount the future convergence path of the real income and use it already today in their consumption behaviour through borrowing. This has an impact on the current account and the sustainability of the convergence process in the NMS, too.

The financial market in the model operates so that households see through the corporate veil in the sense that they first of all own that share of the capital stock in the open sector which is not owned and financed by foreigners and are also responsible for the debts of these firms. Consequently, their consumption behaviour is based on financial assets less the aggre-

gate national foreign debt, denoted by *B*, not including the debts related to inward FDI. Expected human wealth *H*, i.e., the discounted stream of future real labour income per worker is equal to

$$H_t = \frac{W_t}{P_t} + \left(1 + r_t\right)^{-1} H_{t+1}, \tag{5}$$

where W is the wage rate in the NMS and r is the real rate of interest measured now in the overall price level P in the NMS.

There is an initial pressure in the NMS towards borrowing by the forward-looking consumers to smoothen their consumption path and thereby to run a deficit in the current account. However, it would not be sensible to assume that the consumers can and will behave like this because the size of the current account deficit would then become unsustainable and the initial deficit would be much higher than the actual, see Section 5.1. This situation of a limited role for borrowing also reflects the small role of human capital as collateral. In fact, as noted by Barro, Mankiw and Sala-i-Martin (1995), only the capital stock owned by domestic agents, i.e. $K - K_{FDI}$ can serve as collateral for foreign debt.

So, we assume that consumers in the new member countries are either forward looking or liquidity constrained. In the standard manner, consumption by the former group is based on expected human capital and current financial net wealth so that total real consumption C_1, if all consumers were forward looking, would be given by

$$C_{1t} = \theta\left(H_t L_t + E_{t-1} - B_{t-1}\right), \tag{6}$$

where θ is the rate at which wealth is consumed, L is the total labour force in the NMS and E is the value of equity (shadow price multiplied by the volume of the capital stock) related to the domestically owned capital stock. We have to assume that in the long run the growth of real wages is lower than the real interest rate in order to get a solution for the equilibrium human capital in (5). We further fix the rate θ to be equal to $r^* - g_e^* > 0$, where r* is the real rate of interest in the EU-15 and g_e^* is the potential growth rate of the EU-15 economy. Consequently, after convergence has been completed vis-à-vis the EU-15, in a steady state equilibrium, consumption of human wealth and the rate at which it accumulates are the same. It will then (roughly) correspond to the current situation in the EU-15.

Current aggregate real income Y is determined by

$$Y_t = Q_t - i_t^* B_{t-1} - \rho_{FDI,t} K_{FDI,t-1} + U_t, \tag{7}$$

where Q_t is the aggregate GDP, i^* is the nominal interest rate on foreign debt, ρ_{FDI} is the rate of return on FDI in the NMS and U is the budgetary transfer to the NMS from the EU-15 through the EU budget. This item will be specified in more detail in Section 5.1.

Consumption expenditure C_2 if all the consumers were of the liquidity-constrained type would be simply given by

$$C_{2t} = cY_t, \tag{8}$$

where c is the constant propensity to consume out of current income. Now let h denote the fixed share of forward-looking consumers in total population and $\left(1-h\right)$ the share of liquidity-constrained consumers. Aggregate consumption C is then reached by weighing (6) and (8) with these weights h and 1–h.

Net foreign debt of the NMS accumulates through the current account deficit, which is by definition equal to the excess of domestic expenditure over domestic income. A part of it is financed by FDI inflows.

Labour supply and mobility in the enlarged EU has been set aside so far. For simplicity, we assume individual labour supply to be fixed, but aggregate labour force is endogenous through migration. Migration from the NMS depends on the expected gain from migration in the form of the future income in the new member countries compared to that in the EU-15 countries. Following Ottaviano (1999), the private cost of migration is modelled as an externality depending on the amount of people migrating, which is equated with the expected gain related to migration,

$$\frac{L_t - L_{t-1}}{\mu} = -G_t, \ \textit{with}$$
$$G_t = ((1-u_t)q_t^* - y_t) + (1+r_t)^{-1} G_{t+1}, \tag{9}$$

where L is the labour force in the NMS, $y = Y / L$ is the real disposable income per capita, q* is real income per capita in the EU-15 and $\mu > 0$ is a parameter describing the cost of migration, and u_t is the tax rate imposed on EU-15 labour to finance the transfers U to the NMS paid through the EU budget. G measures the expected future gain from migrating to the EU-15 from the NMS, relative to remaining in the NMS.

Let us then turn to TFP growth. We use the core idea in the literature on growth and convergence, which specifies the key notion that the growth rate of TFP is not a constant, but an increasing function of the gap in the per capita income levels, i.e. we use the hypothesis of the so-called β-convergence. Consequently, the NMS will grow faster than the wealthier EU-15 but this gap will diminish gradually over time. Let g_t be the growth rate of TFP in the NMS in year t. We specify the convergence process as

$$g_t = \beta_0 - \beta_1 \log \frac{q_{t-1}}{q^*_{t-1}}, \tag{10}$$

where β_0, $\beta_1 > 0$, where q is the real GDP per capita in the NMS. As a long-run condition, we specify that when catching up will finally be completed at time N, i.e. $q_N = q_N^*$, the growth rate of TFP in the new member countries will also have converged to that in the EU-15, i.e. $g_N = g_N^*$. This gives us the condition that in (10) $\beta_0 = g_N^*$, and we can calibrate the parameter β_1 from the condition that the initial growth rate g_0 of the new member countries is the actually realised one at the initial income gap.

Then consider the link between TFP and the inflow of FDI from the EU-15 and consider the impact of FDI on the productivity of domestic firms in the NMS through knowledge spillovers. This has been under intensive research recently, see e.g. Javorcik (2004) and Barr, Breedon and Miles (2004). There is also a technical argument related to the spillover. As supported by anecdotal evidence, foreign firms in the NMS are taken to produce with technology that is (almost) as advanced and thereby with productivity that is (almost) as high as in the EU-15 countries, but with lower costs. Below we assume that the firms in the NMS linked to vertical FDI are of this type. This will necessarily lead to a rise in productivity in the NMS over time if the stock of FDI grows over time. We assume that the deceleration of TFP growth, as specified in (10), applies similarly to the rise of productivity in both the open and closed sectors in the NMS, so that the initial gap in the growth rates between the two sectors applies all through the convergence process. Consequently, we specify for the TFP rise

$$A_{Tt} = A_{T,t-1}\left[1+\beta_0-\beta_1\log\left(q_{t-1}/q^*_{t-1}\right)+\left(\hat{a}_{T0}-g_0\right)\right]\left[1+\psi\frac{K_{FDI,t}-K_{FDI,t-1}}{K_{T,t-1}}\right], \qquad (11)$$

where $\psi > 0$ and $\hat{a}_{T0} - g_0$ is the initial growth differential between open sector TFP growth and that in the overall economy, assumed to be fixed over the convergence path. Specification (11) includes an element of endogenous growth, as TFP growth also depends on FDI inflows. In general, we assume that technology is freely transferable between and within the two regions.

We still need to specify the nominal side of the NMS economy. Following the Balassa-Samuelson model, the wage rate W is determined by profit maximisation in the open sector (we omit in the sequel the time subscript when not needed),

$$W = P_T(1-\alpha)A_T K_T{}^{\alpha} L_T^{-\alpha}. \qquad (12)$$

This wage rate applies to all four production sectors of the NMS economy as the labour market is homogeneous. The price level in the sheltered sector is given by (4) as

$$P_N = (l_N W + k_N(i+d))/A_N. \qquad (13)$$

By aggregating over the two sectors we can derive the overall price level P on GDP.

Let us finally make a remark on the nature of the convergence process and ask, whether the convergence of the NMS towards the income level of the EU-15 is inevitable, although we have envisioned it to be a natural long-run outcome. However, this parity in incomes is not quite so definitive, since it is possible that a low growth scenario realises so that the growth rate of productivity in the sheltered sector of the NMS is lower than the growth rate of GDP in the EU-15. If simultaneously the elasticity of substitution φ in consumption in (3) is low, more and more of the resources of the NMS will be absorbed into the sheltered sector through the equilibrium in the goods market. This would imply that the overall growth rate of the NMS will be reduced below that in the EU-15. Although this is not very likely, it is a real possibility. Also a high share of forward-looking consumers in (10) has an indirect effect on the speed of convergence, because the more the future convergence of incomes is discounted to affect present consumption, the bigger the sheltered sector and the slower the convergence and the higher the inflation rate in the NMS. A rapid inflation also lowers the real rate of interest in the NMS and thereby feeds to a higher initial level of the expected human capital leading to a higher rate of consumption. Evaluation of these issues requires a numerical assessment.

3 THE IMPACT OF OFFSHORING AND NMS CONVERGENCE ON THE EU-15

We then want to incorporate the EU-15 countries into the analysis as an endogenous block and see how the convergence process of the new member countries may affect them and vice versa. At times, the former raises a heated debate as to the relocation of firms and jobs from the EU-15 to the NMS and elsewhere and measures, both at the firm level to adjust to this pressure, and by policy makers to attract – or punish – firms to stay in the EU-15, are under

way. Therefore we have to describe those basic elements in the model through which growth and convergence of the NMS affects the EU-15 countries.

The two regions are open to the rest of the world so that both can export to the global market the remainder of their production not consumed in Europe at the price level which also depends on the convergence process as the EU is a fairly big player in the global market, see below Section 4. The nominal interest rate is set in the world capital markets for both regions under free flows of finance and taken exogenous. The real rates of interest then react to inflation in the manner explained above.

There are six basic factors of interaction between the NMS and the EU-15 which we consider. We follow the analysis in the recent literature on offshoring, see Grossman and Rossi-Hansberg (2006a,b), but try to enlarge it in several aspects. So, as an extension to this literature, we endogenise the offshoring decisions. First, there is an outflow of FDI, both vertical and horizontal, into the new member countries, which causes a relocation of production from the EU-15 countries so that their employment and capital accumulation will slow down. Second, as a result of vertical FDI there is more production in the form of subcontracting in the new member countries, and as the cost and price levels are lower there than at home, EU-15 firms gain in competitiveness when they produce abroad. The EU-15 firms can use this advantage in their increased supply to the world markets. This should compensate at least partly for the initial loss in employment in the EU-15 countries once the relocation of production to the new member countries takes place. The productivity of the average EU-15 worker will also rise, because offshoring typically concerns less-than-average productivity jobs. Fourth, national income in the EU-15 countries will rise through a higher yield on capital investment in the new member countries than the cost of capital. And fifth, increased output in the NMS both in the form of horizontal or vertical FDI from the EU-15 may have a repercussion through the balance in the global market for tradables on the terms of trade, too. Finally, labour migration flows also have an impact on the EU-15 economies as well as the NMS. Altogether, it is important to put these effects into a dynamic context, as they are likely to change in magnitude over time.

The EU-15 economy is considered to consist of two sectors: firms producing the final goods and firms producing intermediate goods, see Fig. 3 above. The final goods firms can outsource both a part of their final goods production and the purchase of intermediate goods to the NMS. In the case of the former type of offshoring we consider horizontal FDI, which means that a part of their total output supplied to the world markets is outsourced to take place in the NMS, instead of the EU-15. In the case of the latter we consider vertical FDI. Gross (total) output Q^* in the EU-15 by the final goods firms is produced by combining the value added Y^* with intermediate goods input M^*, which is in a fixed input-output ratio to the value added. Consequently,

$$Q^* = Q*\left(Y*, M*\right) = \frac{1}{1-\xi} Y^*, \tag{14}$$

where $M^* = \xi Q^*$ and ξ is the share of intermediate goods in total production, $0 < \xi < 1$. Value added Y* in the final goods firms in the EU-15 is produced using Cobb-Douglas technology with capital K^* and labour L^*,

$$Y^* = A^* (K^*)^{\beta} (L^*)^{1-\beta}, 0 < \beta < 1. \tag{15}$$

The behaviour of the final goods firms can be split into successive stages. These firms maximize their profits with respect to capital K* located in the home economy and labour input L* demanded in the EU-15 in the standard way, the former with a similar cost of adjustment structure as above in Eq. (1). Consider then the decision as to the horizontal FDI. We assume that the EU-15 firms produce their final goods in the NMS with the same overall productivity level A_T that prevails in the open sector in the NMS. However, following Alva-

rez and Stenbacka (2007), they face a real cost D_1 (in terms of tradables), related to the degree of outsourcing, including a sunk cost. We specify somewhat differently so that this cost D_1 depends directly on the extent of horizontal FDI (denoted FDI_1) invested in the NMS, $D_1(FDI_1) = \kappa_1 + \gamma_1(K_{FDI,1})^{\upsilon} / \upsilon Y^*$, with all the parameters being positive and $\upsilon > 1$. So, we assume that the cost of horizontal FDI depends negatively on the scale of activity in the EU-15. By bearing this cost, the firm collects profits from the investment in the NMS, which is $P_T A_T F_K K_{FDI,1}$ and bears a cost of financing the foreign investment $(r+\delta)P_T K_{FDI,1}$. Altogether, the EU-15 final goods firms maximise the following profit Π_1^* when deciding on horizontal FDI,

$$\Pi_1^* = P_T A_T F_K K_{FDI,1} - (r^* + \delta)P_T K_{FDI,1} - P_T D_1(FDI_1) - AC_1 \quad , \tag{16}$$

where r* is the real interest facing the EU-15 and AC_1 is a similar adjustment cost related to FDI investment as was specified above in (2). Then we get,

$$\begin{aligned} I_{FDI1,t} &= K_{FDI1,t-1}\left(\frac{\lambda_{1t} - 1}{a_1} + \delta\right) \\ \lambda_{1t} - 1 &= A_{Tt} F_{Kt} - (r+\delta) - \gamma_1 K_{FDI,1t}^{\upsilon-1} / Y_t^* + (1+r^*)^{-1}(\lambda_{1,t+1} - 1), \end{aligned} \tag{17}$$

where λ_1 is the shadow price on FDI_1 capital. In the long-run equilibrium, when the convergence of the NMS ends and the shadow price goes to unity, there is no incentive for the firms to make horizontal FDI into the NMS as there is no longer a cost advantage related to this production component. During the convergence path, higher GDP (Y*) in the EU-15 creates an incentive to carry out investment in the NMS, as is also caused by a lower cost of FDI, likely to be linked e.g. to the EU membership of the NMS.

Turn then to consider offshoring of production of intermediate goods through vertical FDI. On the basis of Eq. (14) the price P_Y^* of the value added is,

$$P_Y^* = P_T \frac{1 - \xi \frac{P_{M^*}}{P_T}}{1 - \xi}, \tag{18}$$

where P_T is again the price on tradables Q* and P_M^* is the price on intermediate goods, to be defined below. We see from this expression that a lower price of intermediate goods leads to a rise in the value added price P_Y^* of EU-15 production and thereby to a rise in profitability there. On the other hand, the likely rise of P_M^* towards P_T during the convergence process leads to a reduction in P_Y^* so that this gain erodes over time. If the global demand for the EU-15 final goods Q^* remained unchanged – as is often erroneously imagined – there would be a reduction in EU-15 production if there is a relocation of domestic production to the NMS. But this is not the final outcome as the productivity and the rate of return on capital in the EU-15 rises through international outsourcing, which will lead to a rise in capital accumulation and production, see Section 5.2 below for an empirical evaluation of these diverse impacts.

The intermediate goods demanded by the final goods firms in the EU-15 can either be produced domestically by the domestic intermediate goods firms, the output of which is M_{DOM}, or outsourced by the final goods firms to be produced in the NMS through offshoring, now vertical

FDI. The amount of these imported goods is M_{IMP}. The aggregate bundle M* of the intermediate goods is a CES aggregate of the domestic and foreign goods,

$$M^* = \left[a_{DOM}^{1-\sigma} M_{DOM}^{\sigma} + a_{IMP}^{1-\sigma} M_{IMP}^{\sigma} \right]^{\frac{1}{\sigma}}, \sigma \leq 1, \tag{19}$$

where $(1-\sigma)^{-1}$ is the elasticity of substitution between the home and imported intermediate goods and the a_i's are the distribution parameters summing to unity. As there is perfect competition, the corresponding price index on aggregate intermediate goods is,

$$P_{M^*} = \left[a_{DOM} P_{DOM}^{-\frac{\sigma}{1-\sigma}} + a_{IMP} P_{IMP}^{-\frac{\sigma}{1-\sigma}} \right]^{-\frac{1-\sigma}{\sigma}}, \tag{20}$$

where P_{DOM} is the price on the domestically produced intermediate goods, see below Eq. (27).

As stated above, we further assume that the EU-15 final goods firms outsourcing their activity through vertical FDI to the NMS (being there a part of the open sector in the NMS) can produce there at the same level of productivity A* with which the final goods firms can operate in the EU-15. This corresponds to the idea related to offshoring by Grossman nad Rossi-Hansberg, see Baldwin (2006, 40). However, due to competition, the foreign subsidiaries will extend this cost advantage to their parent firms in the EU-15, so that

$$P_{IMP} = \frac{c_T}{A^*} = \frac{A_T}{A^*} P_T, \tag{21}$$

where c_T is the unit cost of tradables comprising of the labour and capital cost per unit of production in the NMS.

The firms in the final goods sector in the EU-15 also bear a cost related to international outsourcing through vertical FDI. Now these firms set the aggregate demand for the intermediate goods given by $M^* = \xi Q^*$ and they decide on the amount of this to be outsourced to the NMS.

Let us first note the relation between the vertical FDI stock and the ratio m which is the share of total production outsourced to NMS, $m = M_{IMP} / M^*$. We get

$$M_{IMP} = mM^* = m\frac{\xi}{1-\xi} Y^* = A^* K_{FDI,2}^{\alpha} L_{FDI}^{1-\alpha} = \eta K_{FDI,2}, \tag{22}$$

where η is roughly a constant as it depends on the capital intensity, which further depends on the real interest rate r* which is roughly fixed in terms of tradables. A similar expression holds for the production $Q_{FDI,1}$ in the NMS linked to horizontal FDI there. Total FDI stock is now $K_{FDI} = K_{FDI,1} + K_{FDI,2}$.

The cost D_2 of offshoring is now specified in a way which somewhat modifies that by Alvarez and Stenbacka (2007) so that the real cost is $D_2(m) = M^*(\kappa_2 + \gamma_2 m^{\upsilon} / \upsilon)$, and $\kappa_2, \gamma_2 > 0, \nu > 1$. The firms minimize the total cost TD_2 of their intermediate goods when some of their intermediate goods are offshored abroad, which is

$$TD_2 = P_T(r^* + \delta) K_{FDI,2} + P_M^* M^* + P_T D_2(m) \ . \tag{23}$$

Using Eq. (22), minimizing the total cost of producing intermediate goods gives with some manipulation the following outcome for the optimal degree of outsourcing m,

$$-\frac{P_T(r^*+\delta)}{\eta}+(\frac{1-\sigma}{o})P_{IMP}^{1/(1-\sigma)}(P_{IMP}^{-\sigma/(1-\sigma)}-P_{DOM}^{-\sigma/(1-\sigma)})=P_T\gamma_2 m^{\upsilon-1}. \quad (24)$$

We assume in (24) that in this optimum also the sunk cost κ_2 of making FDI in the NMS is covered. Let us assume as normal that the elasticity of substitution $(1-\sigma)^{-1}$ is higher than unity so that initially the second term on the left-hand side of (24) is positive when $P_{IMP} < P_{DOM}$ so that we get a unique solution for the optimal m which is likely to be positive. The higher is the cost γ_2 of monitoring and establishing a subsidiary in the NMS, the smaller is the degree of international outsourcing, as is plausible. On the other hand, the incentive to outsourcing diminishes over time as the nominal convergence in the NMS proceeds, i.e. when the ratio P_{IMP}/P_{DOM} rises towards parity.[5] Based on (24), even before the situation of complete nominal convergence, offshoring comes to an end. Altogether we get from Eq. (24) for the optimal m*,

$$m^* = m(\gamma_2, P_{IMP}/P_{DOM}),\ m_1<0, m_2<0. \quad (25)$$

To derive a dynamic behavioural equation for offshoring in the form of vertical FDI, we minimise the sum of quadratic terms for out-of-equilibrium and cost-of-adjustment terms, the latter defined as $AC_2=\sum_t (1+r^*)^{-t}(a_2/2)(m_t-m_{t-1})^2, a_2>0$. This leads to the following equation,

$$m_t=\pi_1 m_t^* + \pi_2 m_{t+1} + \pi_3 m_{t-1}\ , \quad (26)$$

with parameters $\pi_1,\pi_2,\pi_3>0$, depending on r* and a_2, with $\pi_1+\pi_2+\pi_3=1$. In a well-known manner the solution for m_t is a weighed average of its lagged value m_{t-1} and the future desired values m_t^*, see e.g. Heijdra and van der Ploeg (2002, 398).

The domestic intermediate goods firms in the EU-15 simply use A_L^{INT} units of labour to meet their demand and produce their output. The price of domestically produced intermediate goods is thus,

$$P_{DOM}=W^*/A_L^{INT} \quad (27)$$

The aggregate demand for labour L_{TOT}^* in the EU-15 is thereby

$$L_{TOT}^* = L^* + Q^{INT}/A_L^{INT}. \quad (28)$$

where $Q^{INT}=(1-m)M^*$. The wage rate is solved from the equilibrium in the final goods sector in the EU-15. We assume that productivity in the intermediate goods sector is lower than that in the final goods sector, which leads to the productivity effect related to offshoring discussed above, see Section 5.1. Real GDP in the EU-15 is equal to Y*. The GNP (denoted by YI*) in the EU-15 is accordingly,

$$YI^* = GDP^* + (P_T/P_Y^*)(\rho_{FDI}-i^*)K_{FDI} - (P/P_Y^*)U\ . \quad (29)$$

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[5] A full parity of these prices is not, however, a necessary final outcome as the productivity of the intermediate goods sector is lower than that in the open sector in the EU-15, see below. This hinders full convergence of the respective prices.

There remains to specify that labour which migrates from the NMS comes to the EU-15 so that

$$L^*_{TOT,t} = L^*_{TOT,0} - \left(L_t - L_0\right). \tag{30}$$

4 THE GLOBAL ECONOMY

The supply of tradables from the enlarged EU can have an effect on the balance between their demand and supply in the global market as the EU is a big player in these markets. Denote by Q_{ROW} the exogenous supply of tradables from the rest of the world. We can then define the balance between the global aggregate supply and demand D_T as

$$Q^* + Q_T + Q_{FDI,1} + Q_{ROW} = D_T. \tag{31}$$

Assume further that the supply from the rest of the world is in the baseline a fixed share s of the total market, which grows at an exogenous rate g_W and the demand which reacts with price elasticity ε. Altogether we have then for the market clearing,

$$Q^*_t + Q_{T,t} + Q_{FDI,1t} = (1-s)D_0 e^{g_W t}(P_{Tt} / P^*_{Gt})^{-\varepsilon}, \tag{32}$$

which solves for the global price path of tradables in terms of the exogenous overall global price level P^*_G. This means that an increased supply from the NMS through horizontal FDI from the EU-15 and indirectly through the final goods sector in the EU-15 can have an adverse terms-of-trade effect on the EU-15 through its effect on the balance in the global market for tradables. In this way the relocation through horizontal FDI creates a competition between the various locations of production.

5 SIMULATIONS OF CONVERGENCE

5.1 Calibration of the Model

Throughout we will use data from 2005 as the initial equilibrium and to calibrate the model.

In the NMS, the average initial relative income level (at PPP) is 47 per cent, price level 52 per cent, and wage level 24 per cent of those in the EU-15. Consider first TFP growth. Using the so-called β-convergence in Eq. (10), NMS countries will grow faster than the wealthier EU-15. The basic empirical result given by growth literature is that 2 per cent of the initial gap in income levels is closed every year. In the case of the new member countries of the EU, Kaitila (2004) has reached a result using pooled mean group estimation and fixed effects that the speed of unconditional convergence towards the EU-15 was much higher in 1993-2002, on average 8 per cent per year. Anyway, this implies that we cannot set the convergence

speed as a constant over the whole catching-up phase. Using the equilibrium condition mentioned above in connection with Eq. (10), i.e., $\beta_0 = g_N^*$, the latter taken to be 1.4 per cent p.a., we can calibrate the parameter β_1 to be roughly 0.03 from the condition that the initial growth rate g_0 of TFP (3 per cent) of the new member countries is near the actually realised one at the initial income gap of 50 per cent. In the NMS, the initial rise in TFP in the open sector is fixed at 1 percentage point higher and in the closed sector at 0.5 percentage points lower than the average where we have assumed that initially the open sector is assumed to have 30 per cent of total employment

The elasticity of capital in production in Eqs. (1) and (15) is assumed to be 0.4. Parameter a_T in (2) reflects a realistic adjustment and sensitivity of investment behaviour with respect to the rate of return. It is fixed at 20, which corresponds to Hall (2004). The annual rate of depreciation is taken to be 5 per cent.

The substitution parameter φ in (3) is quite crucial in many ways as it in part determines the internal resource allocation in the NMS. It is fixed at unity. Parameter ψ in (11) is set to 0.05, similarly as in Haskel, Pereira and Harrison (2002).

Calibration of the consumption equation in (6) and (8) takes place so that we first fix the propensity parameter c in Eq. (8) to be 0.7 and then calibrate the share h of the forward-looking consumers to be 4 per cent from the condition that the aggregate consumption matches the realised one in the base year.

The rise in the total factor productivity is fixed at 1.4 per cent p.a. in both production sectors in the EU-15. The annual rise in the global price level P_G^* is fixed at 2 per cent. The nominal interest rate in the NMS is 5 per cent and will stay at this level throughout. The interest rate margin for the firm sector in the NMS and EU-15 is fixed to one percentage point and for the household sector borrowers in the NMS to 2 percentage points p.a.

The elasticity μ in the labour migration equation (9) is fixed at 0.00001, which will lead to a reduction of 7 per cent in the NMS labour force over the time span, and to an increase of less than 2 per cent in the EU-15 labour force, an outcome which is in line with estimates typically reached in migration studies for the enlarged EU, see e.g. Alho (2003). The migration flows will gradually dampen over time.

The transfer U to the NMS from the EU budget is calibrated so that initially it is equal to 1.3 per cent of their GDP, and it will then decline over time as convergence proceeds so that the elasticity of the transfer from the EU budget with respect to the income level is −0.025 as estimated by Kauppi and Widgrén (2004).[6] The transfer is financed by levying a tax on labour in the EU-15.

For the EU-15, we specify that intermediate goods production is a half of gross production, a typical value, and that a half of EU-15 imports from the NMS are made by intermediate goods. This implies that in relation to the EU-15 GDP offshored intermediate goods from the NMS make only 0.8 per cent. Somewhat arbitrarily we assume that the initial labour productivity in the intermediate goods production in the EU-15, being under the threat of offshoring, is around 20 per cent lower than that in the final goods production sector. It should be remarked that this is quite an important assumption as to the results. The one made corresponds to the spirit of the globalisation analysis by Grossman and Rossi-Hansberg (2006a,b), but is, however, in conflict with the actual relative productivity between the intermediate and final goods production. Namely, Finnish input-output tables reveal that the average labour productivity is, using the amount of produced intermediate goods as weights,

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[6] The impact of structural funds on income disparities have been analysed in Beugelsdijk and Eijffinger (2003). They find some evidence that the funds contribute to a decrease in disparities. Baldrin and Canova (2003) argue, however, that structural funds are not able to affect long-run growth rates in the NMS.

clearly higher both in the total economy and manufacturing than the average productivity in the economy. This is based on the fact that many industries producing intensively intermediate goods are very capital intensive. It is, however, doubtful whether this fact properly reflects the basic issue concerning the risk of offshoring of jobs, and thereby we are inclined to have a formulation which more corresponds to the insight of the theoretical literature on globalisation.

The elasticity of substitution in (19) between the foreign and domestic intermediate goods is fixed to 5 following roughly estimation in Alho (2005). The vertical and horizontal FDI stocks are in the initial situation taken to be equal. The cost of adjustment parameter in horizontal FDI is roughly the same as for the overall capital stock in NMS, i.e. 20. The adjustment equation for offshoring, i.e. vertical FDI, follows (24) with equal weights for past, current and future desired values for degree of offshoring. We use the value 2 for the exponent υ in Eqs. (17) and (24). We calibrate the cost parameter γ_2 from the condition that the initial m_0 corresponds to the equilibrium in Eq. (24). The parameter γ_1 is calibrated in a somewhat ambiguous way so that we assume that 0.1 percentage points of the initial rate of return on horizontal FDI goes to the cost of running a foreign subsidiary.

The interesting variables for the EU-15 are GDP, GNP (gross national income), and the income of the incumbent EU-15 population. GDP and GNP may diverge because of the gap in the rates of return on capital between the two regions, the burden of the foreign debt and the transfer through the EU budget to the NMS. The income of the incumbent EU-15 population is important, as there will be migration from the NMS to the EU-15, which can divert the total incomes and those of the incumbent EU-15 population from each other. In calculating this variable we assume that the immigrants from the NMS only bring with them their labour input and no capital.

5.2 Simulation Results

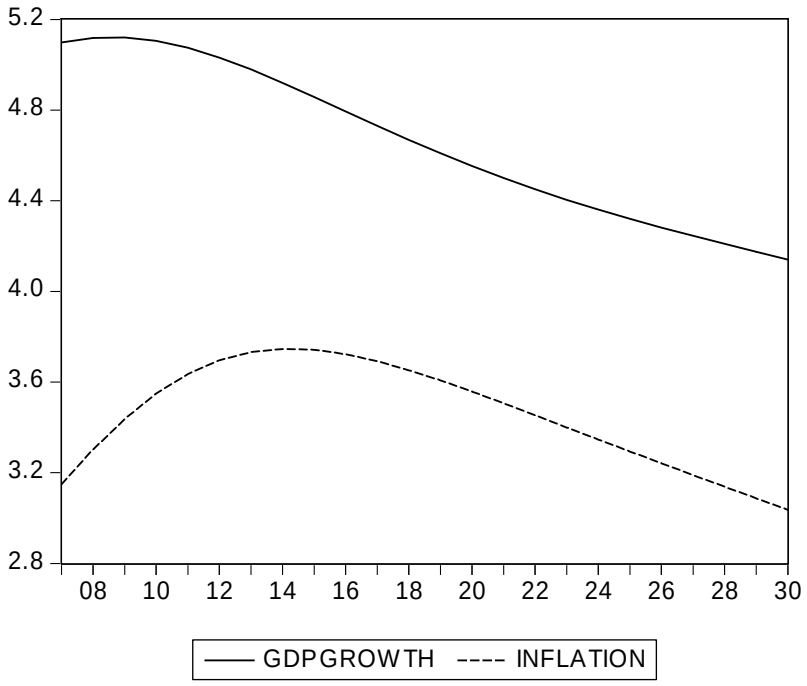
We will then report the results for the numerical simulations. First we will report the baseline solution for the NMS specified in Sections 2–4. We will extend the simulations over the period 2006-2031. Throughout we use constant, but not predetermined, levels for the jump variables as terminal conditions in the forward-looking solution of the model.

Then from the EU-15 countries' point of view we will formulate an alternative convergence path with the aim to shed light on the impact of relocation and FDI by varying their degree. So, in the *baseline scenario*, FDI and offshoring are allowed to react according to the behavioural equations specified above in Sections 3 and 4. In effect, this means that the real FDI stock will grow 3.5 times in comparison to the initial level over time. In the *alternative scenario 1*, we retain the FDI stock (both its components) of the EU-15 countries in the NMS as fixed in volume terms at its level in 2005 all through the simulation period. This level is 0.6 per cent of the initial capital stock in the EU-15.

The real GDP growth rate and inflation in the NMS in the baseline scenario are presented in Figure 4. The growth rate diminishes only slightly in spite of the effect of β-convergence. This is due to the fact that investment activity remains vigorous. What strikes is the fairly persistent inflation which casts a shadow over the accession of the NMS into the Euro Area. The speed of real and nominal convergence of the NMS is presented in Figure 5. A parity in real incomes between the NMS and the EU-15 will be almost reached by the end of the time span. The rise in real incomes and the inflationary process are quite rapid with an average annual rise in wages of 9.4 per cent. There is a fairly constant internal allocation of resources

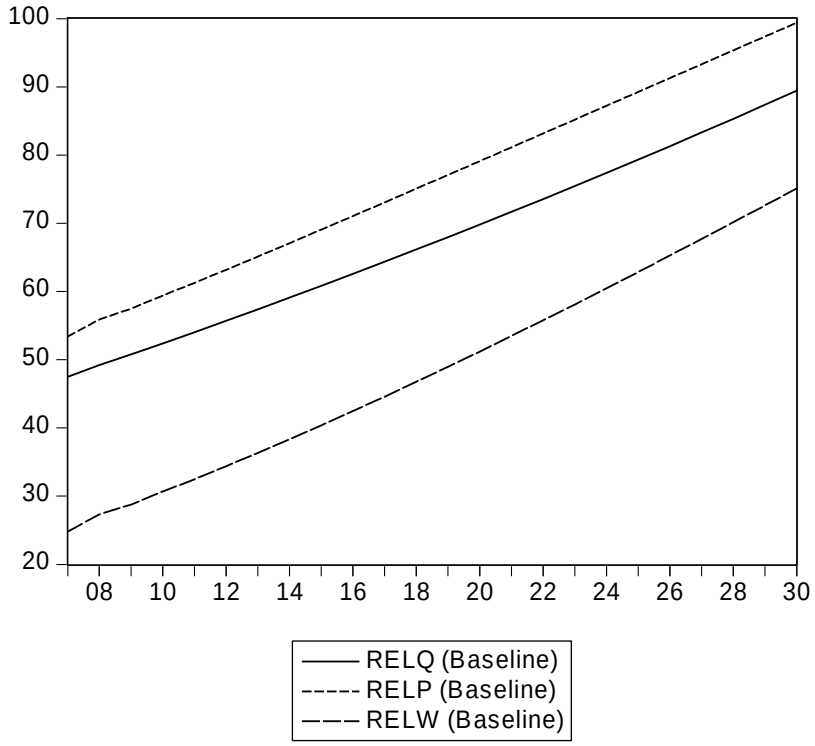
between the sheltered and open sectors, but over time more resources will be shifted to the sheltered sector in the NMS.

Figure 4. Trend of real GDP growth rate and inflation in the NMS in the baseline scenario, % *



* Trend of H-P filter.

Figure 5. Real and nominal convergence of the NMS in the baseline scenario, RelQ = income (PPP), RelP = price and RelW = wage, EU-15 = 100



Sustainability in terms of foreign balance shows that the current account deficit is not a problem. However, it should be remarked that this result quite sensitively depends on the growth rate of investment in the open sector which is influenced by the speed of adjustment parameter a_T in Eq. (1) and the interest margin.

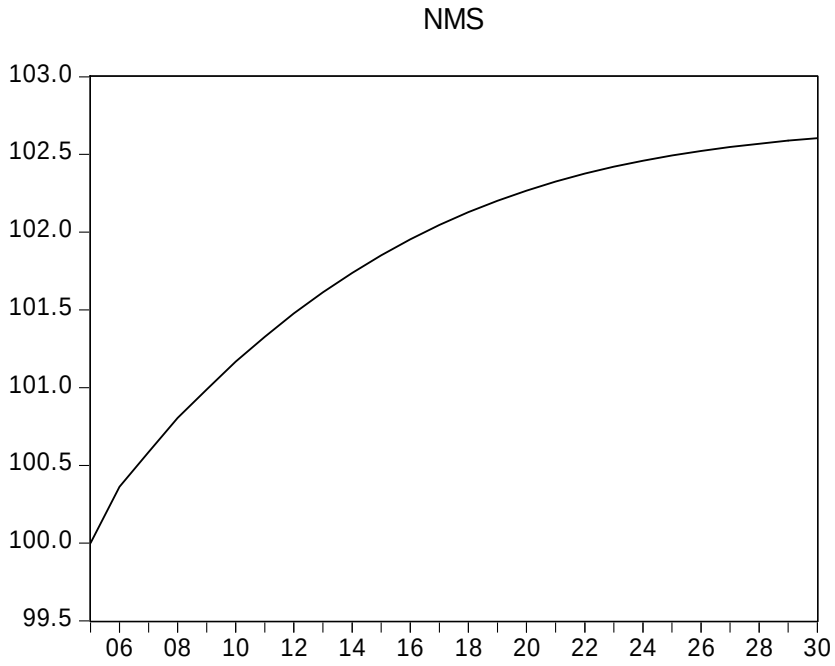
Due to migration, the labour force in the NMS shrinks by around 7 per cent, slightly less in the baseline scenario where the rise in real wages is faster in the NMS.

Turn then to consider the effect of the convergence process also on the EU-15. We first depict the impact of more intensified integration on the level of GDP volume in both regions, i.e. the baseline in relation to the alternative scenario 1, see above, in Fig. 6. We observe that deeper integration is a win-win situation so that both the host and recipient region benefit from more intensified FDI and offshoring. However, the simulation hints to the fact that the growth impulse will start to diminish and level off. This is based on the fact that the two regions will over time converge to be more similar in terms of cost and price levels and this leads to a reduced incentive for further integration. This is then in a way analogous to what Samuelson (2004) suggested to be one possible scenario of China's global integration, where no further gains will be reaped by the US if China specialises similarly in terms of factor contents as the US, see on this e.g. the discussion in OECD (2007b) and in terms of relocation Bhagwati, Panagariya and Srinivasan (2004).

In the EU-15 the relocation of domestic manufacturing to the new member countries will lead to a rise in GDP. This stems from the fact that the productivity growth will accelerate, see Fig. 8. However, at the same time there is a decline in the wage rate, which reflects the job effect by Grossman and Rossi-Hansberg (2006a,b) and Baldwin (2006), as discussed above. The magnitude of these effects is fairly small, however, a result reached in many glob-

alisation studies. Overall, the job reallocation effect is that almost 2 per cent of the EU-15 labour force will face reallocation from the intermediate goods to the final goods sector during the period. The price effect is also depicted in Figure 8. It shows that offshoring leads to a slight terms of trade loss in the EU-15 as expected. However, in terms of real wage there is a small loss due to relocation within Europe.

Figure 6. The effect of more intensified integration on GDP volume (baseline in relation to the alternative scenario 1) in the NMS and the EU-15, per cent



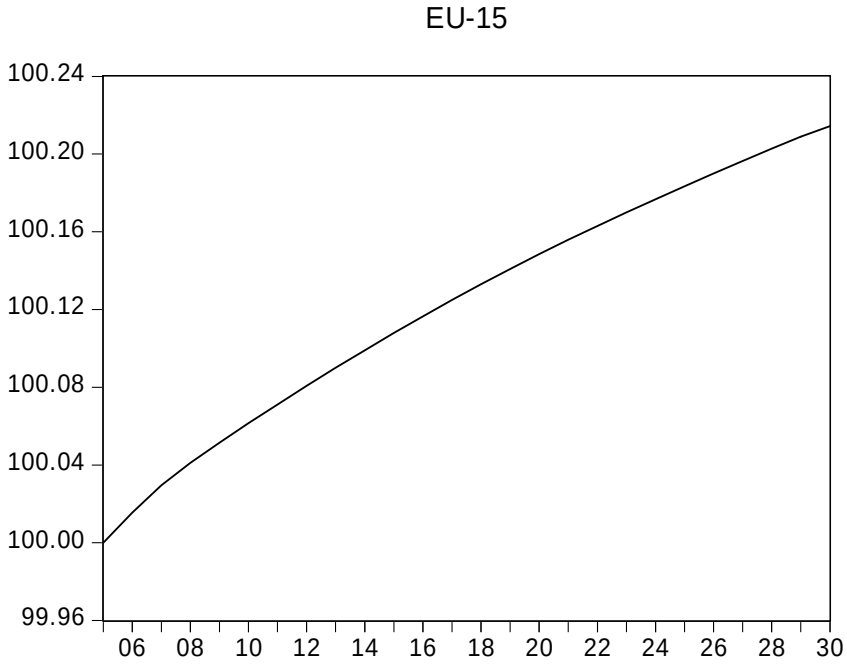
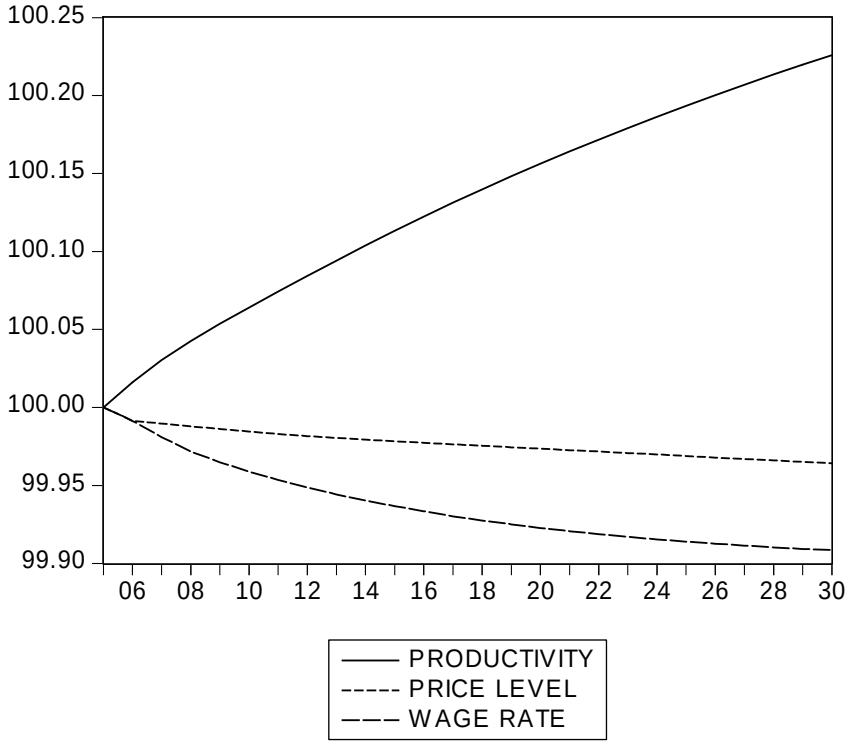
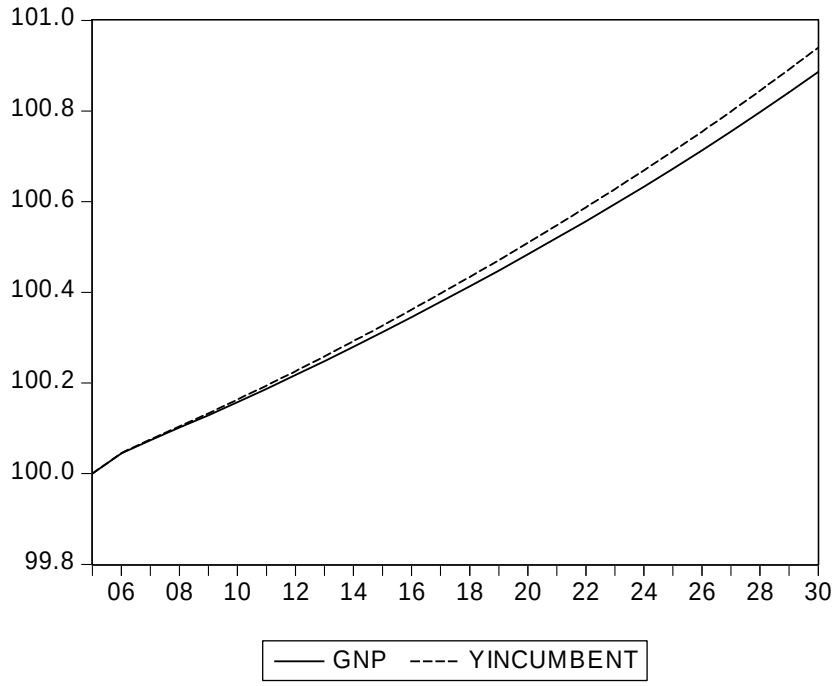


Figure 7. The impact of more intensified integration on the EU-15 (baseline in relation to the alternative scenario 1), as to the levels of productivity, wage and GDP price, per cent



The picture of offshoring is completed by considering its effect on the real gross national income (GNP) and the real income of the incumbent EU-15 population. These are depicted in Figure 8. Due to more offshoring, national income will rise clearly more than GDP because of the return on a larger stock of FDI. The incumbent population will gain more than the whole population (including the migrants) as they are assumed to own the whole capital stock of the EU-15 firms at home and abroad. This outcome, when combined with Figure 7, shows that more integration in the form offshoring will generate additional capital income.

Figure 8. The impact of more intensified integration on the EU-15 (baseline in relation to the alternative scenario 1), as to the level of real gross national income (gnp) and the real income of the incumbent EU-15 population (yincumbent), per cent



6 CONCLUSIONS

We have sought to shed new light on the speed of real and nominal convergence of the average of the new EU member countries towards the average of the EU-15 countries. The analysis covers both convergence of real income and nominal convergence in terms of the price and wage levels. This comprehensive approach to the convergence process is vital for both country groups and therefore for the whole Union.

First, we constructed a two-sector model of production for the NMS in the Balassa-Samuelson tradition, and then enlarged it in several ways to capture key issues of the convergence process.

At the same time we also enlarged the model to cover two regions by endogenising FDI flows from the EU-15 to the NMS and allowing for interaction between the regions through offshoring of EU-15 production in the NMS. Thereby we were able to address the current concern over relocation of production and jobs from the EU-15 countries to the new member countries.

Our general result on the speed of convergence of the NMS showed that it crucially depends on the speed of capital accumulation there. However, not surprisingly, there is considerable uncertainty related to the speed of convergence. Both the NMS and the EU-15 GDP will benefit slightly due to offshoring, but the latter at the cost of downward adjustment in wages. However, the quantitative magnitude of these impacts is fairly small, which suggests that the growth problems can and should be solved internally within the EU-15, and that fears of relocation, at least with respect to the NMS, should be kept limited. The basic reason for the overall small impacts reached in the paper is the fairly small initial current amount of offshoring between the EU-15 and the NMS. As estimated by the OECD (2007a, 36), the overall share of offshoring (imported intermediate inputs in the total economy) is typically around a quarter. However, the bulk of this activity, as also FDI flows, takes place within the group of developed OECD countries.

The model built here is, of course, quite a crude description of the economy. Although we enlarge the basic framework in several realistic ways, the model has its shortcomings. For example, the public sector is very rudimentary and is considered only through the EU budget. All other forms of taxation have been discarded so that, in effect, tax competition is omitted. However, despite these deficiencies we believe that the analysis sheds new light on the topical issue of convergence and its link with relocation of EU-15 production to the new member countries. It should also remarked that we have not yet tried to capture the cyclical pattern like the effect of the current downturn on convergence but tried to capture the trend factors driving the convergence path over the long run.

REFERENCES

Alho, K.E.O. (2003): "EU Labour Markets and Immigration Connected to Enlargement", ETLA Discussion Paper, No. 791.

Alho, K.E.O. (2005): "A Gravity Model under Monopolistic Competition", ETLA Discussion Paper, No. 962.

Alho, K.E.O., Kaitila, V. and Widgrén, M. (2005): "Speed of Convergence and Relocation: New EU Member Countries Catching up with the Old", ETLA Discussion Paper, No. 963.

Alvarez, L.H.R. and Stenbacka, R. (2007): "Partial Outsourcing: A Real Options Perspective", International Journal of Industrial Organization, Vol. 25, Issue 1, February, 91-102.

Baldrin, M. and Canova, F. (2003): "Regional Policies and EU Enlargement", CEPR Discussion Paper, No. 3744.

Baldwin, R. (2006): The Great Unbundling(s), in: Globalisation Challenges for Europe, Part I, Finnish Prime Minister's Office, Publications 18/2006, 11-54.

Baldwin, R., Francois, J. and Portes, R. (1997): "The Costs and Benefits of Eastern Enlargement: The Impact on the EU and Central Europe", Economic Policy, Vol. 24, 127-176.

Baldwin, R. and Seghezza, E. (1996a): "Growth and European Integration: Towards an Empirical Assessment", CEPR Discussion Paper, No. 1393.

Baldwin, R. and Seghezza, E. (1996b): "Trade-induced Investment-led Growth", CEPR Discussion Paper, No. 1420.

Barr, D., Breedon, F. and Miles, D. (2003): "Life on the Outside: Economic Conditions and Prospects Outside Euroland", Economic Policy, No. 37, 573-613, October.

Barro, R.J. (1991): "Economic Growth in a Cross-Section of Countries", The Quarterly Journal of Economics, Vol. 106, Issue 2, May, 407-433.

Barro, R.J., Mankiw, N.G. and Sala-i-Martin, X. (1995): "Capital Mobility in Neoclassical Models of Growth", The American Economic Review, Vol. 85, No. 1, 103-115.

Barro, R.J. and Sala-i-Martin, X. (1995): Economic Growth, McGraw-Hill.

Ben-David, D. (1996): "Trade and Convergence among Countries", Journal of International Economics 40, 279-298.

Ben-David, D. and Kimhi, A. (2000): "Trade and Rate of Income Convergence", CEPR Discussion Paper, No. 2390.

Beugelsdijk, M. and Eijffinger, S. (2003): "The Effectiveness of Structural Policy in the European Union: An Empirical Analysis for the EU-15 during the Period 1995-2001", CEPR Discussion Paper, No. 3879.

Bhagwati, J., Panagariya, A. and Srinivasan, T.N. (2004): "The Muddles Over Outsourcing", Journal of Economic Perspectives, Vol. 18 (Fall), 93-114.

Chang, R., Kaltani, L. and Loayza, N. (2005): "Openness Can be Good for Growth: The Role of Policy Complementarities", NBER Working Papers, No. 11787.

De La Fuente, A. (2000): "Convergence Across Countries and Regions: Theory and Empirics", CEPR Discussion Paper, No. 2465.

DeMelo, J., Panagariya, A. and Rodrik, D. (1993): The New Regionalism: A Country Perspective, in: DeMelo, J. and Panagariya, A. (eds.), New Dimensions in Regional Integration, CEPR and Cambridge University Press.

Denis, C., Mc Morrow, K. and Röger, W. (2006): "Globalisation: Trends, Issues and Macro Implications for the EU", European Commission, European Economy, No. 254.

Dollar, D. (1992): "Outward-oriented Economies Really Do Grow More Rapidly: Evidence from 95 LDCs 1976-1985", Economic Development and Cultural Change 40, 523-544.

Edwards, S. (1993): "Openness, Trade Liberalization and Growth in Developing Countries", Journal of Economic Literature, Vol. 31, 1358-1393.

Euroframe (2005): Economic Assessment of the Euro Area: Forecasts and Policy Analysis, with appendices, The Euroframe Group, http://www.euroframe.org/index.php?id=71.

Grossman, G. and Rossi-Hansberg, E. (2006a): "The Rise in Offshoring: It's Not Wine for Cloth Anymore", Princeton University.

Grossman, G. and Rossi-Hansberg, E. (2006b): "Trading Tasks: A Simple Theory of Offshoring", NBER Working Papers, No. 12721.

Hall, R.E. (2004): "Measuring Factor Adjustment Costs", The Quarterly Journal of Economics, Vol. 119, No. 3, March, 899-927.

Harrison, A. (1995): "Openness and Growth: A Time-Series Cross-Country Analysis for Developing Countries", NBER Working Papers, No. 5221.

Haskel, J., Pereira, S. and Harrison, A.E. (2002): "Does Inward Foreign Direct Investment Boost the Productivity of Domestic Firms", NBER Working Papers, No. 8724.

Heijdra, B.J. and van der Ploeg, F. (2002): Foundations of Modern Macroeconomics, Oxford University Press.

Heijdra, B.J., Keuschnigg, C. and Kohler, W. (2004): "Eastern Enlargement of the EU: Jobs, Investment and Welfare in Present Member Countries", in: Berger, H. and Moutos, T. (eds.), Managing EU Enlargement, CESifo Seminar Series, MIT Press, 173-210.

Henrekson, M., Torstensson, J. and Torstensson, R. (1996): "Growth Effects of European Integration", CEPR Discussion Paper, No. 1465.

Javorcik, B.S. (2004): "Does Foreign Direct Investment Increase the Productivity of Domestic Firms? In Search of Spillovers through Backward Linkages", The American Economic Review, Vol. 94, No. 3, June, 605-627.

Kaitila, V. (2003): "Convergence in Real GDP per Capita in the EU15 Area: How Do the Accession Countries Fit In?", ETLA Discussion paper, No. 865.

Kaitila, V. (2004): "Integration and Conditional Convergence in the Enlarged EU Area", ETLA Discussion Paper, No. 935.

Kaitila, V., Alho, K.E.O., and Nikula, N. (2007): "Growth Prospects of Emerging Market Economies in Europe: How Fast Will They Catch up with the Old West?", ETLA Discussion Paper, No. 1115.

Kauppi, H. and Widgrén, M. (2004): "What Determines EU Decision Making? Needs, Power or Both?", Economic Policy, Vol. 19, Issue 39, 221-266.

Keuschnigg, C. and Kohler, W. (2002): "Eastern Enlargement of the EU: How Much is It Worth for Austria?", Review of International Economics, Vol. 10, No. 2, 324-342.

Klau, M. and Mihaljek, D. (2003): "The Balassa-Samuelson Effect in Central Europe: A Disaggregated Analysis", BIS Working Papers, No. 143, October 2003.

Klundert, van de, T. and Smulders, S. (2001): "Loss of Technological Leadership of Rentier Economies: A Two-country Endogenous Growth Model", Journal of International Economics, Vol. 54, No. 1, June, 211-231.

Noguer, M. and Siscart, M. (2005): "Trade Raises Income: A Precise and Robust Result", Journal of International Economics, Vol. 65, Issue 2, March, 447-460.

OECD (2007a): Staying Competitive in the Global Economy – Moving up the Value Chain, Paris.

OECD (2007b): Offshoring and Employment, Trends and Impacts, Paris.

Ottaviano, G.I.M. (1999): "Integration, Geography and the Burden of History", Regional Science and Urban Economics, Vol. 29, Issue 2, March, 245-56.

Sachs, J. and Warner, A. (1995): "Economic Reform and the Process of Global Integration", Brookings Papers on Economic Activity, 1995, Issue 1, 1-118.

Samuelson, P.A. (2004): "Where Ricardo and Mill Rebut and Confirm Arguments of Mainstream Economists Supporting Globalization", Journal of Economic Perspectives, No. 18 (Summer), 135-46.

Sulamaa, P. and Widgrén, M. (2004): "EU Enlargement and Beyond: A Simulation Study on EU and Russia Integration", Empirica, Vol. 31, Issue 4, 307-323.

Vaittinen, R. (2000): Eastern Enlargement of the European Union, VATT Research Reports 64, (Finnish) Government Institute for Economic Research.

Vaittinen, R. (2004): Trade Policies and Integration Evaluations with CGE-Models, Helsinki School of Economics, Series A, No. 235.

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