wiiw

Wiener Institut für Internationale Wirtschaftsvergleiche

The Vienna Institute for International Economic Studies

wiiw Working Papers | 41

Michael Landesmann and Robert Stehrer

Goodwin's Structural Economic Dynamics: Modelling Schumpeterian and Keynesian Insights

October 2006

wiiw Working Papers published since 1995:

No. 5 A. Bhaduri, K. Laski and M. Riese: Making Sense of the Aggregate Demand-Supply Model. March 1995

No. 6 A. Bhaduri: Reflections on the Economic Role of the Transformational State. December 1995

No. 7 M. Landesmann and R. Stehrer: Industrial Specialization, Catching-Up and Labour Market Dynamics. January 1997

No. 8 J. Fersterer and M. Landesmann: Vertical Product Differentiation in International Trade: An Econometric Investigation. April 1998

No. 9 A. Bhaduri, K. Laski and M. Riese: Effective Demand versus Profit Maximization in Aggregate Demand/Supply Analysis from a Dynamic Perspective. November 1998

No. 10 M. Landesmann and R. Stehrer: The European Unemployment Problem: A Structural Approach. March 1999

No. 11 R. Stehrer, M. Landesmann and J. Burgstaller: Convergence Patterns at the Industrial Level: the Dynamics of Comparative Advantage. October 1999

No. 12 K. Laski: Three Ways to . . . High Unemployment. January 2000

No. 13 F. Turnovec: A Leontief-type Model of Ownership Structures. Methodology and Implications. April 2000

No. 14 M. Landesmann and R. Stehrer: Potential Switchovers in Comparative Advantage: Patterns of Industrial Convergence. June 2000

No. 15 R. Stehrer: Industrial Specialization, Trade, and Labour Market Dynamics in a Multisectoral Model of Technological Progress. January 2001; revised version February 2002

No. 16 K. Laski and R. Römisch: Growth and Savings in USA and Japan. July 2001

No. 17 P. Egger and R. Stehrer: International Outsourcing and the Skill-Specific Wage Bill in Eastern Europe. July 2001

No. 18 R. Stehrer: Expenditure Levels, Prices and Consumption Patterns in a Cross-Section of Countries. August 2001

No. 19 R. Stehrer and J. Wörz: Technological Convergence and Trade Patterns. October 2001

No. 20 M. Landesmann, R. Stehrer and S. Leitner: Trade Liberalization and Labour Markets: Perspective from OECD Economies. October 2001

No. 21 E. Christie: Potential Trade in South-East Europe: A Gravity Model Approach. March 2002

No. 22 M. Landesmann and R. Stehrer: Technical Change, Effective Demand and Economic Growth. April 2002

No. 23 R. Stehrer and J. Wörz: Industrial Diversity, Trade Patterns and Productivity Convergence. November 2002; revised version July 2003

No. 24 E. Christie: Foreign Direct investment in Southeast Europe: a Gravity Model Approach. March 2003

No. 25 J. Wörz: Skill Intensity in Foreign Trade and Economic Growth. November 2003; revised version January 2004

No. 26 M. Landesmann and R. Stehrer: Global Growth Processes: Technology Diffusion, Catching-up and Effective Demand. January 2004

No. 27 M. Landesmann and R. Stehrer: Modelling International Economic Integration: Patterns of Catching-up, Foreign Direct Investment and Migration Flows. March 2004

No. 28 L. Podkaminer: Assessing the Demand for Food in Europe by the Year 2010. March 2004

No. 29 U. Dulleck, N. Foster, R. Stehrer and J. Wörz: Dimensions of Quality Upgrading in CEECs. April 2004

No. 30 R. Stehrer: Can Trade Explain the Sector Bias of Skill-biased Technical Change? May 2004

No. 31 M. Landesmann and R. Stehrer: Income Distribution, Technical Change and the Dynamics of International Economic Integration. September 2004

No. 32 A. Hildebrandt and J. Wörz: Determinants of Industrial Location Patterns in CEECs. November 2004

No. 33 K. Laski: Macroeconomics versus 'Common Sense'. December 2004

No. 34 V. Astrov, Sectoral Productivity, Demand, and Terms of Trade: What Drives the Real Appreciation of the East European Currencies? April 2005

No. 35 R. Stehrer: The Effects of Factor- and Sector-biased Technical Change Revisited. September 2005

No. 36 N. Foster and R. Stehrer: Modelling GDP in CEECs Using Smooth Transitions. December 2005

No. 37 J. Francois and J. Wörz: Rags in the High Rent District: The Evolution of Quota Rents in Textiles and Clothing. January 2006

No. 38 C. F. Castejón and J. Wörz: Good or Bad? The Influence of FDI on Output Growth. An industry-level analysis. April 2006

No. 39 R. Römisch and M. Leibrecht: An Alternative Formulation of the Devereux-Griffith Effective Average Tax Rates for International Investment. May 2006

No. 40 E. Christie and M. Holzner: What Explains Tax Evasion? An Empirical Assessment based on European Data. June 2006

No. 41 M. Landesmann and R. Stehrer: Goodwin's Structural Economic Dynamics: Modelling Schumpeterian and Keynesian Insights. October 2006

Michael Landesmann and
Robert Stehrer

Goodwin's Structural Economic Dynamics: Modelling Schumpeterian and Keynesian Insights

Michael Landesmann is research director of wiiw and professor of economics at Johannes Kepler University, Linz, Austria. Robert Stehrer is research economist at wiiw and lecturer in economics at Johannes Kepler University.

Abstract

In this paper we pursue the work started jointly with Richard M. Goodwin in the 1990s. Goodwin's later work went very much in the direction of modelling Schumpeter's insights into structural and technological transformations in the context of disaggregated models while allowing for non-full employment outcomes and macroeconomic cyclical patterns to develop anlongside these transformations. In a series of papers we have followed up this work for closed and open economies, drawing out in particular the implications of structural transformations for macrodistributional dynamics and effective demand problems. This has been analysed for advanced and catching-up economies and their interdependencies on the global stage. We shall review our modelling efforts in this respect and trace these back to Goodwin's life-long preoccupation with synthesizing disaggregated (linear) modelling with macro-dynamic analysis.

Keywords: Richard Goodwin, structural economic dynamics, modelling global economic integration

JEL classification: C61, F02, F43, F47, O11, O41

Contents

Goodwin's Structural Economic Dynamics: Modelling Schumpeterian and Keynesian Insights

1 Introduction

In this paper we pursue the work started jointly with Richard M. Goodwin in the 1990s. Goodwin's later work went very much in the direction of modelling Schumpeter's insights into structural and technological transformations in the context of disaggregated models while allowing for non-full employment outcomes and macroeconomic cyclical patterns to develop alongside these transformations. In a series of papers we have followed up this work for closed and open economies, drawing out in particular the implications of structural transformations for macrodistributional dynamics and effective demand problems. This has been analysed for advanced and catching-up economies and their interdependencies on the global stage. We shall trace these modelling efforts back to Goodwin's life-long preoccupation with synthesizing disaggregated (linear) modelling with macro-dynamic analysis. Goodwin's economic research pursued consistently a number of tracks: On one side was his preoccupation with economic cycles and it is here that we find his best known and possibly most durable contributions (see Goodwin, 1982). The other side was his life-long concern with economic structures and how these evolve through time; see his collection of papers in Goodwin (1983a), and his advanced economic theory lectures at Cambridge in Goodwin (1970).

Apart from this thematic compartmentalization of his contributions, one should also consider the force field of influences spanned by famous economists on the type of economic questions he posed throughout his life. The collection of economists who had a significant effect on his work is formidable: Joseph Schumpeter, John Maynard Keynes, Roy Harrod, Nicholas Kaldor, Wassily Leontief, John R. Hicks, Richard Stone, Piero Sraffa. Apart from this there were a number of non-economists who were deeply influential, particularly the mathematician John von Neumann, the physicist Le Corbeiller and later Hermann Haken and Otto Rössler. We got to know Richard M. Goodwin only in the 1980s and 1990s when he was still very prolific (having taken up a new professorship in Siena after retiring from his post in Cambridge). At that stage he was very actively involved in the then booming area of introducing the intricacies of non-linear dynamics into economic models, an area in which he had already been a pioneer in the 1950s and where he attracted a large group of young economists who were interacting with him on these issues and who carried this research line forward (to name a few: Alfredo Medio, Kumaraswamy Vellupillai, Juergen Glombowski, Hans-Werner Lorenz, Peter Flaschel, Willi Semmler, Jerry Silverberg, Meghnad Desai, etc.) Some of Goodwin's later writings in this area are collected in Goodwin (1989, 1990). On the other hand, he was also occupied with work on a synthetic major treatise which could bring together what he considered essential to understand the 'Dynamics of a Capitalist Economy' (see his major work with Lionello Punzo in Goodwin and Punzo, 1987) and which integrated what he considered substantial ingredients from Keynes and Schumpeter in a comprehensive effort of 'structural economic modelling'.

2 Goodwin's later structural economic dynamics

Let us dwell a bit on Goodwin's ambition in this area which he most likely carried with him all his life but which crystallised most clearly in the last two decades of his life when he made the effort to bring all the strings together:

Goodwin's views of capitalist dynamics was essentially Marxian, Keynesian and Schumpeterian (he coined it the 'M-K-S system'). He emphasised the importance of the introduction of new technologies as a very important feature driving structural change and economic growth. As with Schumpeter, he thought that macro-distributional dynamics (between labour and capital income) is driven by the impact of the introduction of new techniques of production which Goodwin, however, combines with the Marxian insights of changing power relations on the labour market due to changing employment/unemployment levels which accompany these adjustment processes and which react back on the dynamics of wages, profits and investment. What is also explicitly modelled in Goodwin's writings is the importance of differentiated rents which emerge due to the uneven technological and price-cost dynamics in different sectors of the economy.[1] He deviated from Schumpeter in that the dynamic equilibrium of a capitalist economy was not conceived as a 'stationary' state (i.e. with zero growth in the absence of technical progress) but as a von Neumann ray with a potentially positive expansion rate (depending upon the degree of 'productiveness' and the level of the equilibrium wage rate).

Around this steady-state growth path the more interesting 'transitory dynamics' emerges: here the introduction of new techniques of production induces a differentiated dynamic across sectors which include the emergence of sectoral price-cost dynamics leading to differentiated rents and investment dynamic. Goodwin was keen to use decomposition techniques such that this differentiated sectoral dynamic could be tracked while at the same time making sure that the economy-wide coherence with respect to macro-distributional dynamics (linked to economy-wide employment and wage dynamics) is considered as well (see his decomposition technique in Goodwin, 1983b). This is as far as the Schumpeterian, structural modelling aspect of his writings is concerned. However, an important point of Goodwin's criticism of Schumpeter is that he provided no place in his writing for Keynes, i.e. the problem of lack of effective demand and ensuing deviations from full-employment positions of the economy. On the one hand, Goodwin was in this respect working along the lines of Harrod's emphasis of the instability of a capitalist growth path which could be arrived at by means of aggregate formulations. However, in the line of research which we jointly pursued with him, he also thought of the repercussions of the changes in macro-distributional relationships which accompany Schumpeter's structural dynamics in the wake of technological change. Here it is clear that structural economic dynamics is accompanied by changing aggregate wage and rent (or total profit) shares in national income and as these different income shares affect expenditure patterns in terms of consumption versus investment spending they also highlight the changes in the course of the 'transitory dynamics' of reliance upon spending out of profits and out of wages to uphold the level of effective demand. One can show that this in turn might generate greater instability of effective demand in periods in which technological change is strongest.

In this respect, we constructed (see Landesmann and Goodwin, 1994; Landesmann et al., 1997) a model in which the trade-off between the speed of structural change and the greater likelihood of effective demand failures was emphasised. This problematic was further elaborated in a series of models which look at the situation in a global environment in which either blocs of advanced economies compete with each other or in which the challenge of sizable catching-up economies affect the global dynamics of structural change and effective demand (on this

[1] Here Goodwin's interest in multi-sectoral modelling leads to a different use of Marshall's or Schumpeter's emphasis on 'surplus profits' (in Marshall 'quasi-rents', in Schumpeter simply 'profits') which in these authors describe the relative profit/rent positions of (the more compared to the less innovative) firms within an industry. Goodwin did not explicitely model the competitive processes at the level of firms and hence he focused on rent/profit structures across sectors.

see Landesmann and Stehrer, 2000; Stehrer, 2002a; Landesmann and Stehrer, 2002; Stehrer, 2002b; Landesmann and Stehrer, 2006b, 2004, 2006a). In the current paper we shall elaborate on some features of this model by bringing together structural dynamics of technical change and international specialization as well as the potential effective demand problem which may arise. We do this in a set-up which includes four groups of countries and industrial sectors.

3 Modelling the dynamics of integrated economies

3.1 Equilibrium and disequilibrium dynamics

We set up the model where a number of goods $i = 1, \ldots, N$ are produced by homogenous labour. Some of these sectors produce tradable goods where trade between the $c = 1, \ldots, C$ countries is determined by cost competitiveness. Structural change and macroeconomic distributional shifts arise from exogenous shocks in sectoral labour productivity with a sluggish price-to-cost adjustment process and responses of the wage rates which reflect the bargaining power of workers as well as macroeconomic factors like the level of unemployment. In this respect the model is a simplification of the model introduced in Landesmann and Goodwin (1994) and extended to a multi-country model in Landesmann et al. (1997) in that it assumes that goods are produced by labour (as a primary factor of production) only and does not require a circular flow of production. In particular this allows us to go beyond the assumption of a linear production structure. These simplifications allow us to emphasise the life-long interest of Richard M. Goodwin in macro-dynamics of disaggregated models and non-linear dynamics as described above.

We start the exposition of the model with assumptions on productivity, then introduce price and wage dynamics and finally discuss the modelling of the ouput levels and structure. At a specific point in time labour productivity is determined by technology. We denote the input of labour per unit of output by $a_{i,l}^c$. This specifically assumes a constant marginal product (and thus constant returns to scale) at the industry level.

Technical progress can take the form of a reduction in a_l which may take place exogenously or be the outcome of R&D activities. Furthermore, countries lagging behind the technological frontier can also exploit the 'advantage of backwardness' (see Gerschenkron, 1962) to catch-up to the technological frontier through technology transfer. There is furthermore some evidence that technological diffusion but also more generally catching-up processes in productivity levels may follow a S-shaped pattern (see e.g. Karshenas and Stoneman, 1995, on this). We model the dynamics of labour productivity in the following way: First we assume that a major wave of technological innovation (such as a General Purpose Technology; see e.g. the contributions in Helpman, 1998) proceeds through a series of major and minor primary and secondary innovation processes (see Schmookler, 1966) which we model in the form of an S-shaped logistic and this we see as the evolution of a 'book of blueprints'; we also call that the 'technological potential'. We differentiate this technological potential from the development of actual productivity in that the rate at which technologies are actually introduced from this 'book of blueprints' might depend on a number of economic variables (such as the volume of investment and, in the case of developing economies, the intensity of foreign direct investment). The following is our functional specification of the development of the technological potential (a dot over a variable refers to differentiation with respect to time):

$$\dot{A}_{l,i,pot}^c = \gamma_{A_{l,i,pot}}^c A_{l,i,pot}^c (1 - A_{l,i,pot}^c).$$

where $A^c_{l,i,pot}$ denotes the technological potential and the parameter $\gamma^c_{A_{l,i,pot}}$ is a country-specific parameter which shows the speed by which specific countries tap into a 'global book of blueprints'. The actual dynamics of labour productivity $A_{i,l}$ we then model as being linked to the 'technological potential'

$$\dot{A}^c_{i,l} = \gamma^c_{A_{l,i}} \left(\bar{A}^c_{l,i0} A^c_{l,i,pot} - A^c_{l,i}\right) \tag{1}$$

where $\gamma^c_{A_{l,i}}$ refers to the speed by which actual labour productivity tracks the development of the technological potential (i.e. the degree to which it utilises technological possibilities) and $\bar{A}^c_{l,i0}$ refers to a final limit value which labour productivity can reach in a particular country and industry (we catch in this way a type of conditional convergence pattern).

Labour input per unit of output is then given by $a_{l,i} = 1/A_{l,i}$. The costs of production are determined by labour input per unit of output and the sector-specific nominal wage rate w^c_i, i.e. $c^c_i = w^c_i a^c_{l,i}$. In a competitive equilibrium price equals average costs. However, if costs are changing as labour productivity is increasing or the nominal wage rate changes prices may not adjust immediatly to unit costs. There may be a sluggish price-to-cost adjustment due to time lags, strategic pricing behaviour of firms, etc. Mueller (1977) and Mueller (1986) and a number of authors following this approach study such adjustment dynamics empirically (see Mueller (1990) for an overview). We model this in the following differential equation

$$\dot{p}^c_i = -\delta^c_{p,i}(p^c_i - (1+\pi)c^c_i) \tag{2}$$

where $0 < \delta^c_{p,i} < 1$ denotes an adjustment parameter and $\pi \geq 0$ the (uniform) mark-up rate on costs. If prices deviate from costs plus mark-up, rents emerge which we shall denote by $r^c_i = p^c_i - (1+\pi)c^c_i$. Note that these rents may even become negative which means that firms may face losses. For later use we define mark-up profits as $m^c_i = \pi c^c_i$.

The second component which determines unit costs are nominal wages which may grow or fall for three reasons: First, transitory rents are partly distributed to workers; second, excess supply (demand) of workers in the labour market drives wages down (up); and third, we assume wage equalization across sectors in the long run. These three factors are formalized as follows:

$$\dot{w}^c_{iz} = \kappa^c_{r,i} \frac{r^c_i}{a^c_{l,i}} + \kappa^c_u u^c w^c_i + \kappa^c_w \frac{w^c_i - \bar{w}^c}{w^c_i} \tag{3}$$

$0 \leq \kappa^c_{r,i} \leq 1$ is the proportion of per unit (transitory) rents r^c_i paid to workers; this reflects the bargaining strength of workers (bargaining coefficient). Although this parameter may change over time we assume it to be constant. This parameter is multiplied by the rents per worker $r^c_i q^c_i / a^c_{l,i} q^c_i$. This particular specification implies that there is sector-specific bargaining over rents. If there is only economy-wide bargaining the first term has to be replaced by $\kappa^c_r \frac{\sum_i r^c_i q^c_i}{\sum_i a^c_{l,i} q^c_i}$. The second term on the rhs of the wage dynamics equation reflects the impact of unemployment on the dynamics of the wage rates ($\kappa^c_u \leq 0$). The unemployment rate is defined as $u^c = (h^c - \sum_i l^c_i)/h^c$ where h^c and l^c_i denote labour supply and demand, respectively. This represents a simple linear Phillips curve effect. Third, there is an impact on the wage dynamics if wage rates differ across sectors. This reflects the common assumption that wage rates become equalized across sectors because of inter-sectoral labour mobility and corresponding pressures on nominal wage rates. The (weighted) average wage rate (across sectors) is defined as $\bar{w}^c = \sum_i l^c_i w^c_i / \sum_i l^c_i$. If the average wage $\bar{w}^c$ is higher than the sectoral wage w^c_i the wage in sector i will rise, in the other case fall. This term works across all sectors. Thus in the formulation used in the simulations, there are two sector-specific terms and one economy-wide term (the Phillips curve) having an influence on wage rates in each sector.

Sectoral labour demand is determined by labour input per unit of output $a^c_{l,i}$ and the levels of output, as $l^c_i = a^c_{l,i} q^c_i$ and overall labour demand is $l^c = \sum_i a^c_{l,i} q^c_i$. Labour supply h^c is assumed to be exogenously given and set to one for all countries (i.e. same country sizes). Of course, this may be generalised as population growth rates differ across countries or participation rates may change. However, as we are in this paper mainly interested in the effects of technological changes and patterns of catching-up we stick to this simplifying assumption.

Following on from the discussion of the price system, the quantity system must be specified. Demand for goods consists of two different components, demand out of workers income (consumption) and demand out of profits (which finances investment to increase production capacities). Consumption patterns are determined by relative prices as well as real income levels. The second component will be determined by the dynamics of rents and bargaining over these rents. Investments determine the capacity growth rates of the particular sectors. However, in this set up with labour being the only input, increasing capacities means hiring workers to increase production capacities. These workers get a wage rate w^c_i which again is spent on consumption. The peculiarity here is that investors have to decide in which sector and country capacities should be increased. Let us study these aspects in more detail.

CONSUMPTION DEMAND: A typical worker in industry j in country r receives nominal income given by his wage rate $y^r_j = w^r_j + \kappa^r_{r,j} r^r_j / a^r_{l,j}$ where the second term results from bargaining of workers over rents.[2] Expenditures are allocated across goods i and for these goods across countries c in a two-stage budgeting process. For the second stage (expenditures for a particular good i over country brands) we assume that expenditure shares are given by

$$\gamma^{cr}_{i,j} = (p^c_i)^{1-\varsigma^r_i} (\beta^{cr}_i)^{\varsigma^r_i} \Big[\sum_c (p^c_i)^{1-\varsigma^r_i} (\beta^{cr}_i)^{\varsigma^r_i} \Big]^{-1}.$$

which results from a CES specification. The term $\tilde{p}^r_i = \sum_c (p^c_i)^{1-\varsigma^r_i} (\beta^{cr}_i)^{\varsigma^r_i}$ can be interpreted as the average price of good i sold in country r. In the first stage expenditures have to be allocated across goods. We assume that individuals have the same preferences. The nominal shares then depend on real income levels and relative prices. For the specification we use a (simplified) formulation derived from an Almost Ideal Demand (AIM) system (see Deaton and Muellbauer, 1980):

$$\gamma^r_{i,j} = \alpha_{AIM,i} + \beta_{AIM,i} \big(\ln y^r_j - \ln \tilde{P}^r \big) + \sum_j \gamma_{AIM,ij} \ln \tilde{p}^r_j$$

with $\ln \tilde{P}^r = \alpha_{AIM,0} + \sum_k \alpha_{AIM,k} \ln \tilde{p}^r_k + \frac{1}{2} \sum_j \sum_k \gamma_{AIM,kj} \ln \tilde{p}^r_k \ln \tilde{p}^r_j$. We assume that the parameters satisfy the constraints $\sum_i \alpha_{AIM,i} = 1$, $\sum_i \beta_{AIM,i} = 0$ and $\gamma_{AIM,ij} = \gamma_{AIM,ji}$. The nominal expenditure share of a typical worker in country r working in industry j on good i in

[2] The formulation we are chosing here - also in relation with formula (3) - suggests the following sequencing of wage setting/bargaining: We assume that workers get paid a wage during a production period suggested by formula (3) where the rents r^c_i refer to the results obtained from the sales of commodities minus production costs; these are the rents over which workers can bargain and the result of this bargaining process determines the initial wage at the beginning of the next production period. The wage rate thus determined is hence pre-financed. This is consistent with the formulation in equation (2). The income variable y^r_j is an ex-post variable including not only the pre-financed wage rates but also the results over the bargaining over rents in the current period. These are the underlying sequences as viewed in discrete time; however, in the formulation in continous time these ex-ante and ex-post considerations disappear in the limit. As our numerical simulations use the Runga-Kutta algorithm the sequential view of these processes is implicitly programmed.

country c is then $\mu_{ij}^{cr} = \gamma_{i,j}^{cr}\gamma_{i,j}^{r}$. As $\sum_c \gamma_{i,j}^{cr} = 1$ and $\sum_i \gamma_{i,j}^{r} = 1$ we also have $\sum_{i,c} \mu_{ij}^{cr} = 1$. Summing up over workers employed in sectors j in countries r gives consumption demand for good i in country c, i.e.

$$f_i^c = \frac{1}{p_i^c} \sum_{r,j} \left(\mu_{ij}^{cr} y_j^r a_{l,j}^r\right) q_j^r.$$

Investment behaviour: Next we specify how income out of retained earnings is spent. We assume that per unit mark-up profits together with rents which are not distributed to workers, i.e. $s_k^s + m_k^s$ where $s_k^s = (1 - \kappa_{r,k}^s) r_k^s$ are 'retained earnings', to which we refer as total per unit profits, are entirely used for investment (this assumption will be relaxed in section 3.2 below when we allow for leakages). The volume of this surplus in nominal terms in a particular economy s and sector i is then given by $(s_k^s + m_k^s) q_k^s$. In an integrated global economy investors may decide in which country and sector to invest. This decision may depend on several factors, e.g. (expected) per unit rents, sectoral growth rates, relative unit costs, degrees of excess capacity, etc.

Before introducing such an investment behaviour it is interesting to look at the hypothetical investment which would guarantee a balanced growth path. Assume that a sector attracts the share of $\xi_j^s = c_j^s q_j^s / \sum_{i,r} c_i^r q_i^r$ of the total value of surplus $\sum_{i,r} (s_i^r + m_i^r) q_i^r$. This can be used to hire $\xi_j^s \sum_{i,r} s_i^r q_i^r / w_j^s$ additional workers.[3] Inserting yields $\frac{c_j^s q_j^s}{\sum_{i,r} c_i^r q_i^r} \frac{\sum_{i,r} s_i^r q_i^r}{w_j^s} = \frac{a_{l,j}^s w_j^s q_j^s}{\sum_{i,r} c_i^r q_i^r} \frac{\sum_{i,r} s_i^r q_i^r}{w_j^s}$. Dividing by the number of workers already employed, i.e. $a_{l,j}^s q_j^s$, yields the growth rate of the sectoral labour force $g_j^s = \frac{\sum_{i,r} s_i^r q_i^r}{\sum_{i,r} c_i^r q_i^r}$.[4] As this is the case in any sector, the growth rate is given by $g^* = g_j^s$. Furthermore, as rents are zero in the steady-state, $r_i^r = 0$, and rearranging yields $g^* = \frac{\sum_{i,r} m_i^r q_i^r}{\sum_{i,r} c_i^r q_i^r} = \pi$. In this situation the world economy will grow on a balanced steady-state path.[5] Apart from this special case, the actual (demand driven) growth rate is given by

$$\hat{q}_i^c = \frac{1}{p_i^c q_i^c} \sum_{j,r} \mu_{ij}^{cr} c_j^r q_j^r (1 + g_j^r) - 1$$

where g_j^r denotes the sector- and country-specific growth rates of capacities; a hat on the top of a variable refers to its growth rate. Hence the growth rate of output is denoted by $\gamma_{q,i}^c = \hat{q}_i^c = \dot{q}_i^c / q_i^c$.

In the simulations below we apply a CES-formulation to model investment spending out of retained earnings. First we assume that normal profits m_i^c are invested only in the particular sector where these are arising. Retained earnings s_j^r arising in sector j of country r are invested in sector i of country c depending upon relative retained unit profits according to

$$\nu_{ij}^{cr} = \left(\exp(-s_i^c)\right)^{1-\sigma_i^r} (\eta_{ij}^{cr})^{\sigma_i^r} \left[\sum_c \left(\exp(-s_i^c)\right)^{1-\sigma_i^r} (\eta_{ij}^{cr})^{\sigma_i^r}\right]^{-1}.$$

[3] These additional workers who represent the build up of additional capacity get a wage rate which is determined from past bargaining processes over rents and are again paid ex-ante (see footnote 2 above).

[4] Our model specification shows a real world issue in a sense that the hiring decision of workers to expand capacities is done prior to the knowledge of actual output levels while actual labour needs can only be determined once effective demand and hence actual output levels are known. In the model there can be a discrepancy between the two in which case the income of workers is defined by those workers who are actually needed to produce the actual output as this defines their wage income. There can therefore be actual employment levels which are below or above capacity output in which case we assume short term flexibility in actual labour input.

[5] The same steady-state balanced growth rate π would arise if each sector in each country invests the profits only in its own sector.

where σ_i^r denotes the elasticity of substitution and η_{ij}^{cr} is a parameter determining a home and/or sector bias (e.g. when setting $\eta_{ij}^{cr} = 0$ for all $r \neq c$ no international investment flows would take place or in the case $\eta_{ij}^{cr} = 0$ for all $i \neq j$ only sector specific international flows would occur). This implies that sector k of country c invests the fraction ν_{jk}^{rc} of profits s_k^c in sector j of country r. Conversely, this sector attracts the share $\xi_j^r = \frac{\nu_{jk}^{rc} s_k^c q_k^c}{\sum_{k,c} s_k^c q_k^c}$. The capacity growth rate of this sector is then given by

$$g_j^r = \frac{\sum_{k,c} \nu_{jk}^{rc} s_k^c q_k^c + m_j^r q_j^r}{w_j^r a_{lj}^r q_j^r}.$$

Demand driven growth dynamics. The demand-driven dynamics of the economy can then be modeld as

$$\dot{\mathbf{q}} = \mathbf{D}_f(\mathbf{I} + \mathbf{G})\mathbf{q} - \mathbf{q} \tag{4}$$

where $\mathbf{D}_f$ denotes a matrix with typical element $(1/p_i^c)\left(\mu_{ij}^{cr} y_j^r a_{l,j}^r + \mu_{ij}^{cr} w_j^r a_{l,j}^r g_j^r\right)$.[6] $\mathbf{G}$ denotes a diagonal matrix with the sector-specific growth rates g_j^r on the diagonal.[7] On the balanced growth path it is satisfied that $\dot{\mathbf{q}} = (1+g)\mathbf{D}_f\mathbf{q} - \mathbf{q}$. In the appendix we show that in the balanced equilibrium $\mathbf{D}_f\mathbf{q} = \mathbf{q}$ and thus $\hat{\mathbf{q}} = (1+g)\mathbf{I} - \mathbf{I} = g\mathbf{I}$. If rents are equal to zero, the equality $g = \pi$ holds (see appendix for details).

3.2 Effective demand problem and external disequilibria

Let us now introduce the modelling of a global effective demand problem. For this we start with an imbalance in the trade balance for a particular country given by

$$\sum_i (w_i^c l_i^c + s_i^c q_i^c) > \sum_{j,i,r} \mu_{ij}^{cr} w_j^r l_j^r (1 + g_j^r)$$

i.e. the income generated in the economy (the left hand side of this inequality) is larger than the value of demand it attracts (the right hand side). Summing up over all countries c yields the equality of (nominal) world income on the lhs and the total of nominal expenditures on the rhs, i.e. $\sum_{i,c}(w_i^c l_i^c + s_i^c q_i^c) = \sum_{j,r} w_j^r l_j^r + \sum_{j,r} w_j^r l_j^r g_j^r$, or if expansion of capacities is financed through spending of retained earnings $\sum_{i,c} s_i^c q_i^c = \sum_{j,r} \xi_j^r \sum_i^c s_i^c q_i^c$. The equality holds with $1 = \sum_{j,r} \xi_j^r$, i.e. if all rents are invested. At the global level, for an effective demand problem not to arise one thus has to assume that all generated income is spent.

When a country does not spend its total rent income (e.g. because there is money hoarding or investment in a financial asset which does not immediately feed back into expenditures into the real economy) there may arise a (global) effective demand failure; similarly, a country-specific injection always also means a global injection.[8] More formally a leakage of expenditures may

[6] This specifically assumes that the newly hired workers (whose wage is set ex-ante) have the same spending patterns (given by μ_{ijz}^{cr}) as the workers producing during the production period; the latter also receive a proportion of the rents which result from that period of production.

[7] In the sequential view of the production process as discussed in footnotes 2 and 4 the term $\mathbf{Gq}$ refers to two issues at the same time: On the one hand capacity expansion and on the other hand additional spending by the additional workers hired to expand these capacities.

[8] In this paper we do not explore in detail the issue of investing into financial versus real assets. See however Landesmann and Stehrer (2002) for a detailed account where the accumulation/decumulation of money and other financial assets is introduced into the type of model discussed in this paper.

be modelled as a fraction $0 \leq \lambda^{rc} \leq 1$ for $r, c = 1, \ldots, C$ of s_k^r which is spent on a non-interest bearing financial asset. The capacity growth rate of a particular sector then becomes

$$g_j^r = (w_j^r a_{lj}^r q_j^r)^{-1} \Big[\sum_{k,c} \nu_{jk}^{rc} \big((1 - \lambda^{rc}) s_k^c q_k^c \big) + m_j^r \Big].$$

When $\lambda^{rc(r \neq c)} > \lambda^{rr}$ this implies that the growth rate is lower - ceteris paribus (with given real wage rates) - the higher the share of rents in total profits and the more internationally mobile expenditures out of rents are (the higher is international capital market integration).[9] This can be seen by setting $\nu_{jk}^{rc} = 0$, i.e. the extreme case when there are no international flows, and $\lambda^{rr} = 0$; in this case there would be no leakage at all. The specification thus implies that a shift away from the long-run macro-distribution between wage income and profit income (which in section 3.1 has been shown to lead to a rise in the capacity growth rate in the absence of such a leakage effect) would be reduced in the presence of such a leakage. On the other hand, internationally mobile capital reallocates capital to sectors/economies with a greater productivity growth (and thus higher rents) and contributes to a higher global potential output.

The model thus reveals an interesting trade-off: international economic integration (through strong trade linkages and foreign direct investment flows) leads to a potential growth dividend with respect to exploiting the benefits of comparative advantage and also the reallocation of investible funds towards those economies and sectors which undergo strong productivity/catching-up growth (which gets reflected in their rent dynamic). Both these two factors lead to a boost in the global productivity potential. At the same time, international economic integration and the dynamic of fast productivity and catching-up growth can lead to a higher likelihood of effective demand failures through its distributional dynamic towards increased profit/rent income and an asset portfolio adjustment (between liquid and real investment) which reflects an insurance motive to higher international capital market integration. Both these two factors can lead to a higher 'leakage' effect causing an effective demand failure, i.e. to a deviation of actual output from potential output.

In addition, international economic integration transmits the 'shocks' which differential productivity dynamic across sectors and countries initiate in the form of global changing expenditure structures, investment and production patterns. These in turn can cause - depending upon wage and price dynamics - severe trade imbalances and imbalances in labour markets. The further consequence are re-equilibrating processes in terms of exchange rates, wage and price dynamics. We shall refer to some of these processes in the following section.

4 Simulation studies

4.1 Issues of structural change and integration

The four country, three sector simulations discussed in this paper are designed to examine the following issues: First, there are two pairs of economies, two advanced and two (at the starting

[9] We introduce a 'liquidity bias' of internationally mobile capital. The idea here is that investment of rents abroad imply more risk and hence a certain amount is kept (in proportion to capital flows abroad) in liquid assets as a security. International mobility of capital hence allows reallocation of rents towards high rent/high productivity growth destinations, but it also increases the incidence of a 'leakage' (into liquidity) into the system. Empirically this fits the current observation where high FDI flows go together with a high volume of globally liquid assets.

point) less advanced economies. Of the two less advanced economies, one will follow a dramatic catching-up path in terms of closing the initial productivity (and real income) gap to the advanced economies. The other less advanced economy will not close this gap. Let us, for illustrative reasons, call the first economy 'Asia', the second economy 'Africa'. The two advanced economies will start from the same (high) productivity and real income levels, but they will be characterised by different wage bargaining behaviour. The purpose of distinguishing between these two types of advanced economies, is to analyse the impact of a strong catching-up process by 'Asia' upon the two types of 'Northern' economies which differ in their labour market behaviour. Second, part of the tracking of the impact of the strong catching-up process of Asia within the model will be to analyse the changing division of labour in the global economy and this is done by analysing changing specialization patterns with respect to two tradable sectors, one being a more technology-intensive ('modern') sector in which the initial productivity gaps are higher, the other a 'traditional' i.e. less technology-intensive sector. The distinction between a catching-up Southern economy, Asia, and a stagnating Southern economy, Africa, allows us to analyse how global dynamics (specialization, growth, production and demand structures) are shaped by the interaction between the two sets of advanced and less advanced economies.[10] Third, demand structures are modelled in such a way that real income and substitution effects are captured which together with the productivity and price dynamics give rise to an interesting (endogenous) evolution of expenditure patterns in the different markets with regard to the modern and traditional tradable sectors and the non-tradable sector. Fourth, problems which might be encountered in the global economy when it undergoes strong structural adjustments and hence strong distributional changes are discussed with respect to the effective demand problems that these processes can give rise to.

4.2 Simulation strategy

The model above was introduced in a fairly general manner. In the simulation studies presented in this section we focus on a model with $C = 4$ countries and $N = 3$ sectors. Let us discuss the specific assumptions on countries and sectors. We assume that there are four countries (or groups of countries). The size of these countries with respect to population (labour force) is equal and set to $h^c = 1$. The first two of these countries may be considered as advanced economies in terms of productivity levels. In the base scenario we assume that both these countries have the same sectoral productivity levels but are characterised by different parameter values on labour and product market behaviour. Further there are two developing economies/regions which are initially identical with respect to levels of sectoral productivity. The first of these economies succeeds in catching-up with the advanced economies. The modelling strategy which will be used in this paper is that this country is catching up with the leading country (or the technology frontier). We assume that a (technologically) lagging country will experience higher rates of change in labour productivity in those industries which start off with a larger initial gap relative to the leader (this amounts to an application of Gerschenkron's famous hypothesis of the 'advantage of backwardness' to the industrial level (Gerschenkron, 1962, 1952); see also Landesmann and Stehrer (2001) for a theoretical discussion and empirical analysis of this use

[10]The model would allow also for endogenous exchange rate dynamics; the identification of a non-tradable sector, together with productivity and wage dynamics in all economies allows for example the tracking of Balassa-Samuelson effects. Apart from this one may also track current accounts and trade and investment patterns and hence obtain a simplified picture of balance of payments and debt dynamics; we shall not go into detail on these issues in this paper (see the other references mentioned above).

of the Gerschenkron hypothesis). Here one may also differentiate between a 'weak' and 'strong' Gerschenkron effect. A *'weak'* Gerschenkron effect means that catching-up of the industries takes place following the same logistics. This does not imply however that productivity growth is equal as the 'gap' from the frontier matters at each point of time. A *'strong'* Gerschenkron effect takes place when the convergence parameter is higher in industries with the larger initial gap. This may even imply a 'switchover in comparative advantage' that can take place in the course of catching-up. In the base scenario we shall apply the 'weak' Gerschenkron scenario. The second less advanced economy does not succeed in catching-up. Specifically, we assume that the gap with the advanced economies remains constant.

There are three sectors of which two are producing tradable goods; we shall refer to them as 'traditional' and 'modern'. For simplicity we assume that productivity levels in these two sectors in the advanced economies are equal. With respect to the less advanced economies we assume that the initial gap is larger in the modern sector. By assuming the Gerschenkron dynamics, productivity growth rates in the successful catching-up economy are therefore higher in the modern sector (even if we only assume - as we do - a 'weak' Gerschenkron pattern). The third sector produces non-tradable goods. In terms of initial productivity levels this sector is characterised by a higher input of labour per unit of output in the advanced economies. For the two less advanced economies we assume that the initial gap in this sector is in between that for the traditional and modern tradable good (i.e. productivity gaps are higher in e.g. domestic banking than in the textiles, but lower than in, say, the higher tech electrical goods sector). With respect to income elasticities the traditional tradable goods sector is characterised by income elasticities below one, i.e. expenditure shares are decreasing with rising income, while in the modern tradable and the non-tradable sectors income elasticities are above one.

4.3 Setting up the simulations

4.3.1 The initial equilibrium

In order to calculate the initial equilibrium we assume initial productivity levels as well as labour supply. These are listed in table 4.1. Labour supply is assumed equal across countries, i.e. the size of the countries in terms of population/labour force is the same. With respect to productivity levels we assume that productivity in the traditional sector in the less advanced countries is half of that in the advanced economies, only a quarter in the modern sector and two thirds in the non-tradable sector; see the initial values of input per unit of output coefficients a_i^c in table 4.1.

		Country 1	Country 2	Country 3	Country 4
Productivity A_i^c	Sector 1	1.000	1.000	0.500	0.500
	Sector 2	1.000	1.000	0.250	0.250
	Sector 3	0.500	0.500	0.333	0.333
Input coefficients a_i^c	Sector 1	1.000	1.000	2.000	2.000
	Sector 2	1.000	1.000	4.000	4.000
	Sector 3	2.000	2.000	3.000	3.000
Labour supply h^c		1.000	1.000	1.000	1.000

Table 4.1: Starting values for constant and exogenously changing parameters

Calculation of the equilibrium further requires us to specify the parameters concerning consumer expenditures. These are the parameters of the CES demand system and the Almost Ideal

		Countries 1-4
EoS across countries ς_i^r	Sector 1	2.500
	Sector 2	2.500
	Sector 3	.
Country preference parameter β_i^{cr}	Sector 1	1.000
	Sector 2	1.000
	Sector 3	0.000
$\alpha_{AIM,0}$		0.000
$\alpha_{AIM,i}$	Sector 1	0.200
	Sector 2	0.500
	Sector 3	0.300
$\beta_{AIM,i}$	Sector 1	-0.100
	Sector 2	0.050
	Sector 3	0.050
$\gamma_{AIM,jk}$		0.000

Table 4.2: Parameters for consumption behaviour

Demand system which are listed in table 4.2. The elasticity of substitution for the particular goods across countries ς_i^r is assumed to be equal for all countries and set to 2.5. This implies that the goods are seen as substitutes. Furthermore, the industry specific country preference parameters β_i^{cr} are equal across countries which in particular implies for the tradable goods that there is no home-bias effect and no exogenously specified regional preference pattern of trade (all differences are determined by price structures). The exception to this is the nontradable sector which - by definition - can only be demanded in the home country. With respect to the Almost Ideal Demand System we assumed in particular that the traditional tradable sector shows income elasticities lower than one (i.e. the nominal expenditure shares decrease with income at constant relative prices) and the other two sectors have income elasticities larger than one (i.e. nominal expenditures shares increase with income at constant relative prices); these properties are imposed by the parameters $\beta^c_{AIM,i}$.

Finally, one has to determine initial levels of nominal wage rates. For this we assume that nominal wage rates are equalised across sectors, i.e. $w_i^c = w_j^c$ for $i, j = 1, 2, 3$. Further we normalise nominal wage rates to $w_i^c = 1.0$ for the advanced countries $c = 1, 2$. We solve for the starting equilibrium position imposing both the full employment condition as well as balance-of-payments equilibrium for each country (see appendix for details). We list the most important starting values in table 4.3 which were calculated by an iterative procedure.

		Country 1	Country 2	Country 3	Country 4
Wage rate w_i^c		1.000	1.000	0.543	0.543
Nominal prices p_i^c	Sector 1	1.000	1.000	1.086	1.086
	Sector 2	1.000	1.000	1.628	1.628
	Sector 3	2.000	2.000	1.628	1.628
Output q_i^c	Sector 1	0.138	0.138	0.112	0.112
	Sector 2	0.537	0.537	0.159	0.159
	Sector 3	0.162	0.162	0.100	0.100

Table 4.3: Starting values for selected variables

Nominal wage rates are lower in the less developed countries. The nominal wage rates together with the initial productivity levels determine the nominal price levels. As one can see in table 4.3 the advanced economies have a comparative advantage in the modern sector; the price level in the non-tradable goods sector is lower in the less advanced compared to the advanced economies.[11] With respect to output levels one can see that these are lower in all sectors in the less advanced economies; especially so in the modern sector. This on the one hand reflects higher real income levels in the advanced economies (leading to a shift in expenditure structures to the high income elastic sectors) as well as a comparative advantage of these economies in the modern sector. Other initial values can be seen in the figures showing the dynamics of the economies below.

4.3.2 The dynamics

For the transitory dynamics we have to specify the parameters determining the speed of adjustment of prices, the response of nominal wage rates to disequilibria in the labour market and the effect of bargaining over rents as well as the dynamics of productivity. The parameter values are shown in table 4.4.

		Country 1	Country 2	Country 3	Country 4
Price adjustment parameter $\delta_{p,i}$	Sectors 1-3	0.500	0.500	0.500	0.500
Wage bargaining coefficients $\kappa_{s,i}^c$	Sectors 1-3	0.125	0.250	0.125	0.125
Phillips curve parameters κ_u^c		0.250	0.100	0.250	0.250
Wage equalisation coefficient κ_w^c	Sectors 1-3	0.010	0.010	0.010	0.010
Logistic parameter $\gamma_{A,i}^c$	Sectors 1-3	0.050	0.050	0.050	0.050
Final productivity level $\bar{A}_i^c$	Sector 1	1.333	1.333	1.333	0.667
	Sector 2	2.000	2.000	2.000	0.667
	Sector 3	0.500	0.500	0.500	0.333

Table 4.4: Parameter values for adjustment dynamics

The parameter values are set to be rather similar across countries in general. The most important exception to this is the higher bargaining coefficient and the lower Phillips curve parameter for the second country ('EU'). Further we set the speed parameter in the logistic curve equal to 0.05 for all sectors and countries. One should note however that the productivity dynamics (i.e. the productivity growth rates) differ as the distance from the initial to the final level differ across countries and industries. The catch-up in productivity for the successful catching-up economy (country 3 'Asia') is assumed to be complete in the long-run (final productivity levels) while the productivity gaps remain also in the long-run for the less successful economy (country 4 'Africa'). This can be better seen in the figures presented below. Finally, as surplus profits/rents arise we have to specify the parameters for the investment behaviour. As one can see in table 4.5 we have not assumed a country or sector specific bias and assume a rather sensitive response of investment behaviour to differences in profits.

[11] As price levels can also differ between countries in the tradable sectors it is the CES formulation adopted for the expenditure functions which prevents complete international specialization. The further away relative price structures are across countries the more there is inter-industry specialization or, the other way around, there is a higher degree of intra-industry trade the closer relative price structures are between countries.

	Countries 1-4; Sectors 1-3
EoS across countries and industries σ_i^r	2.500
Country and sector bias parameters η_{ij}^{cr}	1.000

Table 4.5: Parameter for consumption behaviour

4.4 Simulation results

4.4.1 No leakage effects

Let us now present the ongoing dynamics of the respective variables in the base simulation. Figure 4.1 presents the trajectories of the labour input coefficients; as mentioned above, the dynamics of these variables is exogenous. Asia is catching-up with the advanced countries, US and EU, in all sectors; productivity in Asia is growing fastest in the modern tradable sector as in this sector the initial gap is largest. Although Africa also undergoes positive productivity developments it does not succeed in catching-up with the advanced economies; specifically, the gaps with these countries remains constant in all sectors. Note that this also implies that the gap of Africa relative to Asia becomes largest in the modern tradable sector; the non-tradable goods sector shows the lowest gap at the end of the simulation period. Finally the lower right hand panel shows the input coefficients at the aggregate level (the weighted sum of sector specific input coefficients weighted by the nominal output shares). These exogenous productivity dynamics has direct implications for costs of production and thus for price levels as well as for labour demand as the same output can be produced with less input of labour. But also a number of other - more indirect - effects have to be addressed: the structure of output in each country changes as relative prices and real incomes change and the international pattern of specialization (and thus the international division of labour) is affected. Figure 4.2 shows the evolution of the price levels in each country by sector (these are the 'producer' prices which are in general not identical to the prices at which consumers purchase their goods as the latter may substitute across countries' suppliers). The initial equilibrium was designed in such a way that the US and Europe on the one hand and Asia and Africa on the other hand face the same price levels. Services are more expensive in the former two countries; furthermore these two countries have an absolute cost advantage in the two trading sectors and a comparative advantage in the modern sector. The technological/productivity dynamics together with the dynamics of nominal wage rates (discussed later) change the price levels as well as the price structures. With respect to price levels one can see that these are falling in all sectors and countries due to the strong productivity dynamics as well as the negative effect of unemployment rates on nominal wage rates. With respect to relative prices let us first mention that there is a strong convergence across countries; the levels at the end of the simulation period are the same for the US, Europe and Asia (note that the latter fully converges to the US and Europe); the price level of services remains slightly lower in Africa. Relative prices are presented in figure 4.3. The relative price is falling strongest in the modern sector in all countries as this sector experiences the strongest increases in productivity. This pattern is of course most pronounced in the successful catching-up region ('Asia'). In terms of comparative advantage one can see that the US keeps the comparative advantage in this sector whereas Europe and Asia change their rank. The more rigid labour market behaviour (less wage flexibility and hence more wage growth in high-rents generating sectors) in Europe explains the difference between Europe and the US. The lower panels of figure 4.3 present the relative price of the service sector (against a weighted average of the tradable sectors). Due to lower productivity

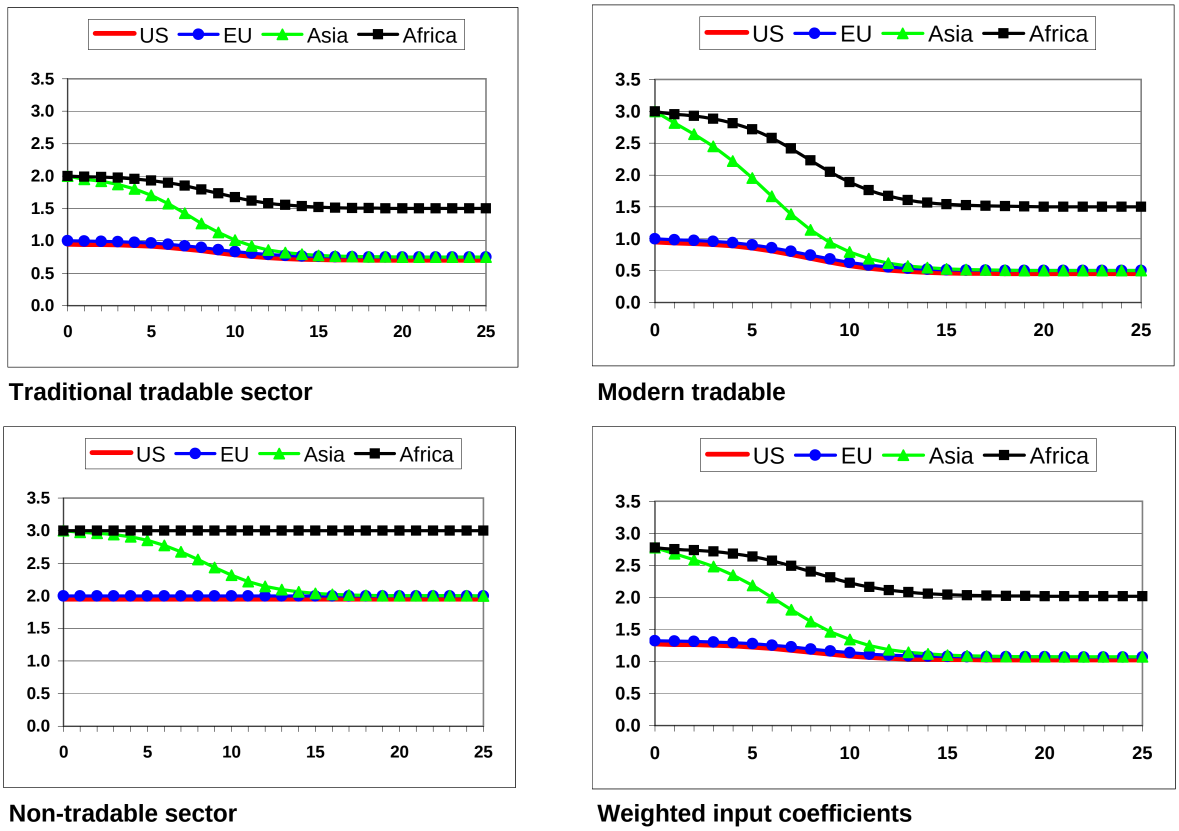

Figure 4.1: Inputs per unit of output by sectors and countries

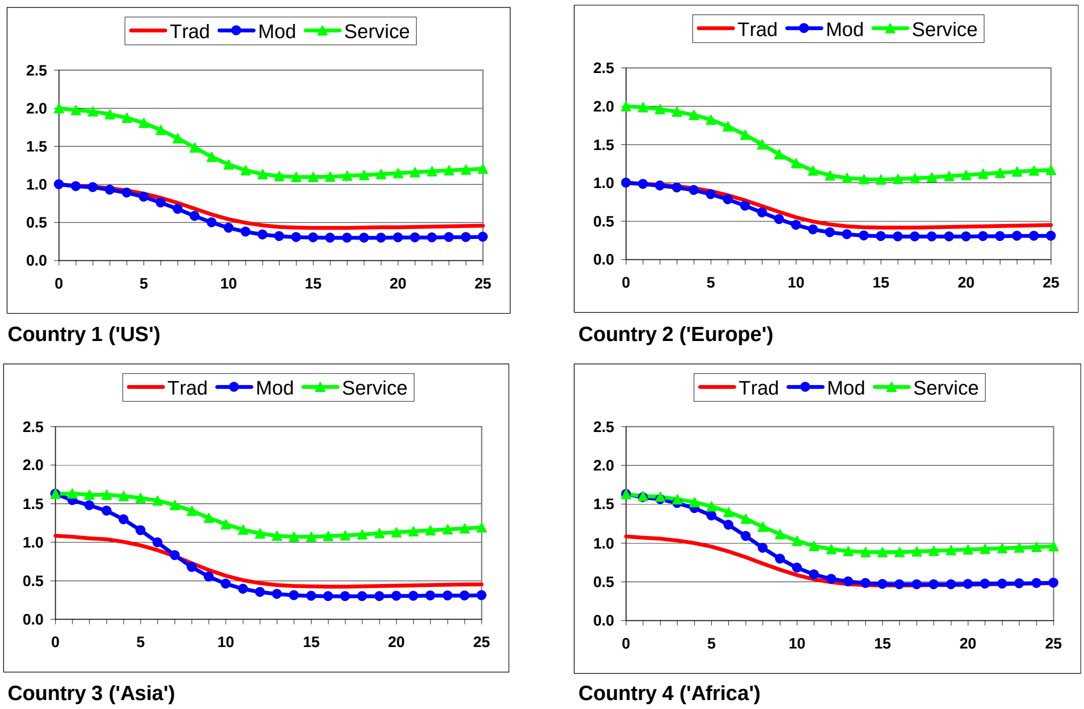

Figure 4.2: Price levels by sectors and countries

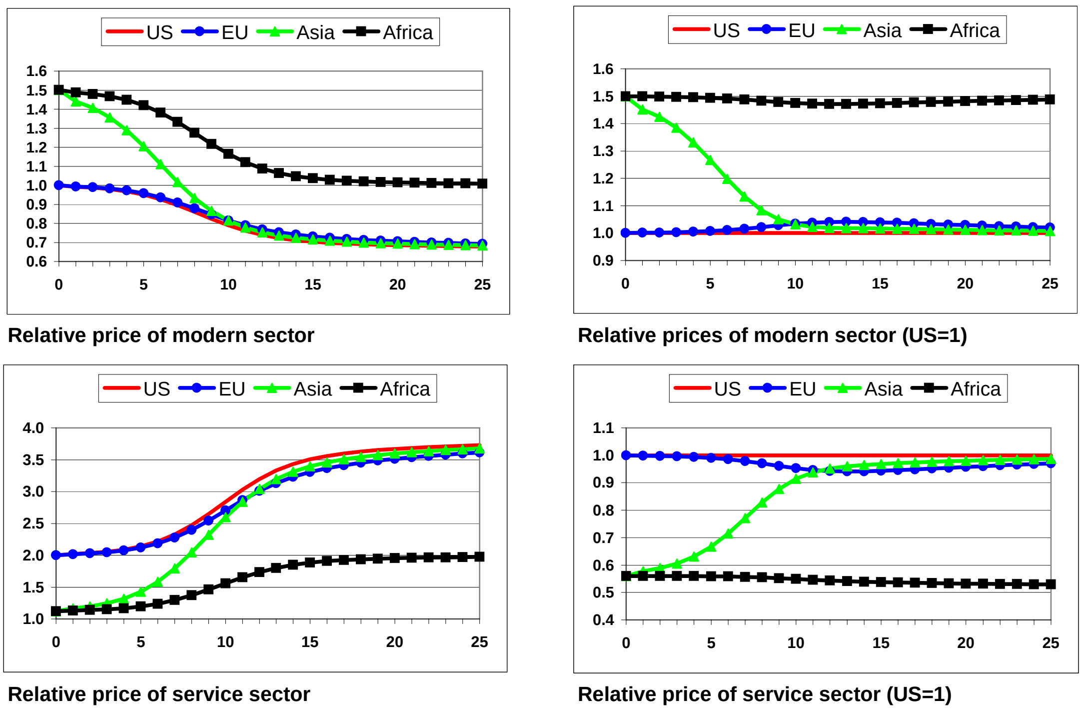

Figure 4.3: Relative prices and comparative advantages

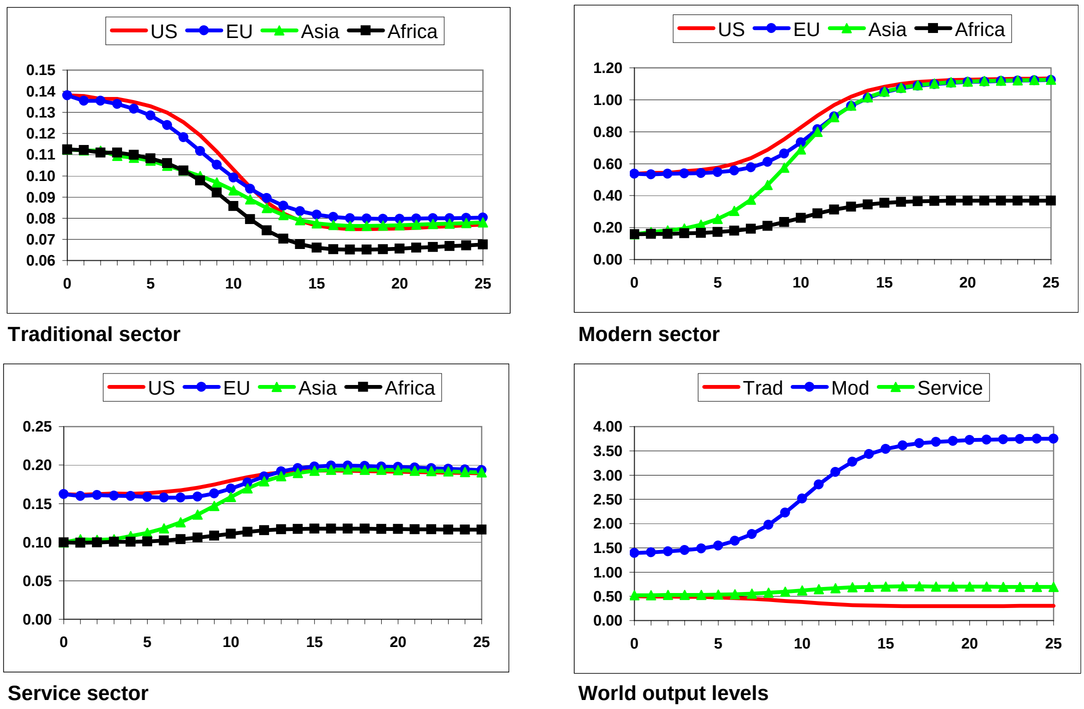

Figure 4.4: Output dynamics

dynamics the relative price of the services is increasing in all countries.

The changes in the structure of relative prices as well as in real income levels (which are discussed below) imply changes in the output structure in each country for two reasons: first, the structure of demand changes due to substitution effects as well as real income effects (non-linear Engel curves) and, second, due to changing specialization patterns following the dynamics of comparative advantage. Figure 4.4 presents the dynamics of output quantities. Output in quantity terms in the traditional sector is falling in all countries due to negative substitution effects and negative Engel-curve effects; the decline is less strong in Asia and Africa as these two countries gain in absolute cost terms against the US and Europe. The other two sectors show increases in output: in the modern sector this is due to substitution effects and in particular for Asia due to specialization effects; in the services sectors the Engel curve effects compensate the substitution effects and thus output levels are increasing. The different behaviour of the US and Europe in the modern sectors mainly reflects the differences in the dynamics of comparative advantages (and as productivity levels are the same in this simulation they differ only with respect to wage dynamics), whereas in the service sector the different real income levels are important; to these we turn next.

Figure 4.5 presents graphs with respect to labour market and income variables. First, unemployment is rising in all countries as productivity dynamics is faster than responses of output levels. There are two important observations: The country experiencing the fastest rise in productivity levels ('Asia') shows the lowest unemployment rates as it is able to attract demand through international specialization (demand shifts to the country which shows the fastest decline in price levels) and it is able to attract foreign investment which keeps up growth rates. On the other hand, Europe shows the highest unemployment rates as it loses its absolute and

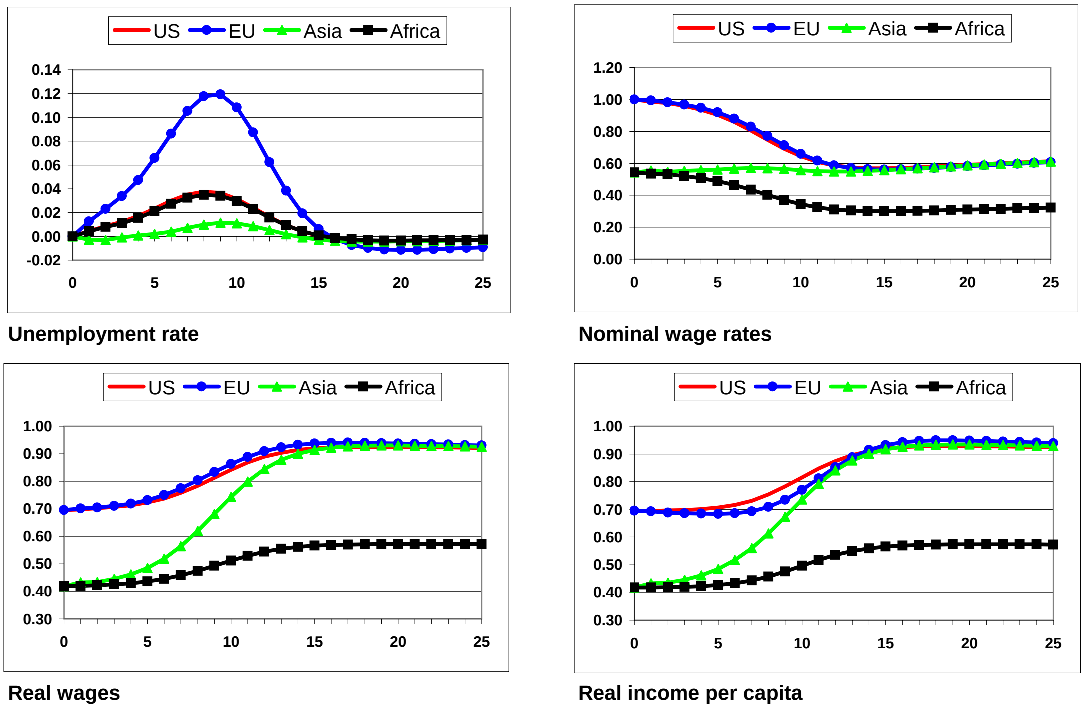

Figure 4.5: Labour market and income

comparative advantages against Asia but also - in a less dramatic way - against the US due to different wage behaviour. Although the differences in prices are not that strong (see figure 4.2 above) the rather high substitution effects matter a lot. The nominal wage rates in the US, Europe and Africa are falling mainly because of the Phillips curve effect. In Asia the nominal wage rates are kept almost constant as unemployment rates are lower and rents, which feed positively into nominal wages, are higher. However, more importantly, real wages are rising in all countries. Here it is important to note the difference between the US and Europe. Whereas in Europe real wages (i.e. real income per worker) are above real wages in the US, the real income (i.e. income per capita) is higher in the US which reflects the differences in unemployment rates. There are also some changes in the sectoral structure of employment demand to be observed. The shares of the traditional sector are falling in each country, especially so in Asia, whereas the shares of the modern and the non-tradable sectors are rising basically following the pattern of output dynamics. Comparing the US and Europe one can see that the latter region suffers from becoming less competitive compared to the US.

Finally, let us look at the distributional effects of the productivity and wage dynamics. Figure 4.7 presents the retained earnings s_i^c in all countries and sectors. These are important as they determine the structure of investment behaviour discussed above. Furthermore, these also show the distributional dynamics between wages and total profits (i.e. the wage share which in the particular case analysed here equals one in equilibrium). The absolute values are highest in the modern sector in Asia and Africa driven by productivity increases. In Europe and the US these are higher in the services sector as the price levels remain higher (lack of international price competition in the non-tradable sector). When looking at the retained earnings to cost ratio this is highest in the modern sector and lowest in the service sector in all countries reflecting

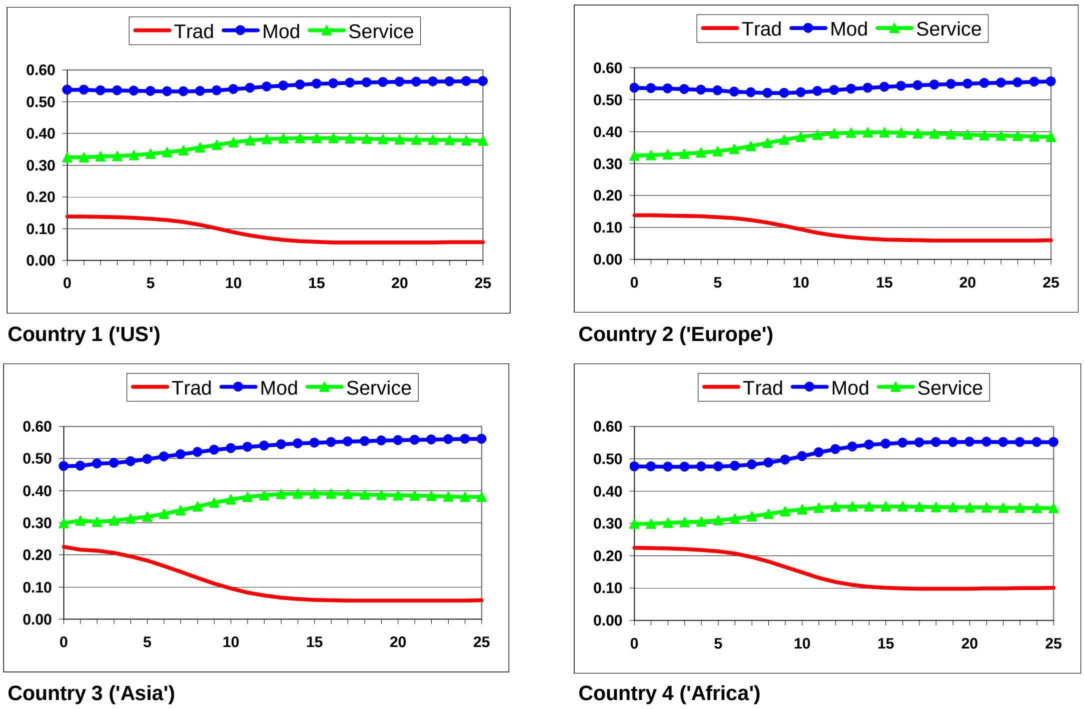

Figure 4.6: Sector employment shares

differences in productivity growth. Again the strongest distributional shift can be observed in Asia.

4.4.2 The effects of leakage

As argued in section 3.2, distributional shifts in the wake of structural change (which initiates the rent dynamic) may cause an effective demand problem as income distribution shifts in such a way that expenditure levels depend more on the 'unstable' component of demand, i.e. investment demand. We also showed that the degree of potential 'leakage' which causes an effective demand problem) could get accentuated in the case of a higher degree of international capital market integration (more FDI flows). Let us demonstrate the effects of a positive leakage parameter. In particular we assume $\lambda^{cr} = 0.10, \forall r, c = 1, \ldots, 4$. We shall not reproduce again the full set of graphs as the structural features of the dynamics remain essentially unchanged. However, there are important level effects which are best seen in the unemployment figures as well as in the changes of the wage share. These two variables are plotted in figure 4.8 for the base simulation (left panels) as well as for the scenarios allowing for leakage (right panels). In both scenarios unemployment is highest in Europe as already discussed above. Despite the high increases of productivity in Asia the unemployment rate is very low as these countries also succeed in attracting international demand and also benefit from raising domestic income. On the other hand, the wage share in Asia is lowest compared to the other countries. Not surprisingly, the leakage of investment has a negative effect on unemployment rates which almost double in this scenario as the overall growth rates are lower whereas productivity increases are not affected. The higher unemployment rates imply a stronger pressure on nominal wage rates, i.e. the shift

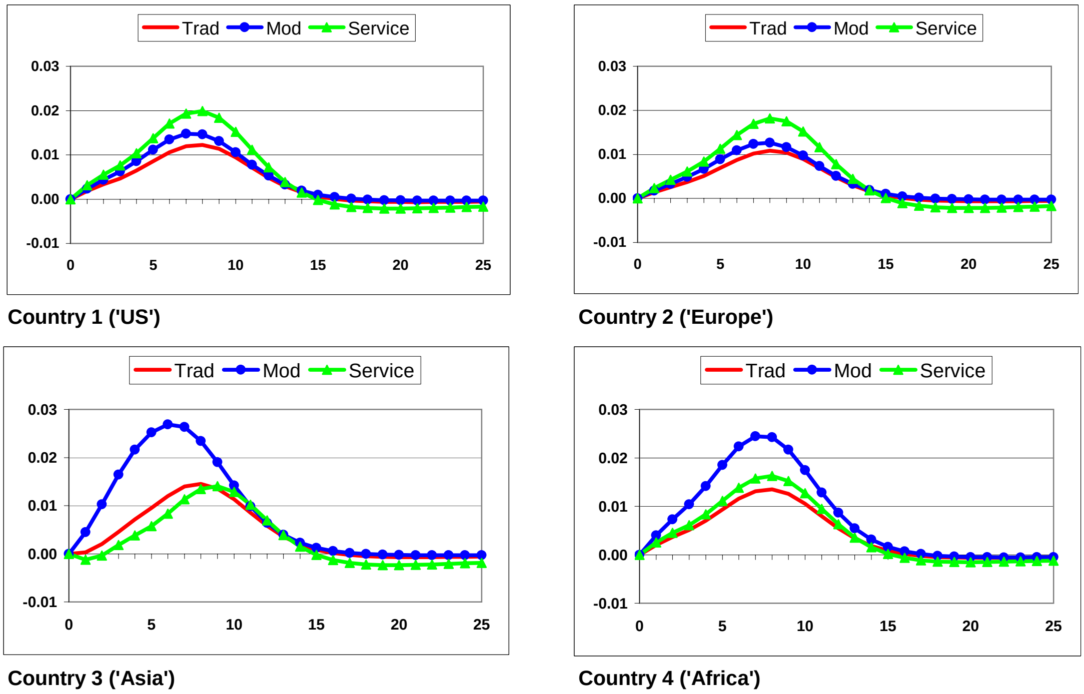

Figure 4.7: Retained earnings

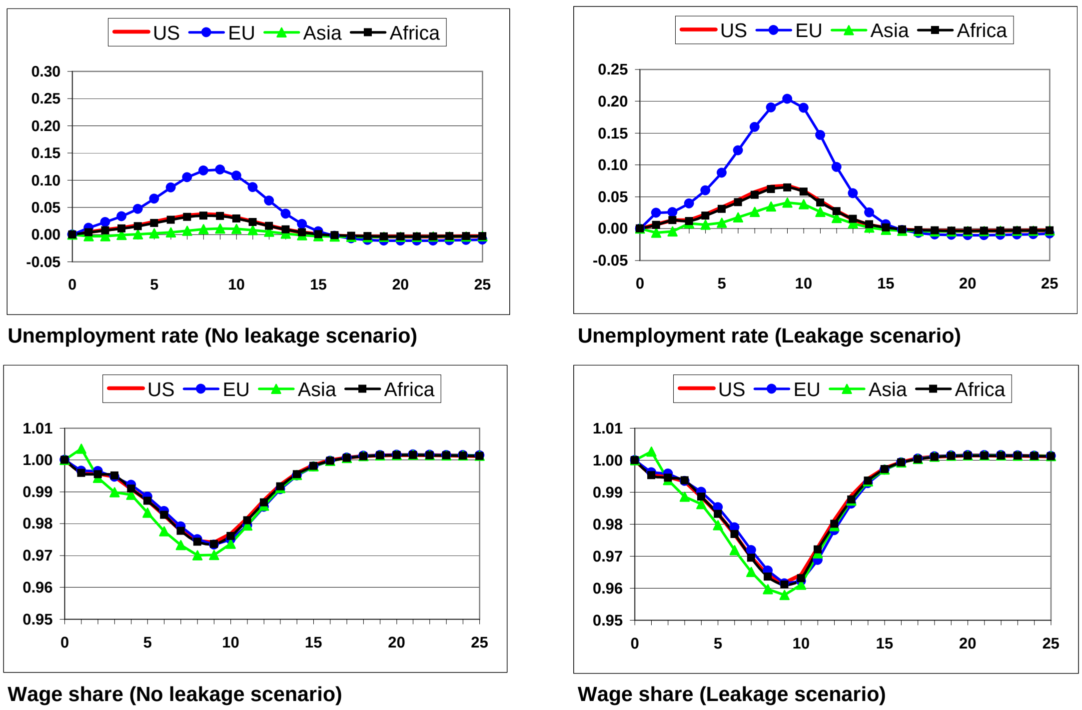

Figure 4.8: The effect of leakage in investment behaviour

to profit income increases and the wage share becomes even lower. Thus, this is a scenario in which a more risky investment climate (caused by structural shifts which show up both in the rent dynamics and in the global reallocation of production) leads to a situation in which, despite declining wage shares and thus higher profits, growth rates are diminished and unemployment becomes higher. This occurs even in a phase of a positive productivity 'shock' in the world economy from which one may expect higher growth rates.

If in such a situation the low growth rates of demand (compared to the higher capacity or potential capacity growth rates) and the higher and rising unemployment rates are interpreted as signs of a global economic slowdown, this may even further lower expectations and thus investment (or in terms of this model, increase the leakage) which may lead to a deepening of the situation of Keynesian unemployment.

Thus going somewhat beyond the scope of the model above, the macrodynamics depends on the characteristics of the 'leakage behaviour': If this is mainly determined by structural imbalances which arise naturally from strong productivity dynamics (which induces structural change and changes in the international division of labour) there may arise a problematic situation even in a phase of high rent income (lower wage shares). On the other hand, if these higher rents would be interpreted as higher expected returns to investment this could boost global growth as leakage would become lower (or even negative which would be an 'injection') and one would observe a phase of higher rents going hand in hand with higher growth rates.

5 Conclusions

This paper has presented an extension of work started originally with Richard M. Goodwin. Goodwin's interests later on in life were increasingly focused on integrating insights from J. Schumpeter and J.M. Keynes, on the importance of structural transformations on the one hand, and on the possibility of macroeconomic effective demand failures in capitalist economies on the other hand. In this paper we have taken a global view of structural transformations: on the one hand, there are uneven sectoral productivity developments, changes in price, demand, employment and output structures which we also observe in closed economies; on the other hand, there are issues of international catching-up patterns and changes in international specialization and of features of international economic integration (through trade, FDI and international financial transactions) which are important ingredients in today's structural transformations at the global level. We have tried to capture both these two sets of issues in the dynamic model described in this paper.

The effective demand issue - here we follow the later works of Richard M. Goodwin - is intricately linked to the changing distribution of income linked to these structural transformations. Periods of high structural change are periods in which complex patterns of profit (better: 'rent') dynamics emerges at the sectoral and international level and these guide the allocation of investment and changing locational patterns of production on one level, but they also affect aggregate macro-dynamics in the distribution of income. The basic idea of an effective demand problem in this context is that redistribution in favour of some income components (profits, rents) might, on the one hand, facilitate a speeding up of patterns of structural change (at the inter-sectoral and international level), but might also be more prone to generate a risk of effective demand failures (i.e. of under-utilizing productive potential). At the international level, the emergence of successful groups of catching-up economies represent an additional force for structural adjustment processes with both the potential to boost global real income growth but also to generate an additional source of effective demand failures. We have tried to trace these processes (and scenarios) in the context of a dynamic structural model which allows for changes in the international division of labour, changes in expenditure patterns, foreign direct investment flows, etc. but which also keeps track of macroeconomic dynamic features which were central to Goodwin's interest in the dynamics of capitalist economies.

A Properties of the model in equilibrium

A.1 Closed economy

Let us discuss the properties of the model in equilibrium. In particular we assume that the nominal wage rate is fixed and equalised across sectors; further we use the nominal wage rate as a numeraire, i.e. $w = 1$. We further use the full employment assumption, i.e. $h = \sum_i a_{l,i} q_i = \sum_i l_i = l$ and that rents are zero, $r_i = 0$. For simplicity we also assume that $\pi = 0$ which implies that $m_i = 0$; this implies that in equilibrium the economy is stationary. Further this implies that $p_i = a_{l,i} = c_i$ for all $i = 1, \dots, N$. The assumption of an equalised wage rate implies that the expenditure structure is the same for all workers. If prices and the nominal wage rate are fixed, the expenditure shares are also constant.

We first have to show that in equilibrium it holds that $\mathbf{D}_f \mathbf{q} = \mathbf{q}$. This matrix can be expressed as $\mathbf{D}_f = \mathbf{P}^{-1} \aleph \mathbf{C} = \mathbf{P}^{-1} \aleph \mathbf{P}$. $\mathbf{P}$ and $\mathbf{C}$ denote diagonal matrices with prices and costs respectively on the diagonal; $\aleph = \boldsymbol{\alpha} \otimes \boldsymbol{\iota}_N$ with $\boldsymbol{\alpha} = (\alpha_1, \dots, \alpha_N)'$; the latter equality in the equation above follows from our assumption of no mark-ups. For a non-trivial solution of the equation $(\mathbf{D}_f - \mathbf{I})\mathbf{q} = (\mathbf{P}^{-1} \aleph \mathbf{P} - \mathbf{I})\mathbf{q} = \mathbf{0}$ one has to show that $\mathbf{P}^{-1} \aleph \mathbf{P} - \mathbf{I}$ is linearly dependent. This can be checked by premultiplying with $\mathbf{P}$ and using $\sum_i \alpha_i = 1$. Thus there exist non-trivial solutions for $\mathbf{q}$. As there are more variables than linearly independent equations the structure is determined but not the levels. This can be determined by using the full employment constraint $h = \mathbf{a}_l' \mathbf{q}$. Using the fact that $p_i = a_{l,i}$ and denoting the diagonal matrix with labour input coefficients on the diagonal with $\mathbf{A}_l$ the above equation can be written as $\mathbf{A}_l^{-1} \aleph \mathbf{A}_l \mathbf{q} = \mathbf{q}$. Using $\aleph \mathbf{A}_l \mathbf{q} = \boldsymbol{\alpha} h$ gives $\mathbf{q} = h \mathbf{A}_l^{-1} \boldsymbol{\alpha}$ or for a particular industry $q_i = \alpha_i h / a_{l,i}$. This also holds for $w \neq 1$.

A.2 Open (trading) economies

The above analysis also holds for economies trading with each other. However, an additional constraint has to be considered, i.e. the balance-of-payments (BoP) for each country must be zero in equilibrium:

$$BoP^c = \sum_{r,i} \mu_i^{cr} w^r h^r - \sum_{r,i} \mu_i^{rc} w^c h^c = 0.$$

Again we have assumed that $\pi = 0$ which implies that the balance-of-payments only consists of the trade balance. Here we have used the fact that in equilibrium $\mu_{ij}^{rc} = \mu_{ik}^{rc}$ for all $j, k = 1, \dots, N$ as wage rates are equalised across sectors. This must be satisfied for all countries. In matrix notation this can be written as

$$\begin{pmatrix} -\sum_{i,r(r\neq 1)} \mu_i^{r1} h1 & \sum_i \mu_i^{12} h2 & \dots & \sum_i \mu_i^{1C} h^C \\ \sum_i \mu_i^{21} h1 & -\sum_{i,r(r\neq 2)} \mu_i^{r2} h2 & \dots & \sum_i \mu_i^{2C} h^C \\ \vdots & \vdots & \ddots & \vdots \\ \sum_i \mu_i^{C1} h1 & \sum_i \mu_i^{C2} h2 & \dots & -\sum_{i,r(r\neq C)} \mu_i^{rC} h^C \end{pmatrix} \begin{pmatrix} w1 \\ w2 \\ \vdots \\ w^C \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \\ \vdots \\ 0 \end{pmatrix}$$

This homogenous system of equations can be solved as each column sums to one; thus the matrix is linearly dependent. As there are more variables $w1, \dots, w^C$ than linearly independent equations we can set $w^c = 1$ for one particular country c. In an equivalent formulation this can also be recalculated in terms of exchange rates. Let $w1 = 1$ be the wage rate in the 'numeraire country'. The nominal exchange rate between this and any other country c is $w^c / w1 = \epsilon^{1c}$ as

$w^c = w1\epsilon^{1c}$. This implicitely defines the nominal exchange rate between any two countries as e.g. $\frac{w^c}{w^r} = \frac{w1\epsilon^{1c}}{w1\epsilon^{1r}} = \epsilon^{rc}$ as then $w^c = w^r\epsilon^{rc}$.

Let $\mathbf{w} = (w1, \dots, w^C)$ and $\mathbf{W} = \mathbf{w} \otimes I_N$; similarly to above we define $\mathbf{a}_l = (a_{l,1}1, \dots, a^C_{l,N})$ and $\mathbf{A}_l$ denotes the corresponding diagonal matrix. As above one can show that $\mathbf{D}_f = \mathbf{P}^{-1}\aleph\mathbf{C} = \mathbf{P}^{-1}\aleph\mathbf{P}$ with $\mathbf{P} = \mathbf{W}\mathbf{A}_l$; the matrix of nominal expenditure shares in equilibrium becomes $\aleph = \boldsymbol{\mu} \otimes \iota_N$ with $\boldsymbol{\mu} = (\boldsymbol{\mu}1, \dots, \boldsymbol{\mu}^C)$ where $\boldsymbol{\mu}^r = (\mu_1^{1r}, \mu_2^{1r}, \dots, \mu_N^{Cr})'$. Analogous to the above, the homogenous system of equations $\mathbf{D}_f\mathbf{q} = \mathbf{q}$ has a non-trivial solution. Again, one equation is linearly dependent as $\sum_{c,i}\mu_i^{cr} = 1$ for all $r = 1, \dots, C$ and thus only the structure of the vector $\mathbf{q}$ is determined. To determine output levels we first note that from the BoP constraint follows that $-\sum_{r,i(r\neq c)}\mu_i^{cr}w^rh^r + \sum_{c,i(c\neq r)}\mu_i^{rc}w^ch^c = 0$, thus $\sum_{c,i(c\neq r)}\mu_i^{rc}w^ch^c = w^rh^r - w^rh^r\sum_{r,i}\mu_i^{rr}$ or $\sum_{c,i}\mu_i^{rc}w^ch^c = w^rh^r$. Dividing by w^rh^r gives the nominal output share for each sector of country r as $w^rq^r = \sum_i p_i^rq_i^r$ in equilibrium. Let us denote $\sum_c \mu_i^{rc}/w^rhr = \alpha_i^r$. Then one can proceed similarly to the above: A typical element of $\aleph\mathbf{W}\mathbf{A}_l\mathbf{q}$ is $\alpha_i^rw^rh^r$ and using that $\mathbf{P}^{-1}\aleph\mathbf{W}\mathbf{A}_l\mathbf{q} = \mathbf{q}$ shows $q_i^r = \frac{1}{p_i^r}\alpha_i^rw^rh^r = \frac{1}{a_{l,i}^r}\alpha_i^rh^r$; the last equality follows from $p_i^r = a_{l,i}^rw^r$. Full employment is assured as $\sum_i\alpha_i^r = 1$.

References

Deaton, A. and J. Muellbauer (1980). *Economics and Consumer Behaviour.* Cambridge, UK: Cambridge University Press.

Gerschenkron, A. (1952). Economic backwardness in historical perspective. In B. Hoselitz (Ed.), *The Progress of Underdeveloped Areas.* Chicago.

Gerschenkron, A. (1962). *Economic Backwardness in Historical Perspective.* Cambridge (Mass.): Harvard University Press.

Goodwin, R. (1970). *Elementary Economics from the Higher Standpoint.* Cambridge, UK: Cambridge University Press.

Goodwin, R. (1982). *Essays in Economic Dynamics.* London: Macmillan Press.

Goodwin, R. (1983a). *Essays in Linear Economic Structures.* London: Macmillan Press.

Goodwin, R. (1983b). Use of normalised general co-ordinates in linear value and distribution theory. In R. Goodwin (Ed.), *Essays in Linear Economic Structures.* London: Macmillan Press.

Goodwin, R. (1989). *Essays in Non-Linear Economic Dynamics. Collected Papers 1980-1987.* Frankfurt: Verlag Peter Lang.

Goodwin, R. (1990). *Chaotic Economic Dynamics.* Oxford: Oxford University Press.

Goodwin, R. and L. Punzo (1987). *The Dynamics of a Capitalist Economy. A Multi-Sectoral Approach.* Oxford: Polity Press/Blackwell.

Helpman, E. (1998). *General Purpose Technologies and Economic Growth.* Cambridge, US: MIT Press.

Karshenas, M. and P. Stoneman (1995). Technological diffusion. In P. Stoneman (Ed.), *Handbook of the Economics of Innovation and Technological Change*, pp. 265–297. Oxford: Blackwell.

Landesmann, M. and R. Goodwin (1994). Productivity growth, structural change and macroeconomic stability. In L. Pasinetti and R. Solow (Eds.), *Economic Growth and the Structure of Long-Term Development.* London: Macmillan Press.

Landesmann, M., R. Goodwin, and R. Stehrer (1997). Structural economic dynamics: Catching-up and the global deflationary bias. In A. Simonovits and A. Steenge (Eds.), *Prices, Growth and Cycles. Essays in Honour of A. Bródy.* London: Macmillan Press.

Landesmann, M. and R. Stehrer (2000). Industrial specialisation, catching-up and labour market dynamics. *Metroeconomica/Review of International Economics 51*(1), 67–101.

Landesmann, M. and R. Stehrer (2001). Convergence patterns and switchovers in comparative advantage. *Structural Change and Economic Dynamics 12*, 399–423.

Landesmann, M. and R. Stehrer (2002). Technical change, effective demand and economic growth. In N. Salvadori (Ed.), *Old and New Growth Theories. An Assessment.* Cheltenham: Edward Elgar.

Landesmann, M. and R. Stehrer (2004). Technology diffusion, international competition and effective demand. *Revue d'Economie Industrielle 105*, 23–46.

Landesmann, M. and R. Stehrer (2006a). Income distribution, technical change and the dynamics of international economic integration. *Metroeconomica/Review of International Economics*. forthcoming.

Landesmann, M. and R. Stehrer (2006b). Modelling international economic integration: Patterns of catching-up, foreign direct investment and migration flows. *Economica politica - Journal of Analytical and Institutional Economics* (December). forthcoming.

Mueller, D. (1977). The persistence of profits above the norm. *Economica 44*(176), 369–80.

Mueller, D. (1986). *Profits in the Long Run*. Cambridge, UK: Cambridge University Press.

Mueller, D. (1990). *The Dynamics of Company Profits: An International Comparison*. Cambridge, UK: Cambridge University Press.

Schmookler, J. (1966). *Invention and Economic Growth*. Cambridge, US: Harvard University Press.

Stehrer, R. (2002a). Dynamics of trade integration and technological convergence. *Economic Systems Research 14*(3), 219–244.

Stehrer, R. (2002b). Technical progress in a dynamic input-output model with heterogenous labour. In R. Cowan and N. Jonard (Eds.), *Heterogenous Agents, Interactions and Economic Performance. Lecture Notes in Economics and Mathematical Systems*, pp. 323–339. Berlin: Springer Verlag.

Short list of the most recent wiiw publications (as of October 2006)

For current updates and summaries see also wiiw's website at www.wiiw.ac.at

Goodwin's Structural Economic Dynamics: Modelling Schumpeterian and Keynesian Insights
by Michael Landesmann and Robert Stehrer
wiiw Working Papers, No. 41, October 2006
26 pages including 5 Tables and 8 Figures
hardcopy: EUR 8.00 (PDF: free download from wiiw's website)

The Vienna Institute Monthly Report 10/06
edited by Leon Podkaminer

- The Czech Republic: high growth likely to slow down
- Hungary: convergence programme revised
- Poland: domestic demand strengthening further
- Slovakia: little change in economic policy, strong growth continues
- Slovenia: flat tax concept abandoned
- Bulgaria: pre-accession reform rush pays off
- Romania: persisting uncertainties at the doorstep of the EU
- Selected monthly data on the economic situation in ten transition countries, 2005-2006
- Guide to wiiw statistical services on Central, East and Southeast Europe, Russia and Ukraine

wiiw, October 2006
36 pages including 18 Tables and 2 Figures
(exclusively for subscribers to the wiiw Service Package)

The Vienna Institute Monthly Report 8-9/06
edited by Leon Podkaminer

- Poland's competitive position in the enlarged EU
- Ownership structure and development of Russian firms
- Building walls: a note on immigration
- Selected monthly data on the economic situation in ten transition countries, 2005-2006
- Guide to wiiw statistical services on Central, East and Southeast Europe, Russia and Ukraine

wiiw, August/September 2006
34 pages including 19 Tables and 2 Figures
(exclusively for subscribers to the wiiw Service Package)

Central and East European Agriculture in Integrating Europe
by Zdenek Lukas and Jan Mládek
wiiw Research Reports, No. 329, August 2006
40 pages including 13 Tables and 8 Figures
hardcopy: EUR 22.00 (PDF: EUR 20.00)

Broader-based Growth Resilient to Global Uncertainties
by Vladimir Gligorov, Leon Podkaminer et al.
wiiw Research Reports, No. 328, July 2006
(special issue on economic prospects for Central, East and Southeast Europe; covering Albania, Bosnia and Herzegovina, Bulgaria, Croatia, the Czech Republic, Hungary, Macedonia, Montenegro, Poland, Romania, Russia, Serbia, Slovakia, Slovenia, Ukraine, Turkey, and China)
123 pages including 44 Tables and 19 Figures
hardcopy: EUR 70.00 (PDF: EUR 65.00)

The Vienna Institute Monthly Report 7/06
edited by Leon Podkaminer

- The floating exchange rate: a troublesome ally of the Polish central bank
- A note on the interpretation and international comparison of external imbalances
- On heroes, villains and statisticians
- Selected monthly data on the economic situation in ten transition countries, 2005-2006
- Guide to wiiw statistical services on Central, East and Southeast Europe, Russia and Ukraine

wiiw, July 2006
38 pages including 17 Tables and 9 Figures
(exclusively for subscribers to the wiiw Service Package)

What Explains Tax Evasion? An Empirical Assessment based on European Data
by Edward Christie and Mario Holzner
wiiw Working Papers, No. 40, June 2006
53 pages including 28 Tables and 1 Map
hardcopy: EUR 8.00 (PDF: free download from wiiw's website)

The Vienna Institute Monthly Report 6/06
edited by Leon Podkaminer

- wiiw in 2005 and beyond
- Yet another Balkan state
- Electricity efficiency in the new EU member states and the accession countries: convergence to Western European levels?
- China preparing for WTO deadline in banking
- Selected monthly data on the economic situation in ten transition countries, 2005-2006
- Guide to wiiw statistical services on Central, East and Southeast Europe, Russia and Ukraine

wiiw, June 2006
34 pages including 21 Tables and 2 Figures
(exclusively for subscribers to the wiiw Service Package)

Wirtschaftswachstum hält in den MOEL an
by Vasily Astrov
wiiw Research Papers in German language, May 2006
(reprinted from: *WIFO-Monatsberichte*, Vol. 79, No. 5, May 2006)
17 pages including 9 Tables and 4 Figures, EUR 8.00 (PDF: free download from wiiw's website)

wiiw Database on Foreign Direct Investment in Central, East and Southeast Europe: Increasing Significance of Repatriated and Reinvested Earnings
by Gábor Hunya. Database and layout by Monika Schwarzhappel
wiiw, Vienna, May 2006
98 pages including 79 Tables
hardcopy: EUR 70.00 (PDF: EUR 65.00), CD-ROM (including hardcopy): EUR 145.00

CEECs' Competitiveness in the Global Context
by Michael Landesmann and Julia Wörz
wiiw Research Reports, No. 327, May 2006
75 pages including 23 Tables and 26 Figures
hardcopy: EUR 22.00 (PDF: EUR 20.00)

An Alternative Formulation of the Devereux-Griffith Effective Average Tax Rates for International Investment
by Roman Römisch and Markus Leibrecht
wiiw Working Papers, No. 39, May 2006
23 pages including 3 Tables
hardcopy: EUR 8.00 (PDF: free download from wiiw's website)

The Vienna Institute Monthly Report 5/06
edited by Leon Podkaminer

- wiiw Managing Director retires
- Further expanding agro-food trade of the NMS-4 in Europe
- Real convergence and inflation
- Green light for reforms with comfortable socialist-liberal majority in the Hungarian parliament
- Selected monthly data on the economic situation in ten transition countries, 2004-2006
- Guide to wiiw statistical services on Central, East and Southeast Europe, Russia and Ukraine

wiiw, May 2006
30 pages including 14 Tables and 8 Figures
(exclusively for subscribers to the wiiw Service Package)

Good or Bad? The Influence of FDI on Output Growth: An industry-level analysis
by Carmen Fillat Castejón and Julia Wörz
wiiw Working Papers, No. 38, April 2006
29 pages including 10 Tables and 2 Figures
hardcopy: EUR 8.00 (PDF: free download from wiiw's website)

The Impact of Romania's Accession to the EU on the Austrian Economy
by Gábor Hunya and Anna Iara
wiiw Research Reports, No. 326, April 2006
36 pages including 18 Tables
hardcopy: EUR 22.00 (PDF: EUR 20.00)

The Vienna Institute Monthly Report 4/06
edited by Leon Podkaminer

- Poland: growth dividend not high enough for Maastricht fiscal criterion to be met
- Fast growth in the Baltic countries continues
- European society and the welfare state
- Selected monthly data on the economic situation in ten transition countries, 2004-2006
- Guide to wiiw statistical services on Central, East and Southeast Europe, Russia and Ukraine

wiiw, April 2006
32 pages including 13 Tables and 4 Figures
(exclusively for subscribers to the wiiw Service Package)

The Ukrainian Economy between Russia and the Enlarged EU: Consequences for Trade and Investment
by Vasily Astrov, in collaboration with Zdenek Lukas and Josef Pöschl
wiiw Current Analyses and Country Profiles, No. 23, March 2006
101 pages including 32 Tables and 7 Figures
hardcopy: EUR 70.00 (PDF: EUR 65.00)

The Vienna Institute Monthly Report 3/06
edited by Leon Podkaminer

- Export quality indicators for the transition countries
- On the profitability of Austrian firms in the new EU member states
- Possible entry into the euro zone of Estonia, Lithuania and Slovenia: an evaluation
- Selected monthly data on the economic situation in ten transition countries, 2004-2006
- Guide to wiiw statistical services on Central, East and Southeast Europe, Russia and Ukraine

wiiw, March 2006
30 pages including 12 Tables and 11 Figures
(exclusively for subscribers to the wiiw Service Package)

wiiw Service Package

The Vienna Institute offers to firms and institutions interested in unbiased and up-to-date information on Central, East and Southeast European markets a package of exclusive services and preferential access to its publications and research findings, on the basis of a subscription at an annual fee of EUR 2,000.

This subscription fee entitles to the following package of **Special Services**:

- A free invitation to the Vienna Institute's **Spring Seminar**, a whole-day event at the end of March, devoted to compelling topics in the economic transformation of the Central and East European region (for subscribers to the wiiw Service Package only).
- Copies of, or online access to, ***The Vienna Institute Monthly Report***, a periodical consisting of timely articles summarizing and interpreting the latest economic developments in Central and Eastern Europe and the former Soviet Union. The statistical annex to each *Monthly Report* contains tables of the latest monthly country data. This periodical is not for sale, it can only be obtained in the framework of the wiiw Service Package.
- Free copies of the Institute's ***Research Reports*** (including ***Reprints***), ***Current Analyses and Country Profiles*** and ***Statistical Reports****.*
- A free copy of the ***wiiw Handbook of Statistics*** (published in October/November each year and containing more than 400 tables and graphs on the economies of Albania, Bosnia and Herzegovina, Bulgaria, Croatia, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Macedonia, Poland, Romania, Russia, Serbia and Montenegro, the Slovak Republic, Slovenia and Ukraine)
- Free online access to the **wiiw Monthly Database**, containing more than 1200 leading indicators monitoring the latest key economic developments in ten Central and East European countries.
- **Consulting**. The Vienna Institute is pleased to advise subscribers on questions concerning the East European economies or East-West economic relations if the required background research has already been undertaken by the Institute. We regret we have to charge extra for *ad hoc* research.
- Free access to the Institute's specialized economics library and documentation facilities.

Subscribers who wish to purchase wiiw data sets **on CD-ROM** or special publications not included in the wiiw Service Package are granted considerable **price reductions**.

For detailed information about the wiiw Service Package
please visit wiiw's website at www.wiiw.ac.at

To
The Vienna Institute
for International Economic Studies
Oppolzergasse 6
A-1010 Vienna

- O Please forward more detailed information about the Vienna Institute's Service Package
- O Please forward a complete list of the Vienna Institute's publications to the following address

Please enter me for

- O 1 yearly subscription of *Research Reports* (including *Reprints*)
  at a price of EUR 225.00 (within Austria), EUR 250.00 (Europe) and EUR 265.00 (overseas) respectively

Please forward

- O the following issue of *Research Reports* ....
- O the following issue of *Current Analyses and Country Profiles* ....
- O the following issue of *Working Papers* ....
- O the following issue of *Statistical Reports* ....
- O the following issue of *Research Papers in German language* ....
- O the following issue of *Industry Studies* ....
- O the following issue of *Structural Reports* ....
- O the following issue of *wiiw Database on Foreign Direct Investment* ....
- O the following issue of *wiiw Handbook of Statistics* ....

....

Name

....

Address

....

Telephone Fax E-mail

....

Date Signature

Herausgeber, Verleger, Eigentümer und Hersteller:
Verein „Wiener Institut für Internationale Wirtschaftsvergleiche“ (wiiw),
Wien 1, Oppolzergasse 6
Postanschrift: A-1010 Wien, Oppolzergasse 6, Tel: [+431] 533 66 10, Telefax: [+431] 533 66 10 50
Internet Homepage: www.wiiw.ac.at

P.b.b. Verlagspostamt 1010 Wien