Economic Growth of the EU and Asia. A First Forecast with the Global Econometric Model GINFORS

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Abstract

The authors present the global economic environmental model GINFORS (**G**lobal **In**terindustry **For**ecasting **S**ystem), which is just being constructed in the project MOSUS (**M**odelling **O**pportunities and Limits for Restructuring Europe towards **Sus**tainability), financed by the EU Commission. With a preliminary version a baseline forecast for global growth until 2010 is presented with a focus on East Asia, South East Asia and Europe. Special interest is given to the linkages between the country developments via international trade. Two alternative scenarios are discussed, in which the growth weakness of Germany and the impact of a strong Euro are the subjects.

Keywords: economic forecast, global modelling, economy-energy-environment models.

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1 Introduction

The global dimension of economic and environmental problems stresses the need of an internationally linked economic and environmental policy. The example of climate change policy shows, that environmental policy has to be a subject of a globally oriented international policy formulating operational targets, that allow for global sustainable development in the environmental, economic and social dimension. Further, a set of policy instruments has to be installed, that will enable to reach global sustainability.

Already from a political point of view the task seems to be huge, and there are many sceptical voices, whether the big political bargaining process could ever converge. A necessary but by no means sufficient condition for this is the solution of a big information problem: What does sustainable development mean for the different countries, when it comes to the formulation of *operational* targets for the use of the environment, the economic and social development for the future? How are the *relations* between the targets? What do we know about the interdependencies between the environment, the economic and the social development in the different countries? How do the different instruments affect nature and the paths of economic and social development? How is the efficiency of these instruments?

Only simulations and forecasts with models, which depict the interdependencies between the environment, economic and social development, can give us answers to these questions. Of course, such models have to fulfil certain requirements. In section 2 we will discuss this point from the perspective of a concrete policy project. The MOSUS project

"**M**odeling **O**pportunities and Limits for Restructuring Europe towards **SUS**tainability", which is funded by the 5th framework program of the European Union, tries to give answers for the above quoted questions. Part of the project is the development and application of the model GINFORS (**G**lobal **IN**terindustry **FOR**ecasting **S**ystem) as a simulation tool.

The focus of the paper at hand is an application of the present version of the model, that combines 40 macro econometric country models with a bilateral trade model. It is a **preliminary version**, which has no sector detail in the country models and no relations between the economy and the environment. We present a forecast of the world economy till the year 2010 with special interest to the interrelations of the development of the EU, East Asia and South East Asia.

In section 3 we give a short description of the preliminary version of the model and discuss the assumptions concerning the forecast for the exogenous variables. In section 4 we describe the future developments of the trade shares for some important Asian countries for the export totals and some interesting product groups. In section 5 we analyse the forecasts for real GDP prices and employment in the EU, the United States and East and South East Asia. The forecast gives a good perspective for global growth with different dynamics in the countries. Germany has a relative weak growth perspective. We discuss the reasons in section 6 and make an alternative simulation of the impact of a recovery program, which first elements have just passed the two chambers of parliament, on the world trade. One important exogenous variable is the Euro/Dollar relation, which is kept constant in the forecast. In a sensivity analysis we present in section 7 the results for an alternative scenario with a stronger Euro. Some conclusions in section 8 close the paper.

2 The MOSUS Project and its Challenge for Modelling

Since the Gothenburg summit in June 2001 the concept of Sustainable Development is in concrete terms a dominant guideline for the policy of the European Union (EU 2002). The commission presented an overall strategy, which demands to examine the links between economic, social and environmental policies to make them more compatible with Sustainable Development. Since the European socio-economic development and its use of the environment has impacts far beyond the borders of the community, the Sustainable Development Strategy explicitly stresses, that the development of the European Union has to be analysed within a global context.

The MOSUS project (www.mosus.net) is the ambitious attempt to identify possible strategies for a sustainable development in Europe considering the interrelations of

- resource inputs, land use, energy consumption,
- economic development, and
- fundamental social indicators.

As part of the 5th framework programme of the European Union MOSUS started with the kick-off meeting in March 2003. MOSUS is endorsed by the Industrial Transformation Project of the International Human Dimensions Programme (IHDP-IT). Partners of the project are 12 research institutes from 8 European countries.

There are five requirements, which the simulation model used in the MOSUS project has to fulfil (Meyer, Lutz, Wolter 2003):

1. It has to be a *multicountry* global model. The global coverage is already demanded in the strategy of the Commission. The multicountry approach is needed as policy decisions are made in countries and for countries and not in regions. Of course, all EU 15 and the accession countries as well as all other countries in the

world, that are important from an economic and environmental point of view, have to be described explicitly.

2. A *multisector* model is needed: The interrelations between the economy and the environment with its complex structures for the different resources and emissions can only be depicted in a deep sector disaggregation of the economy.
3. From 1 and 2 follows, that *international trade* has to be analysed in a *multisector/multicountry* approach. This means, that for every product group, that is important to describe the economic-environmental interdependencies, the international trade between all important countries has to be depicted bilaterally.
4. The model has to give an *endogenous explanation of socio-economic development and its linkage with the environment.* This follows from the integrative approach of sustainability, that defines the MOSUS project.
5. The model must be able to describe concrete and realistic policy alternatives. How will the future be in the business-as-usual case? How can this path be influenced by instruments, that are in discussion. A *forecast* model is needed, which is able to reproduce the historical development because of the *statistical significance of its parameters.*

The model COMPASS (Uno 2002, Meyer and Uno 1999) fulfills these requirements for the economy-energy parts of the task with one exception: The country selection is not focussed on the EU. Insofar further modelling work would concern additional land use and material input models for every country and to construct the economic heart of the system for the missing EU member and accession countries. But it was not possible to simply add some models to the COMPASS system, because for the new countries the data is only available in the new SNA 93 classification. So we had to start from the beginning using the SNA 93 data for all countries. A central point

for a new development was, that the OECD recently published time series data of trade matrices, which cover most European countries.

The new model named GINFORS (**G**lobal **IN**terindustry **FOR**ecasting **S**ystem) is already under construction. It is based on the same philosophy as COMPASS, but uses a different data set and a different software. The relations between the economy and the environment will be modelled more completly, since not only energy, but also material inputs and land use will be integrated.

Figure 1 shows the information about data sources and geographical coverage of GINFORS. The trade model uses OECD data, distinguishing 25 commodities and services as an additional group for 40 countries and the two regions OPEC and ROW (Rest of the world). The macro models are also based on SNA data from the OECD. The Balance of Payments and monetary variables are taken from the IFS statistics of the International Monetary Fund. There are macro models for 53 countries, which means, that 13 of these countries are not explicitly part of the bilateral trade model. Their trade is linked to the trade of the region Rest of the World.

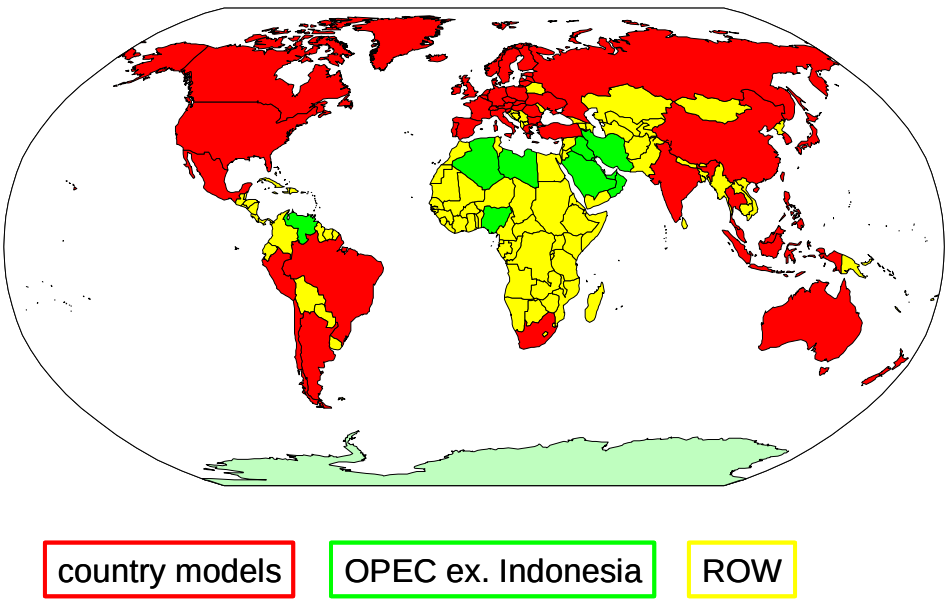
Figure 1: Data sources and coverage of GINFORS

model type		**data sources**	**geographical coverage**
trade		OECD	40 countries, 2 regions (OPEC, ROW), 25 sectors + services
country models	input-output	OECD, national sources	20 - 30 countries
	macro	OECD / IMF	53 countries
	energy	IEA	53 countries
	material	SERI	53 countries
	land-use	IIASA	20 - 30 countries

The input-output tables are delivered for 15 OECD countries from the OECD. The tables for the accession countries and for some important Asian countries will be taken from national sources. It can be expected, that input-output tables for at least 20 to 30 countries will be available. The energy data is already given for all 53 countries with the energy balances of the International Energy Agency. The material inputs will be delivered by the Sustainable Europe Research Institute (SERI) for all 53 countries. Land use data for about 20 to 30 countries is prepared by IIASA.

A better impression about the country coverage gives figure 3: The red areas are covered with countries, that are explicitly part of the system. The green area shows OPEC (without Indonesia, that is explicitly modelled) and the white area represents the rest of the world, ROW. This group consists of economies in Central and South America, in Asia, in Africa and very few in Europe, that play a minor role concerning GDP, trade and environmental pressure.

Figure 2: Country coverage of GINFORS



An overview of the logical structure of the system can be derived from figure 3, where *for one specific country* the interrelations between the different modules are depicted. At the moment figure 3 is only a blue print, which does not describe the structure of the model, which we will use in the forecast. It is shown here to highlight the importance of the input-output model to describe the linkages between the economy and the environmental modules energy consumption, material inputs and land use.

In the centre the input-output model is situated, which takes aggregate final demand from the macro model and disaggregates it for product groups estimating share functions, that depend on relative prices. For consumption the disaggregation is first done for consumption purposes and in a next stage for product groups. The input-output model further receives vectors of export demand and import prices by product groups from the trade model. Import demand for products is calculated as part of final demand for products depending on relative prices.

With input coefficients as exogenous variables the vectors for gross production, intermediate demand and value added are calculated. Labour demand by sector in physical units depends on gross production of the sector and its real wage rate. The wage rate of each sector depends on the macroeconomic average, which is explained by the aggregate consumption price and the average productivity of labour in the economy. Sectoral profits can be calculated by subtraction of labour costs, depreciation and indirect taxes from value added.

With the unit costs by sector for labour (labour costs per unit of output) the value added prices are estimated. Using the transposed input-output conversion, the vector of value added prices and import prices explain the vector of gross production prices. The export price vector and the consumption price vector depend on the vector of gross production prices. The vector of export prices is given to the trade model, whereas the prices for consumption and investment feed as aggregates into the macro model.

The vectors of gross production, consumption and its prices are drivers for the energy model, the material input model and the land use model.

The macro model takes the primary income in sector detail, aggregates it for private households, financial and non-financial corporations, government and the foreign sector, and redistributes the income between these institutions and calculates in a fully endogenized SNA system such figures as disposable income and net lending/net borrowing. Money supply is explained by a policy rule for the central bank, money demand is explained by GDP and interest rates, so that interest rates are part of the equilibrium solution of the money market. Prices are taken in sector detail from the input-output model and are aggregated for the different components of aggregate final demand.

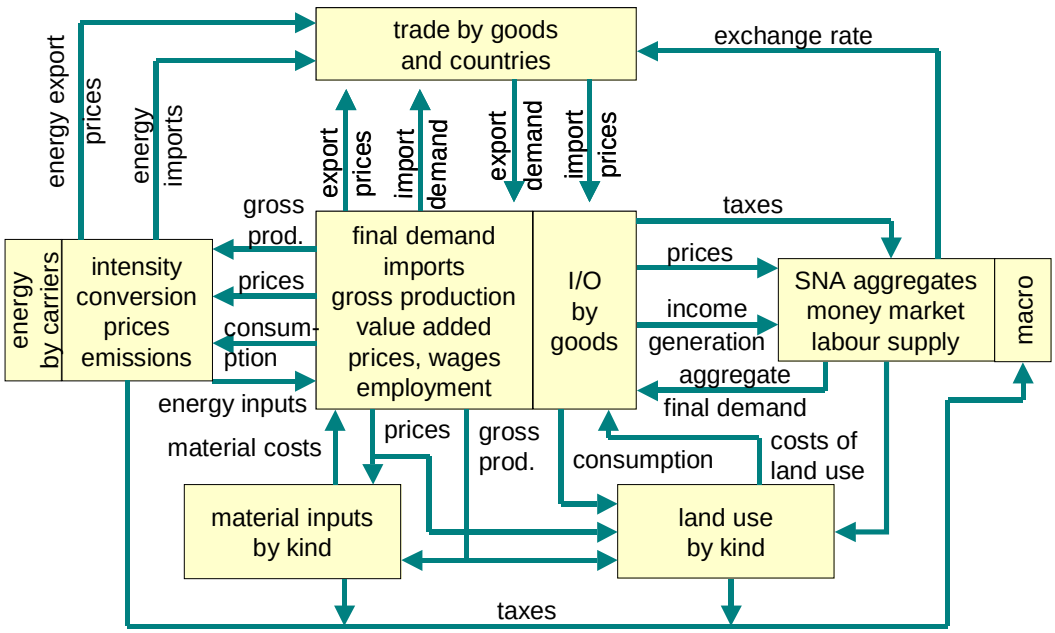
Disposable income of private households and the government, and interest rates are important determinants for aggregate private and public consumption and aggregate investment. Domestic GDP deflator relative to the US value and the difference between the domestic interest rate and the US interest rate explain the exchange rate of the local currency against the US-Dollar.

The structure of the input-output models and the SNA models will be similar to these modules in the COMPASS system (Meyer and Lutz 2002a), but the new OECD data will allow more variability in the structure of final demand and the primary inputs.

The energy models first computes for every final demand category energy intensities, that depend on the ratio of energy price to the output price of the demanding sector and (technological) time trends. Multiplication with the activity of the demanding sector (production or consumption) gives the energy demand of that sector. In the next stage, for every final demand category the shares of the different energy carriers are calculated, depending from relative prices and trends. The input coefficients for primary energy carriers in the production of secondary energy carriers

are explained by relative prices and trends. The total demand for the different primary energy carriers allows for the calculation of CO_2 emissions via fixed carbon intensities. The prices of the different energy carriers are explained by gross production prices, indirect taxes minus subsidies and import prices. Energy costs feed back to the input-output model. Energy taxes are calculated, which are input for the SNA model as tax revenues of the government. The energy models will have a similar structure as the energy models of the COMPASS system (Umehara 2002).

Figure 3: Model structure for a specific country



For the material model the drivers are - as already said - the vector of gross production and its price vector, which both are taken from the input-output model. A vector of material input-coefficients is calculated by dividing physical material inputs by gross production of the demanding sector, measured in constant prices of the local currency. These coefficients are determined by the price of material relative to the output price of the demanding sector and time trends. The information for material costs is

given back to the input-output model. If taxes are levied on material inputs, these feed back to the SNA model as tax revenues of the government.

The modelling of the land use module is not yet finished, but it is clear, that production and consumption activities as well as their prices will be the drivers. There will also be a feed back of the cost of land use to the input-output model and in the case of taxes to the macro model.

3 A preliminary version of GINFORS

The country coverage of the preliminary version of GINFORS is the same, which we have just discussed: The system is modelling the economies of 40 countries explicitly, its bilateral trade model additionally distinguishes the OPEC region and the region “Rest of the World”, so that the system is closed. The preliminary system has in the country models no sector detail and no relations to the environment. So every country model is a macro-economic model with a complete picture of the balance of payments, the market for goods, a money market and a labour market.

All components of final demand are endogenous variables as well as the import totals. The goods structure of the imports is exogenous, since at the moment we don´t have the sectoral prices, which are needed to explain import competition for the different goods. The model explains the GDP deflator, the export price and gets the import price as well as the goods vector of exports from the bilateral trade model.

The balance of payments is calculated with all components of the current account, and the balance of the capital account. The latter is given by definition, since the overall balance is an exogenous variable. With the exception of the Euro all exchange rates against the US-Dollar are explained. The exogenity of the Euro is not avoidable, since there are not

enough observations for an econometric estimation. The balances of payment are globally in equilibrium.

On the money markets the discount rate and the government bond yield are estimated in an equilibrium approach with a money demand function and a money supply function.

Labour supply is depending on the development of population, which is exogenous according to the UN (2002) forecast. Labour productivity is depending on the real wage rate and technological trends. Labour demand can be calculated multiplying the inverse of labour productivity by real GDP. Unemployment is the difference between labour demand and labour supply. The nominal wage rate is estimated in a Phillips-curve approach.

The bilateral trade model has a similar specification as the COMPASS model (Meyer and Lutz 2002b). It gets the imports of 25 commodities and the service imports from 40 country models and 2 regions and the export prices of the countries and regions. The trade model calculates the shares, that the exporters of country *i* have in the imports of country *j*. This is done for all 25 commodities and the service totals, so that more than 35,000 trade shares are calculated. In the extended version of the system these shares will depend on the relation of the export price of the specific commodity in country i and the import price of the commodity in country j and a time trend. Since commodity prices are not available at the moment, the trade shares depend only on time trends. Multiplication of the share matrix of a specific commodity with the vector of its imports gives a vector of exports for that commodity. The import prices for commodities and countries can be calculated from the export prices using the trade shares of a base year as weights. At the moment this can only be done for aggregated import prices.

The equations of the country models have been calculated for the period 1980-2001, whereas the trade share equations have the base period 1989-2001. All equations were estimated using the OLS procedure.

The important exogenous variables of the system are:

population,
Yuan/Dollar,
Euro/Dollar,
oil price,
export price of Rest of the World, and
nominal import demand of the Rest of the World.

For population development of the 40 countries we follow the medium variant of the population projection of United Nations (2002). The Euro/Dollar relation is a very important variable of the system. Therefore we choose a two stage procedure: In our forecast in section 5 we keep its average value of the year 2003 constant, and we add a sensivity analysis in section 7 with a stronger Euro. The Yuan is kept constant in relation to the Dollar, which reflects the actual policy of the Chinese government. The oil price follows a long run trend with a growth rate of about 1% per year. The export price of the Rest Of The World rises with 2%, and its nominal imports with 5% per year.

The estimation period for the model equations ends in the year 2001, so that the forecast period begins in 2002 and ends in 2010. One further information about policy activities during the years 2002 and 2003 entered the model by influencing the equations. This was fiscal policy activities in the USA, which were introduced with a factor on government consumption.

4. The forecast of the trade shares

In the entire model version, the trade shares of a specific commodity will depend on the relation of the price of the exporting country and the average price of all competing suppliers in the importing country. So - for example - the share, that Japan has in the automobile imports of the USA depends on

the relation between the Japanese export price for cars and the import price for cars in the United States. To catch the influence of other variables – as changing preferencies for instance – time trends are also tested.

Since in the preliminary version we do not have sectoral price data, the trade shares are only driven by trends. A trade share is the relation between nominal exports and nominal imports. So a given trade share implies the assumption, that this market share in real terms has a price elasticity of minus one. We are testing exponential trends for the nominal trade shares, so the shares in real terms are price dependent with elasticity minus one and trend determined.

The observation period for the estimations of the trade shares is 1989-2001. We accepted only results with t-values for the trend coefficient of 5 and more. This is a very high level of significance, which means, that the error probability is less than 1%. If a trend coefficient has a lower t-value, the nominal trade share is assumed to be constant. About 5,300 trade share functions from about 35,000 tested fulfilled this hard criterion, which shows, that there is a strong structural change in trade. Since the column sums of a trade share matrix have to be 1, all trade shares are calibrated to this value.

How are the forecasts of the trade shares for important Asian countries? Table 1 shows Japan´s shares in the imports of selected countries for the years 2000 and 2010. Japan will lose market shares in the United States, the EU and in China, but Japanese products will more or less hold its position in South-East Asia and in Australia and New Zealand. Japan’s share in the world total import in US Dollars will fall from 8.3% to 6.8%.

Table 1: Japan's shares in the imports of selected countries in % - total imports in US Dollars

	2000	2010
United States	12.03	7.55
EU 15	3.89	3.09
Germany	4.96	3.35
France	3.78	3.01
Italy	2.58	2.34
United Kingdom	4.67	3.76
Japan	0.00	0.00
China	20.14	16.93
Hong Kong	12.02	11.11
Korea	19.83	18.88
India	3.65	3.85
Philippines	19.10	19.27
Australia	13.10	11.87
New Zealand	11.21	9.72
World	8.26	6.79

Table 2: Japan's shares in the imports of selected countries in % - motor vehicles, trailers and semi-trailers

	2000	2010
United States	25.96	14.11
EU 15	6.66	5.23
Germany	7.50	3.67
France	3.66	3.92
Italy	5.91	5.21
United Kingdom	8.40	7.96
Japan	0.00	0.00
China	30.36	25.65
Hong Kong	23.31	22.70
Korea	37.61	39.43
India	25.80	22.64
Philippines	42.43	17.36
Australia	52.94	48.97
New Zealand	50.97	49.76
World	15.80	11.65

One may interpret these developments in the EU and the USA as consequences of an ongoing integration in the EU and in the NAFTA region, where especially Mexico is winning trade shares in the USA. Table

2 shows for an important Japanese export product group “motor vehicles, trailers and semi-trailers” the effects in more detail.

Here the losses in the USA and in Germany are much higher than in the average of total trade. A look at the trade shares of the other countries in table 3 gives a better understanding of the changes in the US market:

Table 3: Shares of selected countries in the US imports in % - motor vehicles, trailers and semi-trailers

	2000	2010
Canada	35.20	37.60
Mexico	16.80	20.00
Japan	26.00	14.10
Germany	10.50	12.50
Korea	3.10	4.70
United Kingdom	2.30	2.50
Others	6.10	8.60
	100.00	100.00

The NAFTA country Mexico is winning strongly. Countries like Germany and Korea can improve their position. But the drastic reduction of the Japanese share does not necessarily mean, that Japanese firms are the loosers. They are producing more directly in the USA and in countries like Mexico and some EU countries, that are hidden under “others”.

As table 4 shows, China´s trade shares are rising world wide. In Japan the increase is the strongest. Korea has a relatively stable position in the international markets, as can be seen from table 5.

It is plausible, that Japan, China and Korea are closely connected with the other Asian countries. But it is worth mentioning, that the shares of Japan, China and Korea in the imports of the EU are rather small, which is also true, if one takes into account, that there is a lot of intra-European trade.

Table 4: China's shares in the imports of selected countries in % - total imports

	2000	2010
United States	8.21	10.82
EU 15	2.76	3.77
Germany	3.43	4.50
France	3.17	6.05
Italy	2.82	3.84
United Kingdom	2.23	2.65
Japan	14.51	23.54
China	0.00	0.00
Hong Kong	43.12	42.82
Korea	7.98	9.43
India	2.98	3.00
Philippines	2.53	3.29
Australia	7.76	11.56
New Zealand	6.26	12.21
World	4.17	5.67

Table 5: Korea's shares in the imports of selected countries in% - total imports

	2000	2010
United States	3.31	2.57
EU 15	1.08	0.90
Germany	1.09	0.84
France	0.72	0.61
Italy	0.90	0.88
United Kingdom	1.56	1.17
Japan	5.39	4.04
China	11.26	9.27
Hong Kong	5.01	4.58
Korea	0.00	0.00
India	1.77	2.96
Philippines	7.32	6.69
Australia	4.11	3.63
New Zealand	2.20	1.93
World	2.91	2.72

5 A global forecast of economic growth till 2010

One general feature of the forecast is, that inflation will be reduced in the most countries compared with the development in the last decade, but there will be no danger for a global deflation. Table 6 gives a short look at this point: In the period 2001-2010 the biggest countries of the Euro area, Germany and France, will have average rates of inflation (GDP deflator) between 0.9 and 1.4 The smaller countries in the Euro zone will have higher rates of inflation, so that the rate for the Euro area is 1.5%.

Table 6: Average percentage change of the GDP deflator in selected countries

	1991 - 2001	2002 - 2010
United States	1.8	1.5
Japan	- 0.4	0.0
China	5.8	1.6
United Kingdom	2.6	1.6
EURO-area	-	1.5
Germany	1.7	0.9
France	1.4	1.4

For the United Kingdom (1.6%) and the USA (1.5%) we expect nearly the same rates of inflation. China will reduce its high inflation rates of the last decade to 1.6%. Japan will have negative rates of inflation until 2004, beginning in 2005 we expect rising prices with rates about 0.7% per year. Over the whole period 2001-2010 this means stable prices in Japan, as table 6 shows. The average annual growth of nominal global trade was 5.6% in the period 1991-2001 and will be about 5.8% in the period 2001-2010. So the average real growth rates measured in US-Dollars will rise from 3.8% to 4.3%.

Figure 4 shows the growth dynamics of real GDP for the United States, China, Japan, and Korea. The world wide recession in the years 2001/2002 has affected the economic development of the United States, Korea and

Japan, but China did not leave its long run growth path. After 2002 Korea and the United States find back to their long run development patterns, and Japan will reach a an annual rate of 1.6%.

Figure 4: Growth rates of real GDP for the United States and selected East Asian countries

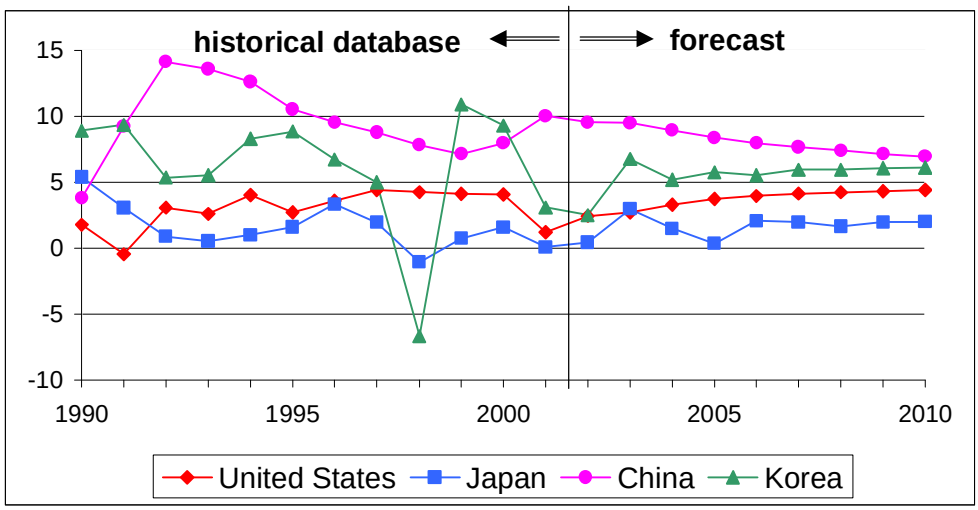


Figure 5 shows the real growth dynamics for South East Asia. Here the crises 2001/2002 can hardly be watched. The economies of Thailand, the Philippines and Indonesia are already growing fast.

The contrary is the case in Europe, as Figure 6 shows. Only in the United Kingdom we observe a stable situation. The biggest economies of the Euro area – Germany, France, Italy – are more or less hit by the crises. This happens in a modest way in Italy and France, but Germany suffers from three years of stagnation in 2001, 2002 and 2003. The year 2004 will bring for all European countries economic normalization. In the longer period till 2010 the United Kingdom and France will have rising growth rates, that reach 2.9% in 2010. The forecast for Italy and Germany follows the same path, but on a lower level with 2.6% in 2010.

Figure 5: Growth rates of real GDP for selected countries of South East Asia

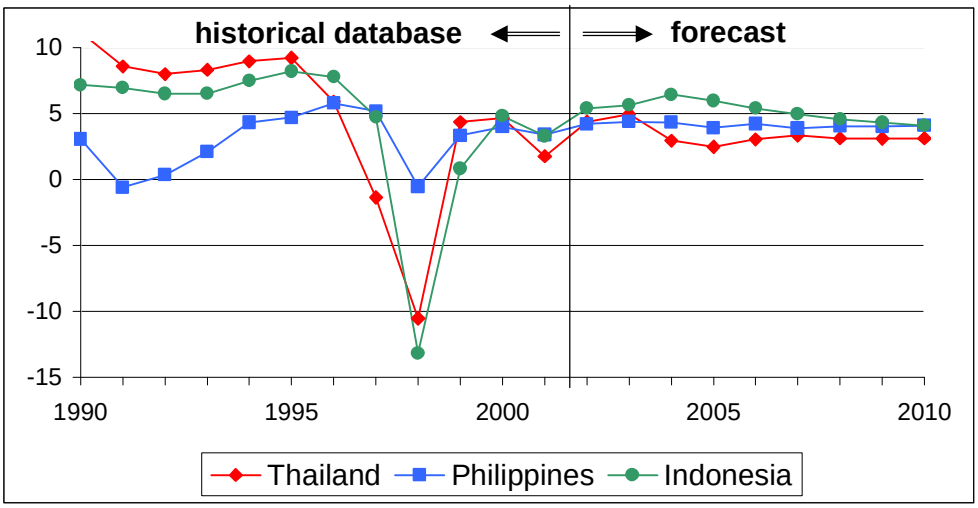


Figure 6: Growth rates of real GDP for selected European countries

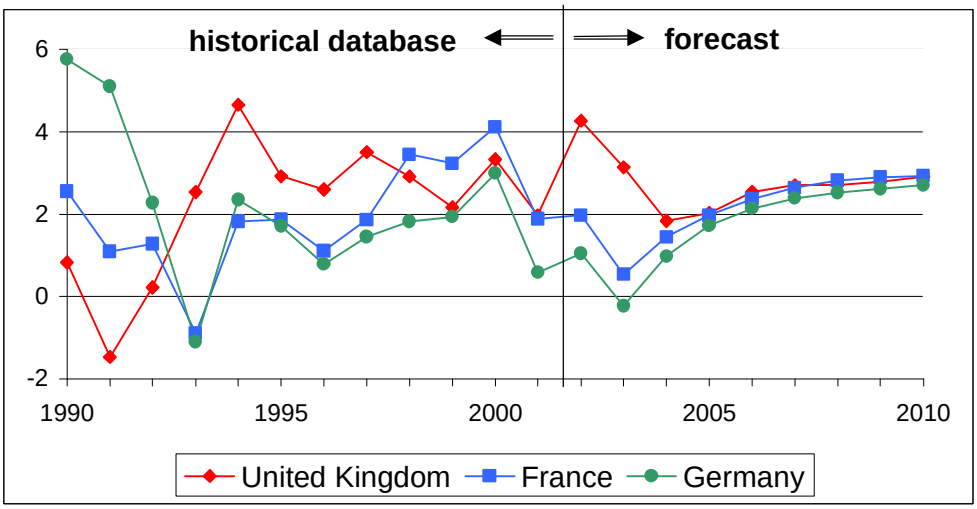


Table 7 shows the consequences of the just described growth dynamics for the labour markets. We calculated average annual growth rates for the forecast period 2001-2010 for real GDP, labour productivity, employment, labour force and population. The United States will realize a growth of its

GDP of 3.7%, that is above the rate of the nineties (3.4%). Although there is a high productivity growth of 1.9%, the strong GDP development allows an annual rise of employment of 1.6%. This is a stronger expansion compared to the labour force (1.2%), so that unemployment will be further reduced.

Table 7: Forecast for average annual growth rates for the period 2001-2010 for selected countries

country	gdp	productivity	employment	labour force	population
United States	3.7	2.1	1.6	1.2	1.0
Asia					
Japan	1.6	1.2	0.4	0.3	0.0
China	8.1	6.1	2.0	-	0.7
Korea	5.5	4.1	1.4	0.6	0.7
Philippines	4.1	1.1	3.0	2.0	1.7
Thailand	3.4	2.8	0.6	0.9	1.0
Indonesia	5.2	3.7	1.5	1.6	1.2
Europe					
United Kingdom	2.8	1.9	0.9	0.1	0.2
EURO area	2.0	1.4	0.6	0.5	0.1
Germany	1.7	1.2	0.5	0.0	0.0
France	2.0	1.8	0.5	0.0	0.0
Italy	2.2	0.8	1.3	0.2	-0.2

For Japan the next years will bring back economic dynamics. For the average annual growth rate of GDP we calculate 1.6%. Since there will be only a low productivity growth of 1.2%, employment may slightly rise with 0.4% per year. The rise of the labour force of the same magnitude will not push unemployment.

China will have a average growth rate of GDP of 8.1%. Labour productivity will rise with 6.1%, which means an annual rise for employment of 2%. We have no information about the development of the labour force, so that it is not clear how the impact on unemployment in China will be. Korea follows its long run growth path with an annual rate of 5.5%. The growth of productivity is 4.1%, so that employment will rise with 1.4%. Since the labour force in Korea will rise with only 0.6%, we expect a strong reduction of unemployment. For the Philippines we calculate an average growth rate of 4.1%, but a productivity growth of only 1.1%. So

there will be a strong growth of employment of 3.0%. This value clearly exceeds the growth of the labour force, so that we expect a reduction of unemployment in the Philippines. In Thailand the opposite is the case: The growth of GDP is lower than in the Philippines and the productivity growth is below GDP growth, but with 2.8% rather high. In the consequence employment growth is lower than the rise of the labour force, which means rising unemployment for Thailand. For Indonesia we expect a similar situation for GDP growth and productivity development as in Korea, but the growth of the labour force will be very high, so that it reaches the dynamics of employment. We therefore expect a stable situation for unemployment in Indonesia.

In Europe the growth perspectives for the United Kingdom (2.8%) are better than in the Euro area (2.0%). The difference in the productivity growth is 0.5% (United Kingdom 1.9%, Euro area 1.4%). Employment will in the United Kingdom rise with 0.9% and in the Euro area only with 0.6%, which means there only a slight reduction in unemployment, whereas in the United Kingdom a further strong reduction of unemployment can be expected. Germany will raise its growth of GDP from 1.4% in the nineties to 1.7%., but nevertheless Germany has the lowest growth rate of GDP in the Euro area. Since it is by far the biggest economy in the Euro area, the result for Germany depresses the average for the whole area. The other countries like France and the here not mentioned “smaller” countries like Spain and the Netherlands have significantly higher growth rates. Employment in Germany will rise, since productivity growth is only 1.2%. This will reduce unemployment, because labour force will be stable. For France we observe the same impact on the labour market, since the growth difference with Germany is the same as the difference in productivity.

Summarizing we observe, that the Asian countries with the exception of Japan have the most dynamic economies in both the growth of real GDP and the growth of labour productivity (with the exception of the Philippines).

The United States are in a middle position, and Europe faces the lowest growth dynamic. The relative bad results for the Euro area are to a large extent resulting from Germany, which represents 30% of the GDP of the Euro area.

6. The impact of a German recovery program on world trade: A sensivity analysis

As we have just seen, the German economy suffers from low growth and high unemployment, which depresses directly the economic dynamics in the Euro area, but in a globalised world these effects are not restricted to one region. In Germany we can observe now a debate about economic reform to regain higher growth rates.

The process of transformation of the debate into concrete political activity is rather complicated, since the federal structure needs in many laws not only a majority in the Bundestag – where the Red-Green coalition of socialdemocrats and the green party is dominating – but also in the second chamber of the representatives of the 16 countries (Bundesländer), where the conservatives have the majority. But the process has started and it can not be stopped. Let us ask, what are the reasons of the bad economic performance in Germany, and what can we expect to be the results of the beginning reform process?

The economic constitution in Germany guarantees a high level of social security, which gives not only an acceptable minimum standard of living for the poorest, but allows for a participation of broad lower income groups in economic growth. This concerns all three columns of the German social security system, health, pension, and unemployment insurance.

Taxation has been in the last decades an important instrument of structural policy, which led to a very complicated system with exemptions and subsidies in the direct and indirect taxation, which even the experts can hardly overview. The results are relative high tax rates, but possibilities to avoid these, if certain premises are fulfilled.

This system was rather successful till the end of the eighties, and so it was not changed, when in 1990/1991 the unification with the former GDR occurred. The old production structures in the former GDR were not able to compete with West German firms and the quickly rising unemployment could not be avoided by new investments, although taxation incentives were given and big public investments in the infrastructure of Eastern Germany were made, financed by a huge increase of public debt. Additionally the number of recipients of pensions rose dramatically, because the East German recipients of pensions had now to be financed by the former West German social security system. So the transactions from West to East led to a drastic rise of the expenditures of the social security system without such a movement in the number of contributors to the system, so that the payments per employed person rose very strongly.

In Germany social security contributions are half and half payed by the firms and by the employed persons. So there was a direct impact on labour costs coming from the contributions of the firms. At the moment the net wage per hour, that the employed person gets, is about a half (52.5%) of the labour costs per hour, which the firms pay, 15% are direct taxes and 32.5% are payments for social security.

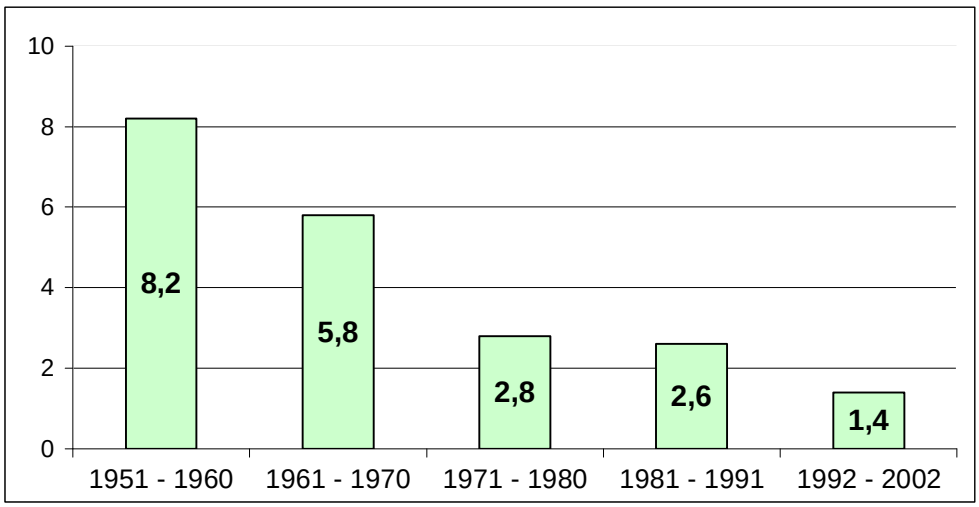
On the other hand the fall of the iron curtain gave the German firms the chance to invest in low wage countries, not only in Asia, but also 50 miles east of Berlin, and of course the world wide globalization did not stop. In the six years from 1996 to 2002 the direct investment from Germany in other countries was about 40 billion € higher than the direct investment from abroad in Germany. During that period total real investment in

Germany declined from 399.1 billion € to 391.9 billion €, which depressed growth. The already discussed rising labour costs and the low growth rates did allow an average annual growth of net wages of only 1.9% which is less than the rate of inflation (2.1%) in the period 1991-2002.

The big difference between labour costs and net wages and the complexity of the taxation system are two reasons for the fast growing shadow economy in Germany. Mummert and Schneider (2001) show, that the size of the shadow economy in Germany has grown from 12.5% of GDP in 1991/92 to 16.3% in 2001/2002. So the volume of the shadow economy is now about 350 billion €.

Our thesis, that Germany as an economic system lost international competitiveness after unification, is illustrated in figure 7.

Figure 7: Annual average growth rates of real GDP in Germany



Source: Statistisches Bundesamt, 2004

The extreme high average annual growth rates of 8.2% for the period 1951-1960 and 5.8% for the period 1961-1969 characterize the post war phase with a dynamic demand in all sectors and strong technical progress and scale effects on the supply side. In the period 1971-1980 with strong

turbulences in the world economy an average annual growth rate of 2.8% was the value, and this – in international comparison acceptable rate – could nearly be hold also in the period 1981-1991 with 2.6%. But a clear breakdown can be observed after the unification with an average growth rate of only 1.4%.

The process of structural change in the economic constitution in Germany has already started and will go on in the following directions:

- More flexibility on the labour markets.
- Reduction of the benefits of social security.
- Change in the financial structure of social security: Emphasis on elements of “security” rather than “social”.
- Reduction of growth of governmental consumption.
- Tax cut and reduction of subsidies and exemptions from taxation.

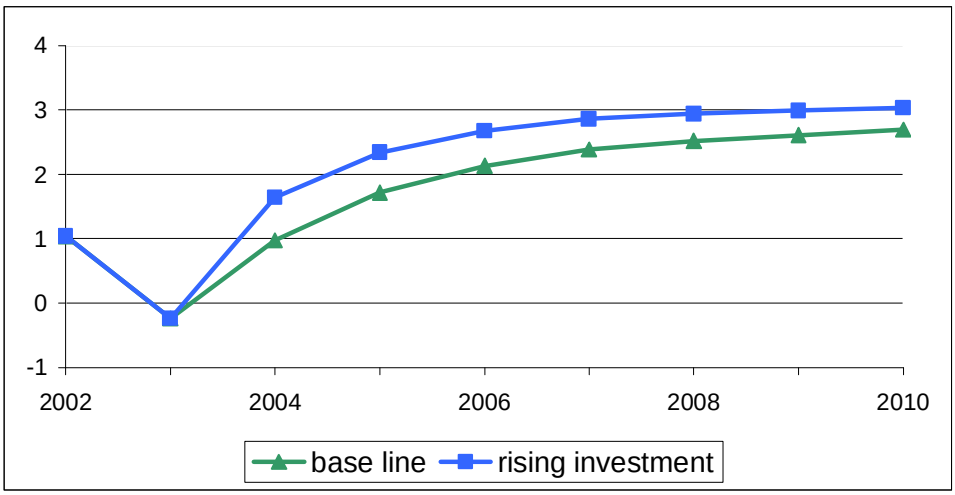
The first laws have just passed both chambers (December 2003) and the red green coalition as well as the opposition are willing to follow the reform program “Agenda 2010” of chancellor Schröder and the opposition wants to go beyond this target.

Of course, it is hardly possible to calculate the economic effects of this assumed economic reform process. Everyone expects a reduction of labour costs and in general an improved profitability and competitiveness of the German economy, which might induce a push on investment. We try a careful estimation of this effect, looking at the development of the investment ratio in Germany: It has been falling since 1992. If we take the ratio of the year 1996 – a year with an only modest economic growth of 0.6% – as “normal”, we calculate an investment gap of 210 billion Euro for the years 1997 to 2003. Our crude assumption is, that this amount will be additionally invested during the next 7 years. So our analysis is rather a sensivity analysis than a forecast.

Figure 8 shows the effects on real GDP growth in Germany: The recovery of the economy will be faster and at the end of the forecast period

the growth rate will be 3.2% instead of 2.6%. Cumulated over the whole period GDP rises about 530 billion, which implicates a plausible magnitude of the multiplier of 2.5.

Figure 8: The impact of rising investment on growth of real GDP in Germany

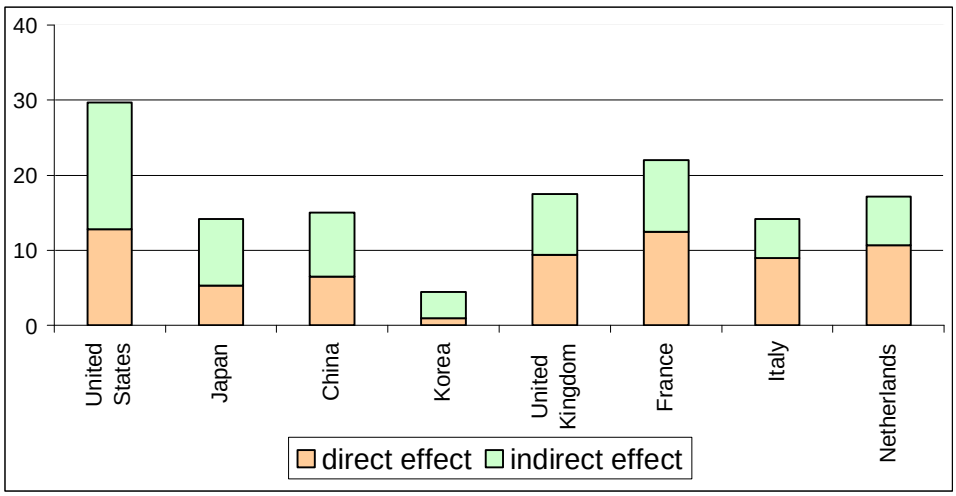


German imports will rise accumulated by about 145 billion US Dollar over the period 2004-2010. The effects of this impulse on global trade are depicted in figure 9.

The world total of imports rises accumulated with 310.9 billion US Dollar due to higher German investment from 2004 to 2010. So there is a world trade multiplier of 2.1. But the dynamic process is not at an end: Until 2020 the German imports rise by 210 billion US Dollars and world trade total by 808 billion US Dollars, which gives a multiplier of 4.2. So the effects on world trade should not be underestimated. In figure 9 only the effects until 2010 are reported. It is clear, that the biggest economy – the United States – faces the strongest impact with 29.7 billion Dollars. But the major influence on the United States is given by indirect effects, US exports to Germany only increase by about 12.8 billion Dollars. The figures for the exports of Asian and European countries reflect the degree of integration

between the economies. This concerns the level of the effects and the relation between direct and indirect effects: For the European countries, of course, the direct effects are stronger.

Figure 9: The impact of a rise of German imports of 145 billion US-$ on world exports in the scenario rising investment – deviations from the baseline cumulated over the period 2004-2010 in billion US-$



7. The impact of a strong Euro on global growth

In our baseline scenario the exchange rates of two currencies are exogenous – the Yuan and the Euro – all other exchange rates are endogenous. The exogenity of the Yuan is plausible, because it is fixed by the Chinese government. The Euro is exogenous, because we don´t have enough observations for an econometric estimation of its parameters. In the following chapter we try to give an answer to the question how a stronger Euro than assumed in the baseline would affect growth. Starting from an

average value of 0.90 in 2003, we assume a 10% rise of the Euro in the year 2004 to a value of 0.81 Euro/Dollar, which will stay until 2010.

The fall of the Dollar will raise the export prices of the Euro area measured in US Dollars not by 10% – as one might imagine at a first sight–, because the reduced import prices in the Euro area will diminish production costs and therefore also reduce export prices measured in Euro.

The import prices in the other countries measured in local currencies will not react instantaneously, because most of the exporting firms have instruments to hedge currency risks. We have grasped this effect by estimating import price functions with lagged reactions.

Figure 10: The impact of a rise of the Euro of 10% on real GDP of selected countries - deviations from the baseline in %

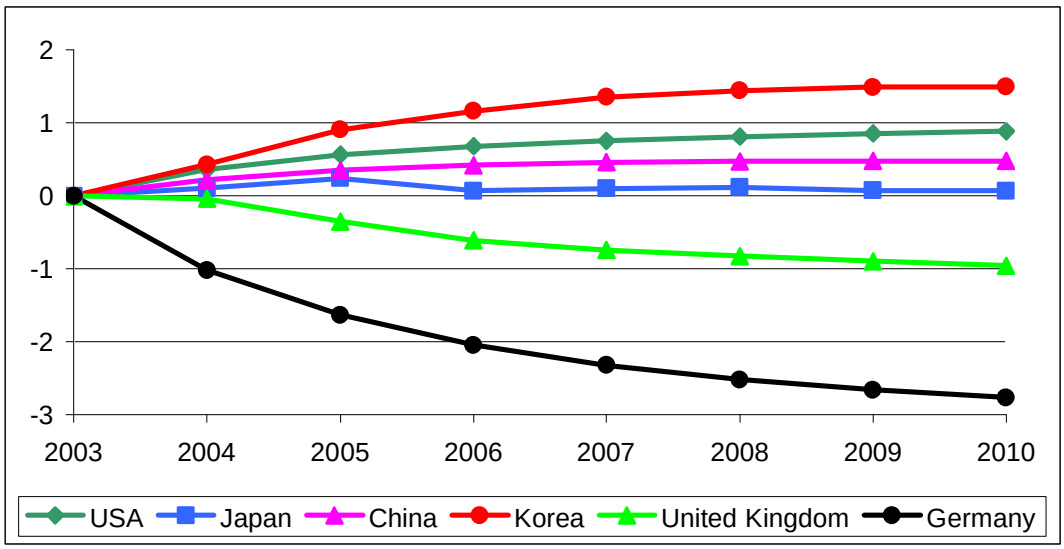


Figure 10 shows the impact on real GDP of selected countries. First we see, that the abrupt rise of the Euro in 2004 unfolds its full effect only in the long run. A rise of the Euro for one year would hardly affect real world. We can understand figure 10 after the following considerations: The trade shares are in real terms depending from the relative export prices measured

in Dollars with elasticity -1. So we expect, that the countries of the Euro area will loose exports in real terms.

The reaction of the imports is depending on two effects: First, the GDP deflator will fall because production costs reduce due to falling import prices. Second, the relation of import prices and the GDP deflator will fall, since the reduction of the GDP deflator is smaller compared to the import prices. This effect raises the imports. On the other hand, the fall of the exports will reduce GDP, and this diminishes the imports in real terms. So there are two countervailing effects on real imports of the Euro area, which may compensate each other more or less.

The same reasons will raise the GDP of the United States and its deflator. The United Kingdom is in a special situation: In the past the weighted exchange rate of the British Pound followed the Deutsche Mark with an elasticity smaller than one. We asssume this relation to hold against the Euro in the future as well. So the British Pound rises by 4%, and we find weaker but similar effects as for the Euro area also for the United Kingdom.

The Asian countries are winners of the rising European export prices. Different effects on real GDP in the countries are depending on the structure of trade and from movements of their exchange rates, that may react, if the prices and interest rates differ from the movements in the USA.

8. Conclusions

The application of a preliminary version of the global model GINFORS forecasts a world wide economic recovery in the next years till 2010. China and the South East Asian countries will be the most dynamic economies, the United States will be in a middle position, followed by the United Kingdom,

and the Euro area will have the weakest growth, which is to a large extend depending on the economic problems in Germany.

Our analysis of the situation in that country comes to the result, that the burden of the unification in the economic constitution in Germany, that was not changed after the unification, led to a rise of labour costs, which depressed investment. The just beginning reform process will favour growth and employment, as a rough estimation of such effects with the model shows.

A simulation of the effects of a rise of the Euro shows, that only in the long run the Euro area and in a weaker form the United Kingdom have to fear negative effects on growth and employment. The other countries will benefit from a strong Euro.

The results of these simulations seem to be plausible. Nevertheless, the further extension of the system will improve it. A central point will be the integration of sectoral detail in production and demand integrating input-output systems in the country models. This will allow to calculate sectoral prices, which reflect structural change in supply and demand of the countries. Sectoral prices will be taken as additional variables to estimate for the trade shares not only the influence of time trends – as it is done in the paper at hand – but also the price elasticities, that might be different from the value -1, which is implied in the preliminary version.

With the extension of the last stage we will integrate energy demand and supply, land use and the material inputs, which transforms the economic model into an economic-environmental global system. The integration of the input-output systems has just started. We expect to finish the entire model at the end of 2004.

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