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### Abstract

This paper presents four main macro-economic and financial scenarios for the world up to 2030 with 3 variants focussing on alternatives for Europe.

The first global scenario, "Reduced government", is the most pessimistic as it assumes market forces will have a pervasive and increasing influence worldwide while governments, especially those in high income regions, are unable to intervene with sufficient force to change the trends that result. A variant titled "EU breakup" portrays difficulties that might be encountered following fragmentation of the Euro area and EU institutions.

Remaining global scenarios assume more effective action by governments to adjust market behaviour. The "China and US intervention" scenario generates significant improvements for the two super-powers and their closest neighbours but leaves Europe depressed with limited trade opportunities and little capability for lifting financial constraints.

The "Regionalisation" scenario represents a more significant and extensive break with recent trends on the assumption that problems arising from continuing globalisation of business and markets oblige national governments in each part of the world to undertake important new initiatives at the regional level. In Europe this is taken to mean active management of financial institutions and government bodies and increased concertation or regulation of corporations with the objective of overcoming debt problems and restarting programs to reduce internal disparities that had been followed in previous decades. The scenario assumes that more integrated and effective financial and economic management in Europe is mirrored by similar schemes for regional integration in North America and East Asia and, although with less effect, in the rest of Asia, Africa and South America. The outcome of this scenario is a substantial improvement in growth prospects in all parts of the world with substantial gains in Europe even if the institutional framework of the European Union is not radically changed.

Two variants of the regionalisation scenario examine alternative patterns for the evolution of European institutions and policies. A "Federal Europe" scenario assumes a move to more centralised government with a federal budget rising to 15% of GDP by 2030. The other variant scenario, "Multi-speed Europe", explores a quite different direction of development in which the Eurozone divides into multiple currency areas with flexible internal exchange rates.

The last scenario, "Multipolar cooperation", takes regionalisation one step further by introducing effective cooperation between world regions to deal with major problems affecting the world as a whole. Among the assumed objectives of global cooperation are limitation of financial imbalances, faster growth of per capita income in the South, reduced energy dependence and stabilisation or if possible reduction of carbon emissions. This scenario illustrates conditions under which it may in principle be possible for the world community to make simultaneous progress with respect to three long-term global objectives - economic security, reduced inequality and sustainability. This program would require substantial changes in political systems and new developments in institutions at the global and regional level as well as important adjustments of policy norms and the regulatory framework for commercial and financial institutions.

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Given existing governance patterns and conflicts of interest, scenarios that assume a high level of international cooperation whether within Europe or at the global level appear somewhat implausible and the overall impression given by the scenario exercises reported in this paper is to that extent somewhat pessimistic. If that government remains weak and coordination exercises are largely cosmetic, the more likely prospect for Europe is one of slow GDP growth with deteriorating standards of government service and support for the elderly and continuing economic decline in many areas in South and East Europe. Individual countries are likely to experience "lost decades" similar to South America and Africa in the 1980s. An eventual cure through long-term reductions in costs or realisation of the need for stronger European government might be long delayed and will not come easily.



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## Introduction

This document represents an update of working paper D1.3 which was entitled "Macro model of world regions and revised scenarios to 2030". The following sections present model-generated projections of economic and financial developments under different governance assumptions that provide a common framework for AUGUR teams examining prospects for Europe in the world to 2030.<sup>1</sup>

Appendix A briefly describes the scope and methodology of the macro model and Appendix B documents assumptions behind the graphs shown in the main text. Appendix C details rules for the federal budget assumed in scenarios that envisage further European integration.

## The scenarios

Global governance assumptions examined in this paper are as follows:

- S1 Reduced government
- S2 China and US intervention
- S3 Regionalisation
- S4 Multipolar governance.

These scenarios implement assumptions about future policy intervention in a cumulative manner starting from the most conservative - reduced government - in which governments in the US and more highly-indebted countries of Europe are obliged to adopt austerity measures to cut debt and are unable to implement expansionary programs or block relocation of industrial capacity to other parts of the world where long-term prospects are more positive. The second scenario super-imposes policy adjustments in China and the US pursued in the self-interest of each superpower.

The third scenario takes policy intervention much further by assuming more extensive and widespread intervention in each world region, demonstrating that if the necessary political cooperation and regional institutions are established, joint action at the regional level has a better potential than national programs. This scenario examines potential costs and benefits of a closer degree of regional integration than has been achieved hitherto in each world region including Europe.

The multipolar governance scenario goes one step further by introducing a higher level of global cooperation. Objectives include limitation of global financial imbalances, faster development of countries in the South, reduction of energy dependence world wide and stabilisation or reduction of carbon emissions.

Variant scenarios examine the potential impact of different patterns of policy development in Europe. Those presented in this paper include

- S1a EU breakup, S3a Federal Europe and S3b Multi-speed Europe.

"EU breakup" is assumed to occur in the context of reduced government globally, imposing substantial macro-economic losses over a period of 5-10 years in which

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<sup>1</sup> A previous draft of the present paper was circulated in September 2011 and presented at a workshop in October. The framework of assumptions and scenario definitions has been adjusted substantially for this version.



member states face loss of world-wide and intra-European business and reduced support from global investors as well as severe limitations on the ability of European institutions and other European governments to provide assistance. This variant projects substantially worse outcomes for all parts of Europe, at least in the period up to 2020, than the main "Reduced government" scenario in which investor confidence is broadly maintained as member states with high levels of government debt are assumed to be able to obtain finance on reasonable terms with at least some degree of support from other governments and European institutions.

The "Regionalisation" scenario and its two variants examine alternative directions for Europe's future development. In the main scenario, extension of the Eurozone to Eastern Europe is accompanied by introduction of a federal budget rising to 5% of GDP by 2020 with short-term deficits in the first few years as revenue sources lag expenditure commitments. Other European policies assumed in this scenario include cooperative management of exchange rates of countries that do not join the Eurozone itself together with coordinated expansion of government spending, labour market policies aimed at restoring high employment rates in the longer term and closer cooperation with neighbouring regions in Africa, West Asia and the CIS.

In the "Federal Europe" variant, the federal budget expands rapidly with participation of all countries except the UK which is assumed to remain outside the federal arrangement. By 2020 the federal budget reaches 15% of GDP.

The "Multi-speed Europe" variant illustrates an alternative direction in which there is no federal budget (beyond the current low-level arrangement) and the eurozone divides into multiple currency areas with flexible exchange rates.

### **Some implications for European policy**

The macro scenarios suggest that Europe needs strong mechanisms to control financial markets and institutions and support government services and investment in peripheral regions of Europe and neighbouring countries outside Europe.

These scenarios do not support the case for intensifying internal competition by completing the single market, nor does it appear that new policies are required to make Europe more competitive and defend its share of world markets against competitors, nor will Europe gain jobs by boosting labour productivity. It may also be noted that the case for immigration to remedy a demographic deficit remains unproven (immigration may be desirable for other reasons).

The most difficult point that people in all countries of Europe may eventually have to accept is that in Europe as elsewhere in the world there are and will remain many regions and communities where productivity is relatively low in market terms. Such communities do not contribute a high flow of revenue to government but rely on government services and grants to provide amenities. Therefore it is not possible to maintain a large, integrated economy with cultural and social diversity on the basis that each distinct region or social group must pay its own way. The only solution in the long term is common standards and burden-sharing. This principle has been widely practiced by national governments for many decades past but has not been accepted as a basic rule for the European Union. Given that European institutions do little to provide equal treatment and security for all citizens, it is not surprising that the nation state remains the main recourse for people in each country and that the initial popularity of European integration is fading. The other side of the coin is that unless there is widespread popular support for a European level of government it is

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hard to see how the necessary financial and economic policies to secure employment and convergence of lower-income regions, invest in sustainable patterns of production and settlement and maintain improved relationships neighbouring countries and partners in other parts of the world can be implemented.



### Scenario 1 Reduced government

This scenario examines what the future may be like assuming the pervasive influence of global markets continues to increase with a concomitant decline in the ability of national and international government to influence economic and financial developments in all parts of the world but more especially in high-income regions such as the US and Europe that are core participants in global financial markets. Governments with limited revenues, under pressure to reduce deficits and accumulated debt and facing extensive responsibilities for security and maintenance of the social and commercial fabric, have little choice but to cut welfare services and refrain from potentially controversial interventions in the market economy. Rules of domestic and global business and finance are set internationally. Large financial and commercial corporations invest and develop markets to serve the interests of a growing class of private individuals whose wealth is invested globally. The availability of finance and distribution of economic growth around the world depends on decisions made by global investors and corporate management and inevitably reflects their changing confidence and attitudes.

#### Specific assumptions

The Eurozone and European Union will not break up but stricter budgetary and financial supervision will limit deficits of European governments with knock-on effects on consumer and business spending. At the same time political pressures limit the share of income appropriated by national governments to finance spending on services and government investment. Difficulties experienced in South Europe and the UK have negative effects on investment in Central and North Europe and tend to inhibit intra-European migration.

Similar pressures apply in the US, the Other Developed bloc<sup>2</sup> and Japan.

Given low growth prospects in Europe and the US there will be ongoing relocation of industries to other parts of the world including South America and India and increased production and export of primary commodities in Africa and South America.

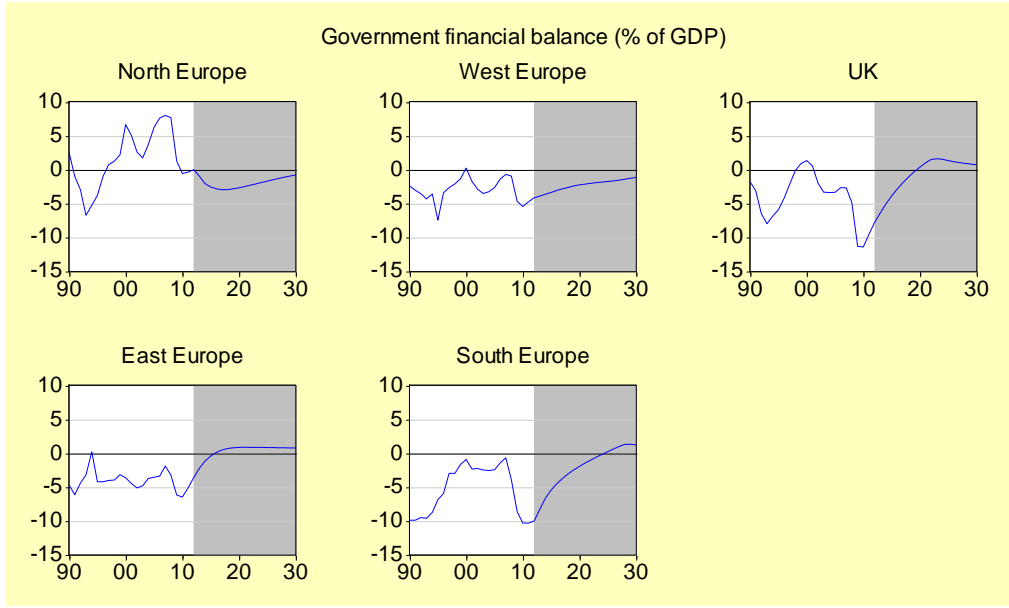
#### **Outlook for Europe**

The charts show cuts in government deficits and the effects on debt in different parts of Europe.

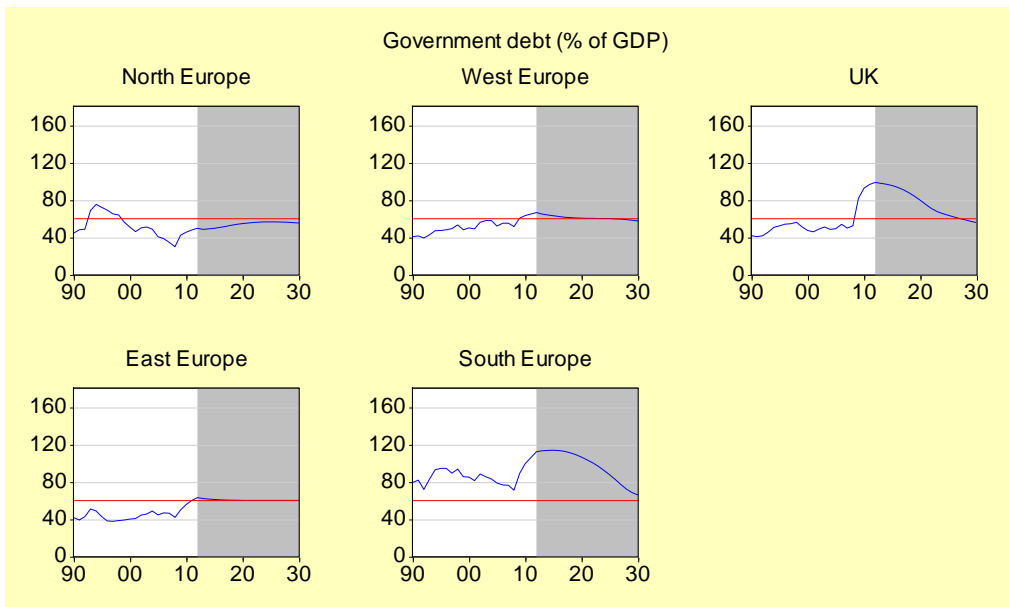
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<sup>2</sup> Canada, Australia, New Zealand and Israel.

# WP1 revised historical data and scenarios



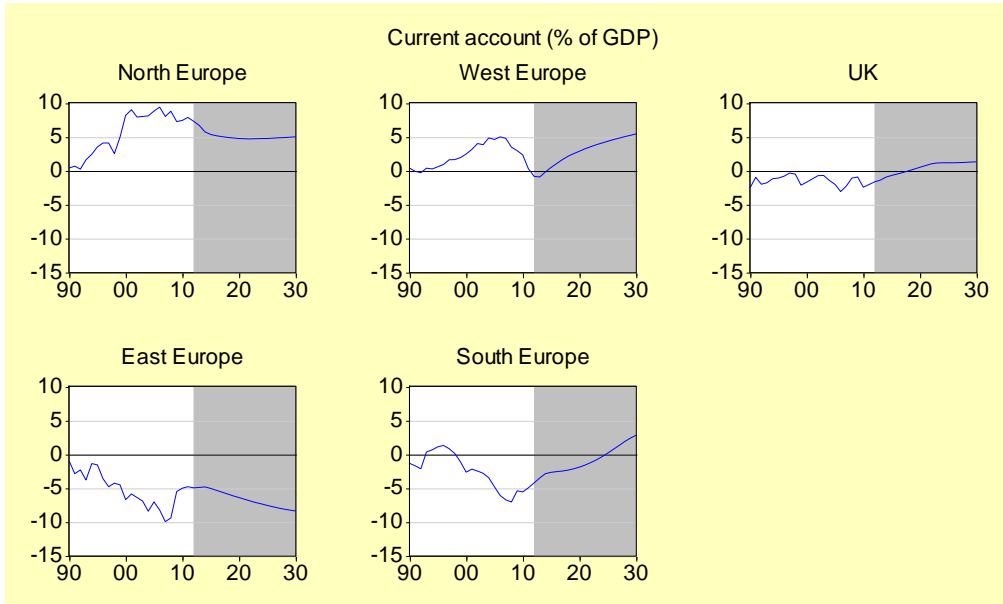
Budget cuts eventually stabilise government debt ratios within the assumed target ceiling of 60% of GDP but South Europe's debt ratio remains at more than 100% of GDP up to 2020.



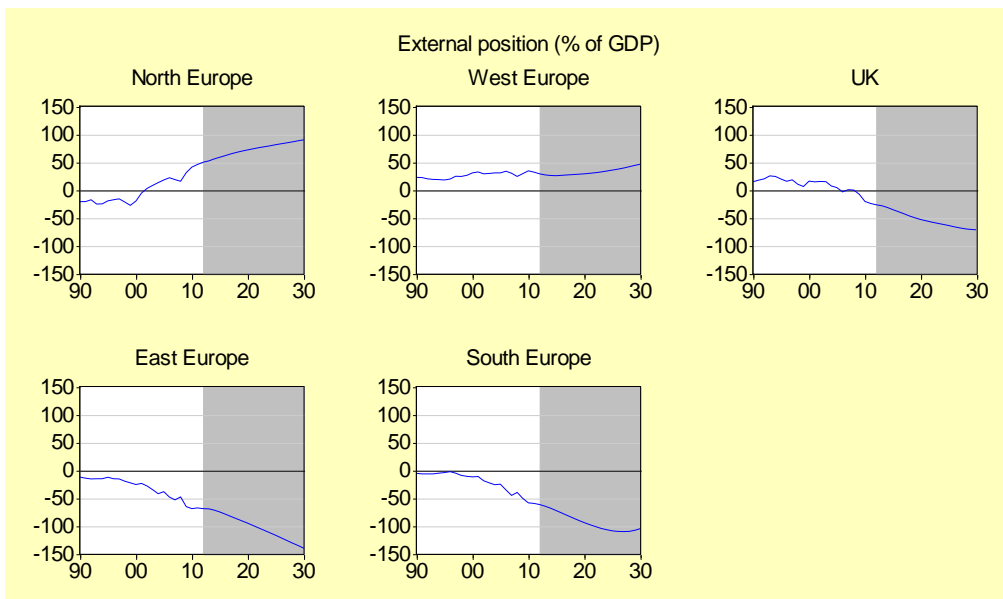
# WP1 revised historical data and scenarios



On the balance of payments North and West Europe show sustained current account surpluses while the UK and South Europe achieve surpluses in the 2020's. East Europe, having joined the Eurozone, shows a continued deficit in the range 5-8% of GDP.



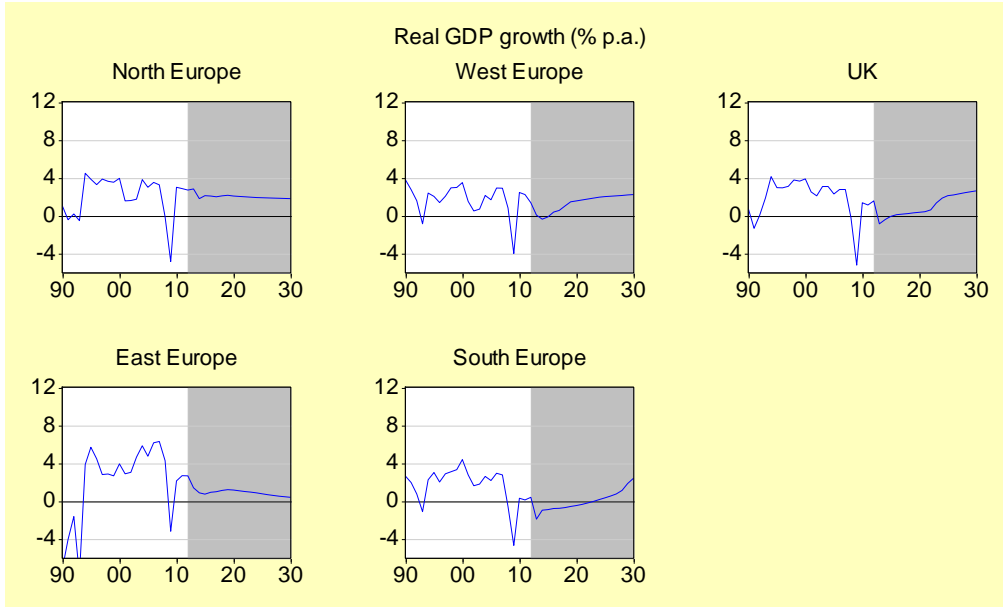
As current account imbalances accumulate, external positions increase. By 2030 North Europe has net external assets worth almost 100% of annual GDP while UK net liabilities rise to 70%, South Europe's net liabilities reach 100% and East Europe's net liabilities reach more than 130% of annual GDP. These outcomes imply concentration of wealth in North and West Europe and growing dependence of other parts of Europe on external investors.



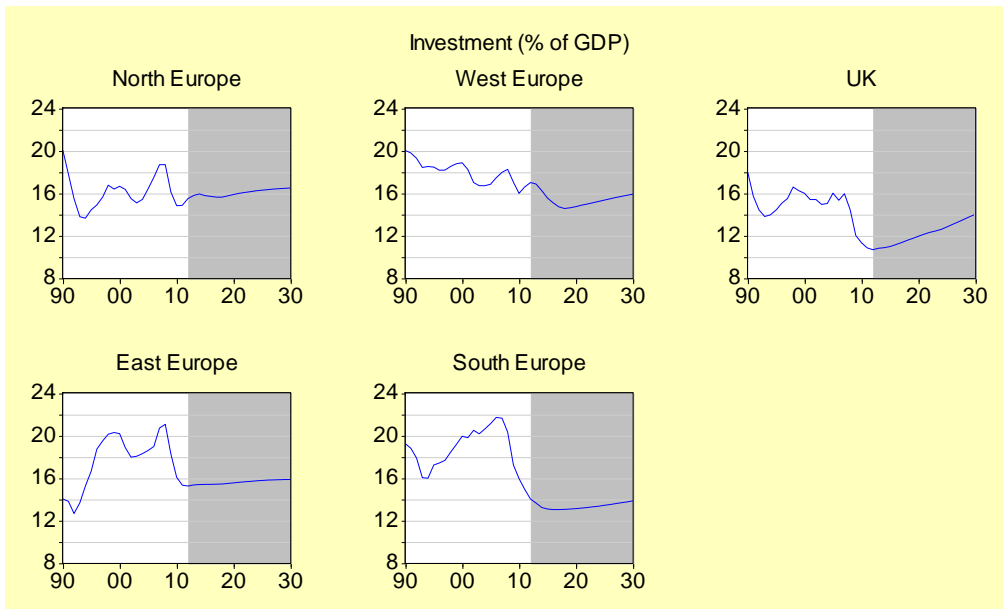
# WP1 revised historical data and scenarios



The most immediate consequence of fiscal austerity in response to current debt problems will be low GDP growth in Europe as a whole with a prolonged recession in South Europe.



The 2010s could turn out to be a "lost decade" for many countries, stretching on into the 2020s unless fundamental changes can be made in the way Europe manages fiscal and monetary policy and relations with neighbouring regions.



## WP1 revised historical data and scenarios

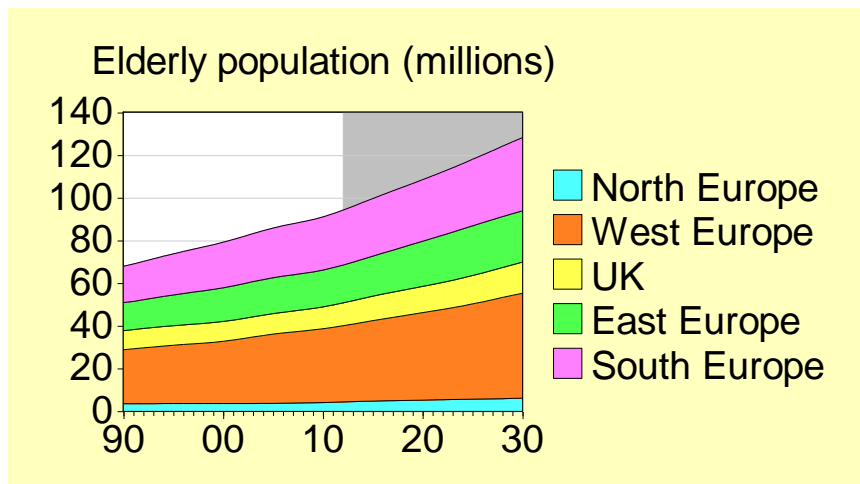


With low GDP growth and investment, recovery of employment rates and reduction of unemployment will be long delayed, particularly in the UK and South Europe.



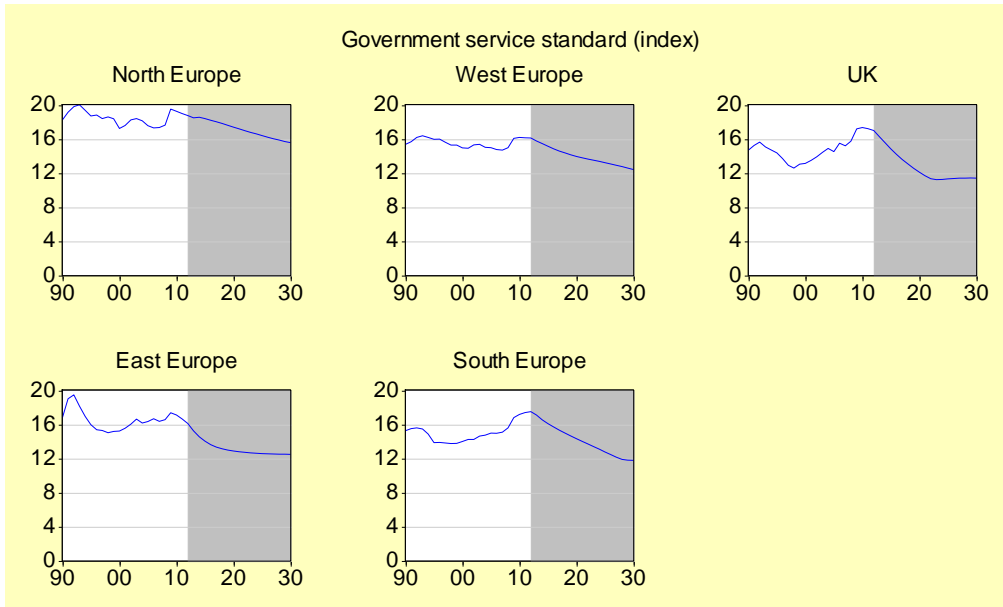
Despite reductions in working-age population the male employment rate in East and South Europe remains below 70% and the employment rate for women remains below 60% in both regions as compared with 65-75% in the rest of Europe.

Low growth and budget restrictions will make it difficult to provide support services, income and jobs for the growing number of elderly people.



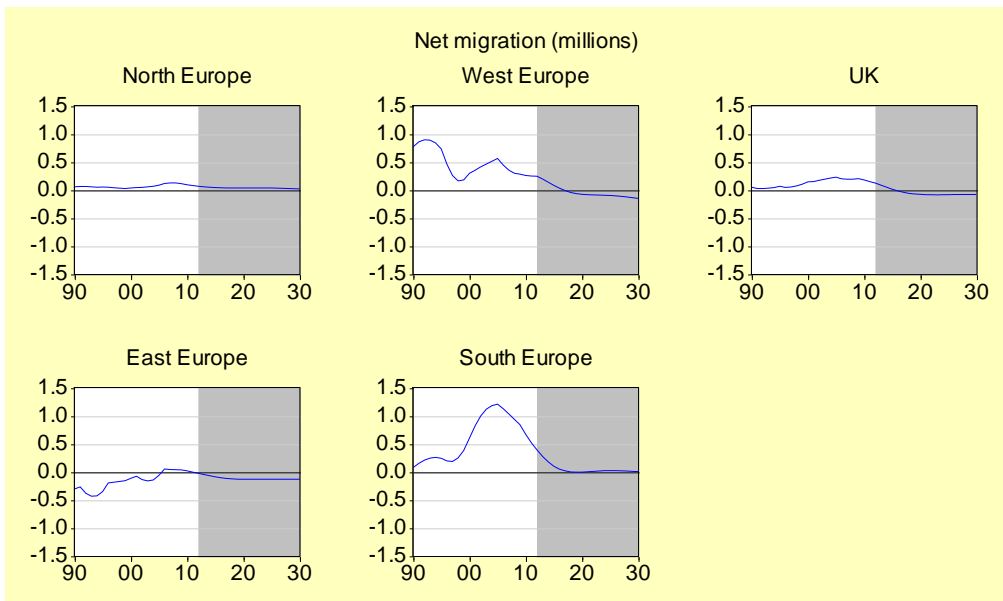
The combination of an increasing population of elderly people with reductions in government income and services and low growth of GDP implies that income transfers will be downgraded and standards of care for elderly people will fall relative to expectations of the population at large. Added to this, fragmentation of families due to economic pressures for family members to move to find jobs and the trend for a high proportion of women as well as men of working age to work in paid occupations makes mutual support within the family less practicable.

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The government service standard (index) in the above chart is measured by comparing (i) the ratio of government spending to a weighted population index with children and the elderly having a relatively high weight with (ii) national income per capita. To maintain the same standard with an ageing population government spending has to rise faster than GDP.<sup>3</sup> Traditionally Europe has had a higher service standard than other parts of the world but in this scenario the standard will fall by around 25% except in North Europe.

Europe may become a less attractive destination for immigrants and obstacles to migration within Europe mean that we cannot rely on internal migration to play a large part in alleviating imbalances in living standards and job opportunities.

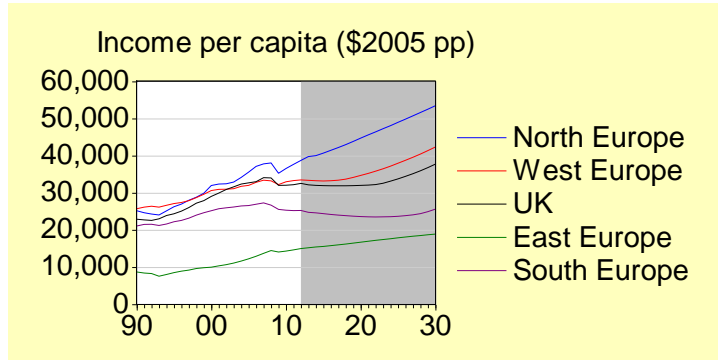


<sup>3</sup> The assumed weights are 3 for the elderly (over 65), 2 for children (0 to 14) and 1 for people in the 15-64 age group.

# WP1 revised historical data and scenarios

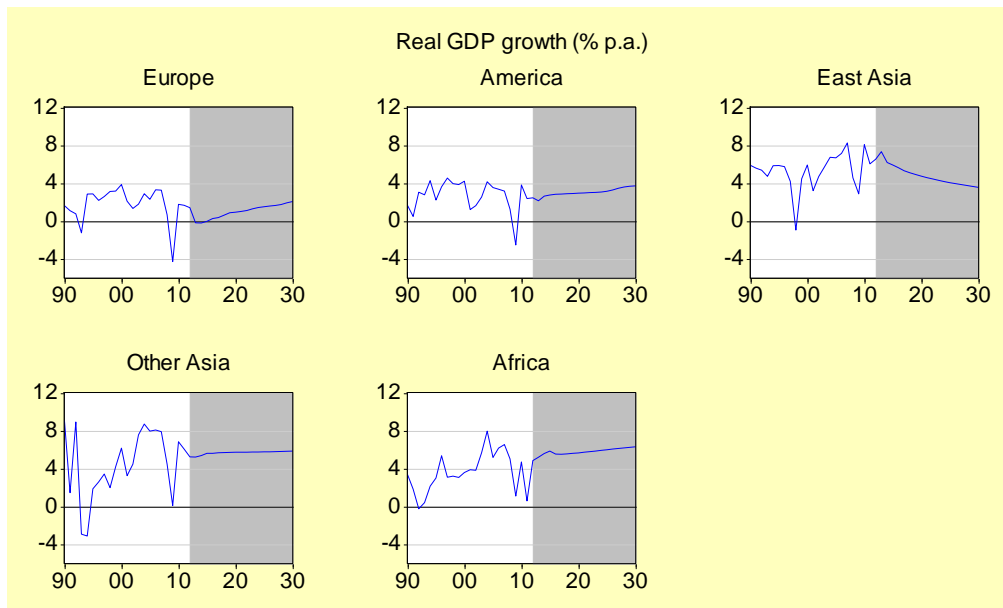


Per capita income will stagnate for some years in West Europe and the UK and will fall in South Europe, not fully recovering the pre-crisis level even by 2030. Income levels in East Europe show only modest improvement and by 2030 have still to catch up with levels achieved in other parts of Europe since the 1990's.



## Outlook for other parts of the world

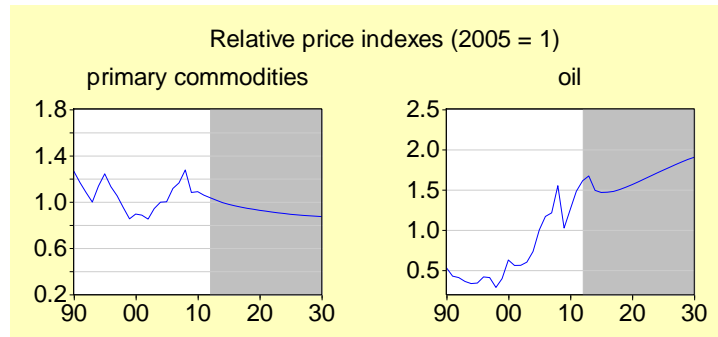
Similar but less severe problems of stagnation and unemployment are projected for the US but other parts of America will grow more rapidly while East Asia maintains a high although diminishing rate of GDP growth. Long-run growth rates in Africa and the rest of Asia are projected to be higher than in East Asia.



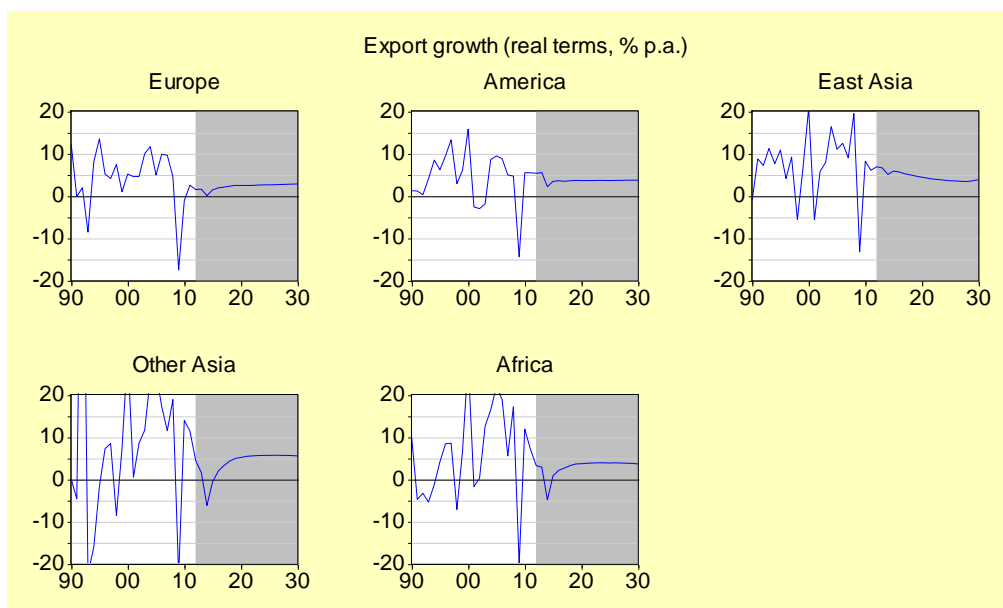
## WP1 revised historical data and scenarios



Sustained GDP growth in Asia, America and Africa may push the world price of oil to new highs.



Exports of all regions are projected to grow slower than in the past with Africa and West Asia being badly affected over the next few years by the recession in Europe.

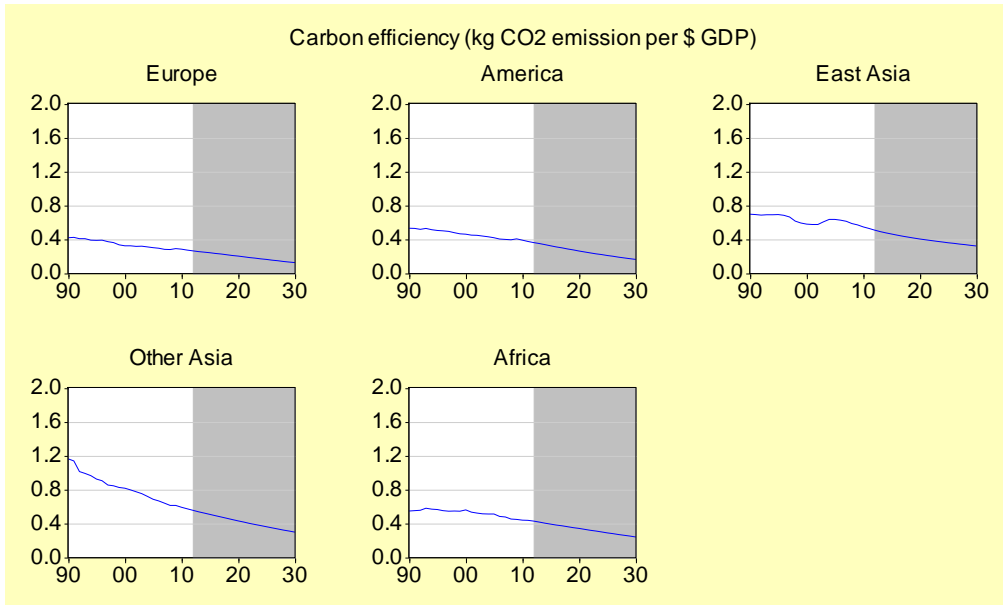




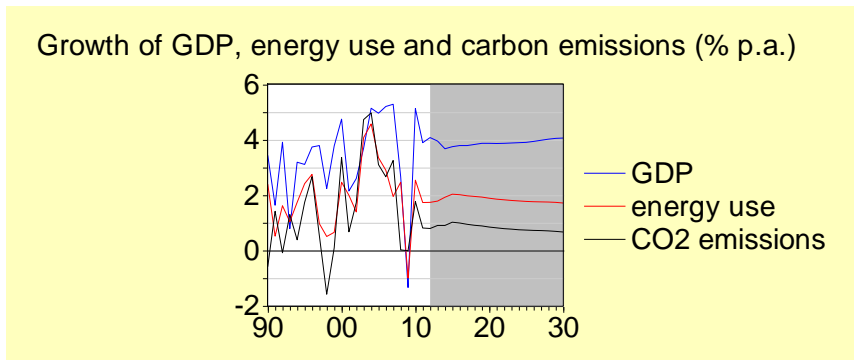
# WP1 revised historical data and scenarios



There have been large improvements in energy efficiency and reduction of emissions in recent decades and the momentum of these improvements should be sustained by a high and rising world price of oil.



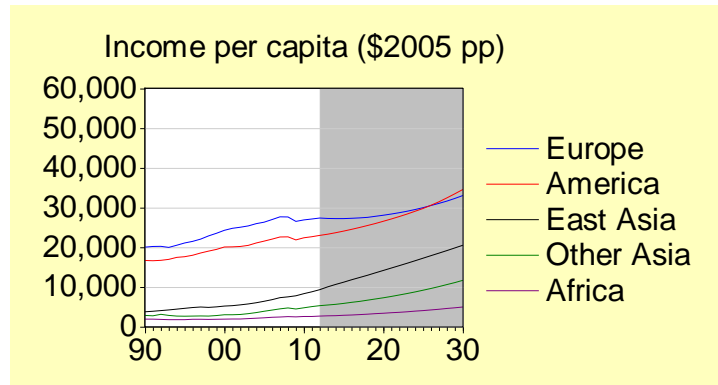
Although Europe is somewhat nearer to a low-carbon economy than other world regions, trends in other regions are similar and the gap appears to be closing. But it is unlikely global emissions will stabilise or fall by 2030 given the increased weight of emerging markets in the world economy which will keep world GDP growing faster than it did on average in previous decades.



## WP1 revised historical data and scenarios



The final graph shows the trend of per capita income in different world regions. The average for Europe, facing slow growth, is overtaken by the figure for the American continent (North and South combined).



By 2030 East Asia catches up with 1990 figures for Europe and the US (i.e. 40 years behind). The rest of Asia catches up with where China is now and Africa reaches income levels typical of Asia in the 1990s (a further 30 or 40 years behind). There are evidently wide differences between countries in each continent and further huge differences within countries between people with different levels of wealth and opportunity. Although the global market continues to support sustained growth of income, continuous innovation, new products and services for consumers and investment opportunities for those who can afford them, it also generates extremes of inequality that will be a crucial concern as time goes on.

## Scenario 2 China and US intervention

With or without stagnation in the US and Europe, it is hardly possible for China to pursue the same pattern of growth as in the past. This has been widely noted by commentators and the broad direction of change is clear - higher wages, increased household income, improved government services, reduced pressure on the environment and cooperation with other countries to ensure acceptance of China's increased participation in the world economy and safeguard its external assets.

On the other side of the world the US government has less scope for policy intervention than the government of China. But it may be assumed that the US will continue to pursue devaluation of the dollar through low-interest policies and will find ways to finance federal and state government programs to create new jobs or protect existing ones without a substantial increase in taxation.

This scenario examines the possibility that the two super-powers will achieve some or all of their most important goals.

### Specific assumptions

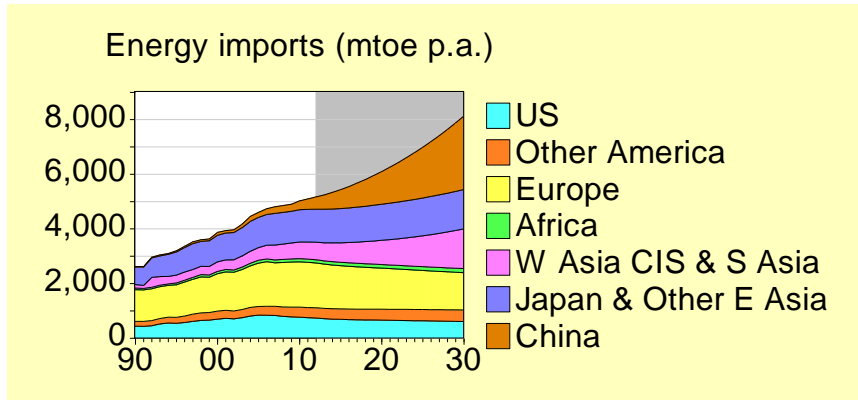
China's objective is a sustainable long-run growth path with growing benefits for citizens and reduced stress on the environment. To this end, the scenario assumes that profits and investment will be reduced as a share of GDP while the share of consumers expenditure increases and the share of government services rises gradually from 14% now to 18% by 2030. Real GDP growth comes down from 7.5 % in the current decade to 6.5% in the next and the exchange rate is allowed to appreciate so long as this is consistent with a gradual decline in the current account surplus. Energy saving measures and investment in non-carbon energy sources are assumed to mitigate the need for further increases in domestic coal output although large increases in oil and gas imports will still be required and there may be some increases in domestic production.

For the US the scenario assumes restrictive budgetary policies imposed by Congress will be partially relaxed or circumvented. A gradual increase in the government's share of national income and a softer target for the debt/GDP ratio, make it possible to increase government spending on services and infrastructure.

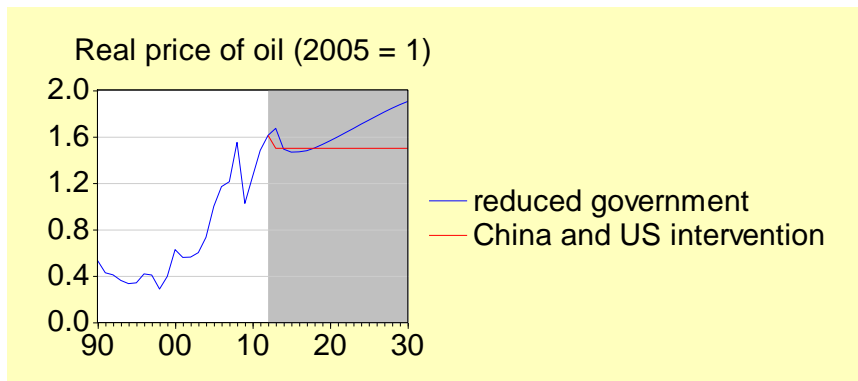
The final element is an assumption that both the US and China invest in expansion of oil and gas supplies in the CIS, West Asia and North Africa, Central America and the Caribbean as well as the USA itself. The resulting increase in output is assumed to be sufficient to prevent long-term price increases, keeping the price of oil at about the present level in real terms.

### **Outcomes for China and the US**

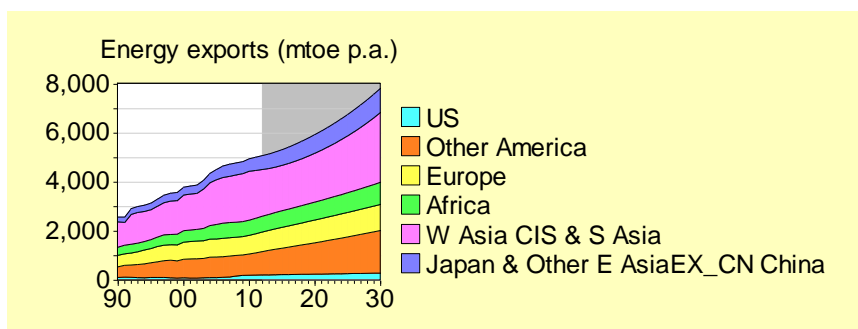
Pressure on global energy supplies will come mainly from China and other parts of Asia. With slower growth elsewhere dependence of other regions on energy imports may remain at around the present level (about 2.5 billion oil equivalent per year) but Asian demand is projected to rise from around 3 billion to 6 billion tons oil equivalent by 2030.



With a sufficient expansion in oil and gas supplies the price of oil holds at around its present level despite the large increase in Asian demand.



The main exporters are West Asia, the CIS bloc and Other America.<sup>4</sup>

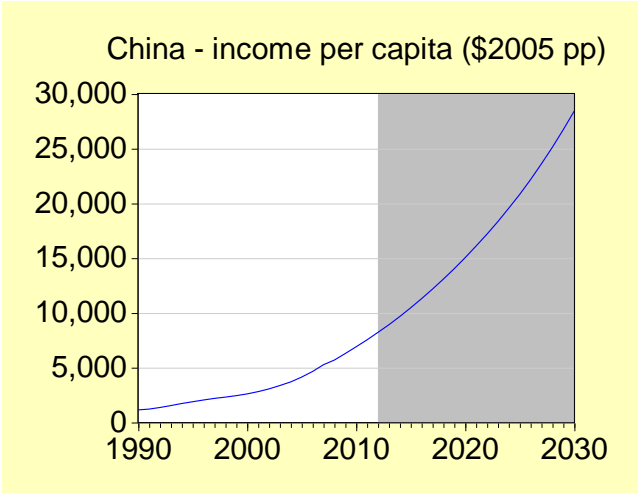


<sup>4</sup> The definition here includes Australia as well as Canada, South and Central America and the Caribbean.

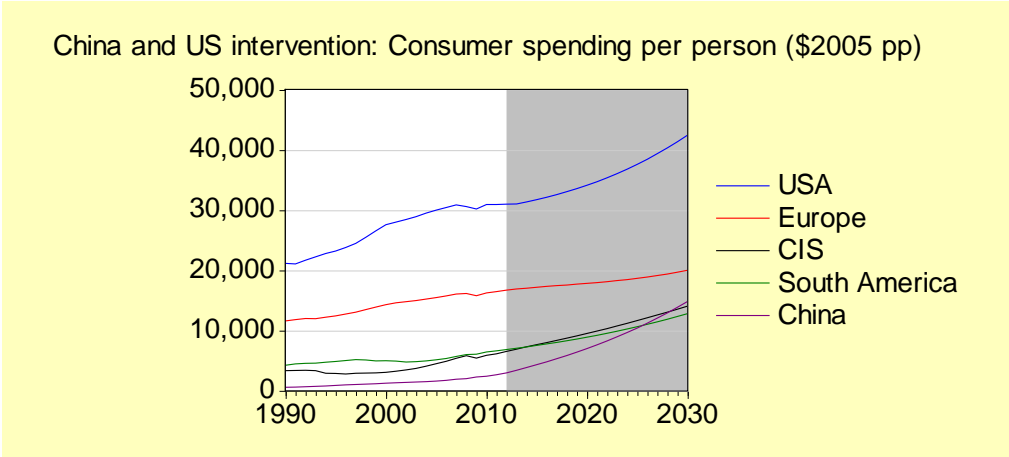


Economic growth in China

By 2030 sustained GDP growth maintained by rising domestic consumption and government spending brings China up to the current average income level in Europe (around \$28,000 per capita at 2005 pp).



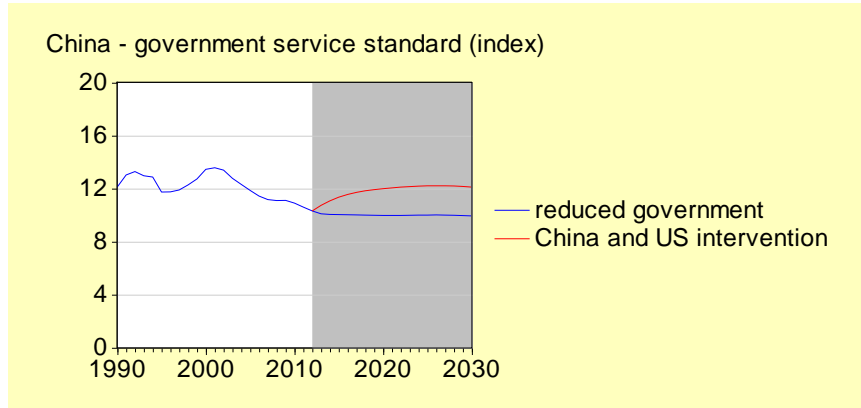
Consumer spending in China may increase rapidly but will still be well below the European level per capita and far below that in the US. With a higher rate of growth of GDP investment will account for a larger share of national income in China than in Europe and the US.



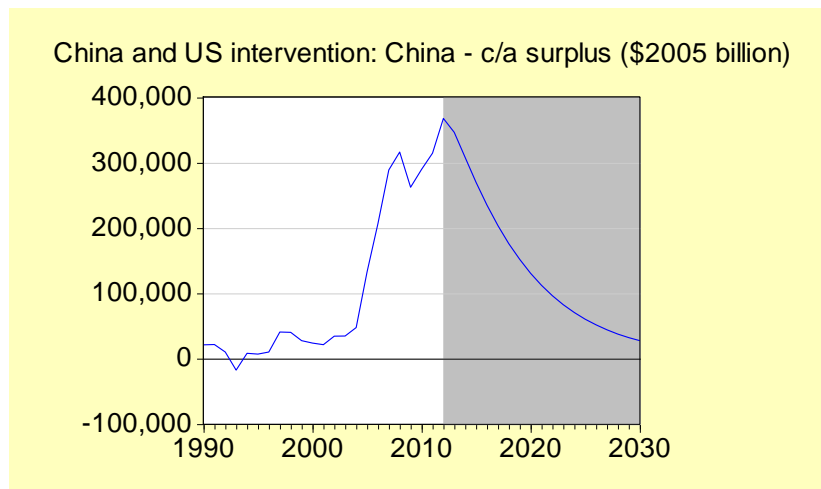
## WP1 revised historical data and scenarios



Rapid growth of spending on government services will allow the government to maintain service standards for an ageing population, albeit at a lower level than in Europe.<sup>5</sup>



The current account surplus falls progressively as profits and savings are reduced in favour of consumer spending.

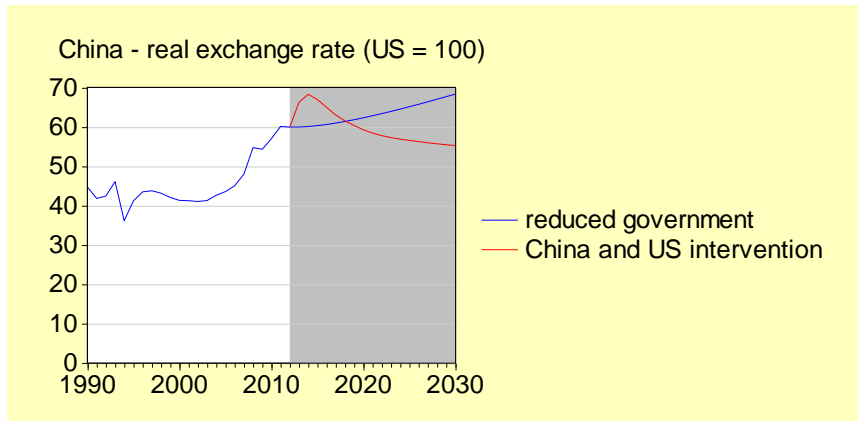


<sup>5</sup> The government service standard (index) is measured by comparing government spending relative to a weighted population index with children and the elderly having a relatively high weight with national income per capita. To maintain the service standard with an ageing population government spending has to rise faster than GDP.

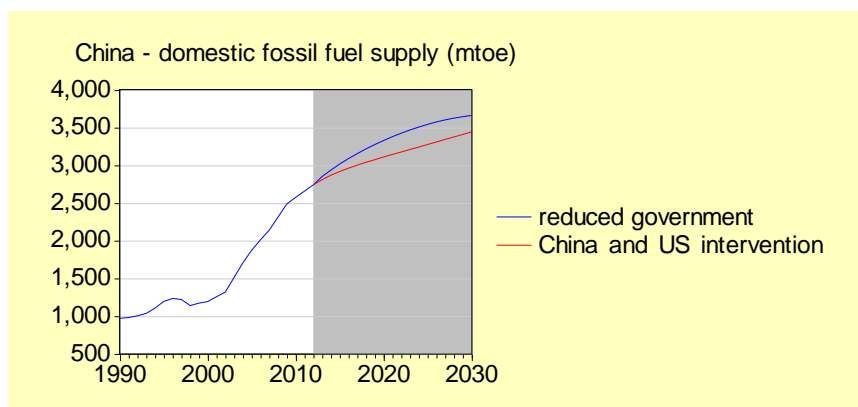
## WP1 revised historical data and scenarios



The real exchange rate rises initially but then declines slowly as China seeks to maintain sufficient exports to cover the rising cost of energy imports.

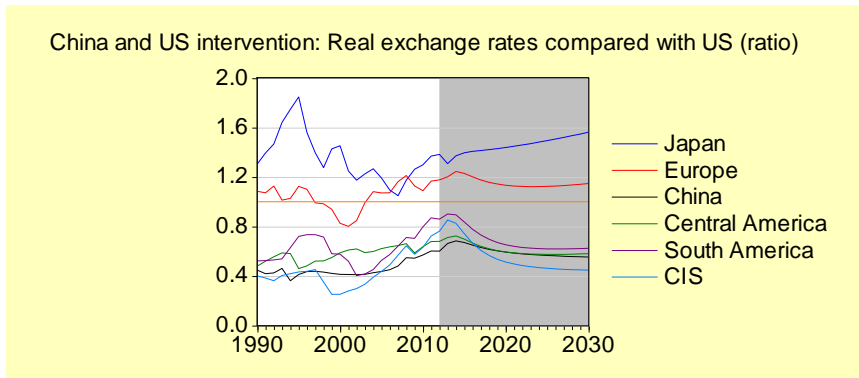


Energy-saving policies that contribute an additional 1% per year to the reduction in primary energy use per \$ of GDP make it possible for China to reduce the growth rate of domestic coal, oil and gas supply to 1% p.a. in the 2020s with up to 40% of energy needs being met by imports as compared with 10% now.

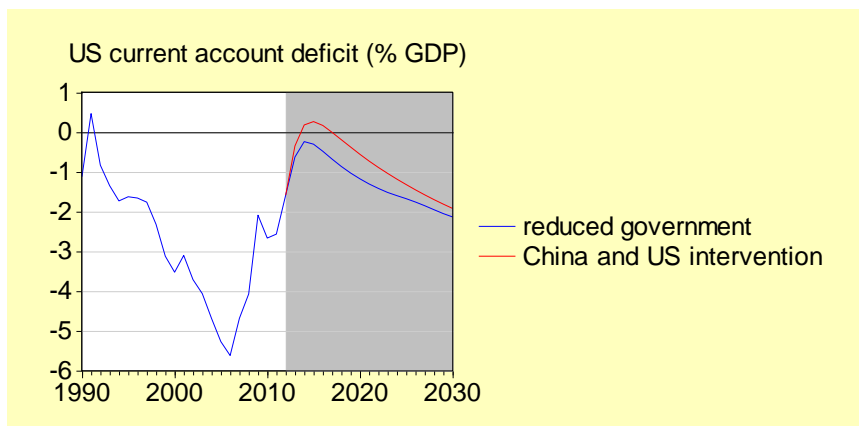
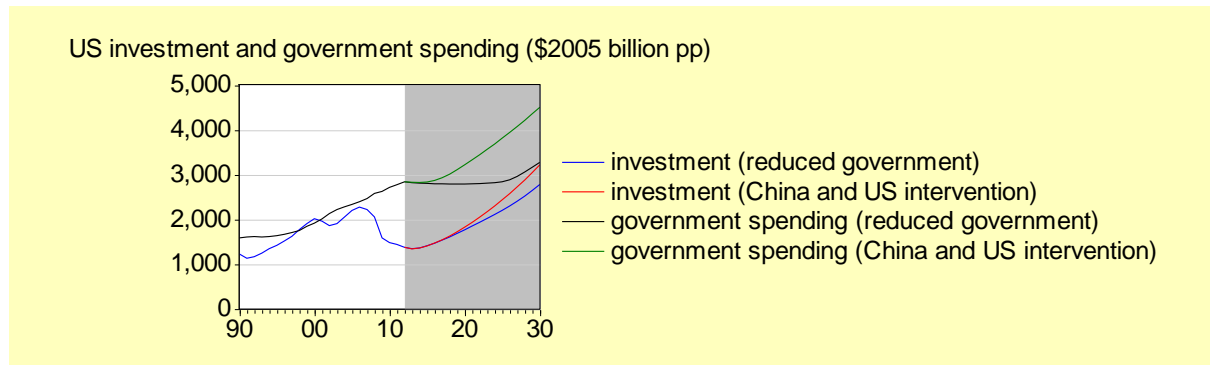


Modest improvement in US prospects

The story for the US is somewhat different as it is almost impossible for the US to engineer a substantial real devaluation against other countries in general. As shown in the graph below the real exchange rate (cost relationship) may remain quite favourable relative to Europe and Japan. The main problem is the likelihood of real devaluation in other parts of the world, particularly South America and the CIS whose real exchange rates have risen dramatically over the past decade making it difficult for them to diversify exports.



Nevertheless there is scope for the US to secure an improvement of around 1% p.a. in GDP growth sustained by government spending and private investment while the current account deficit reduces remains below 2% of GDP.

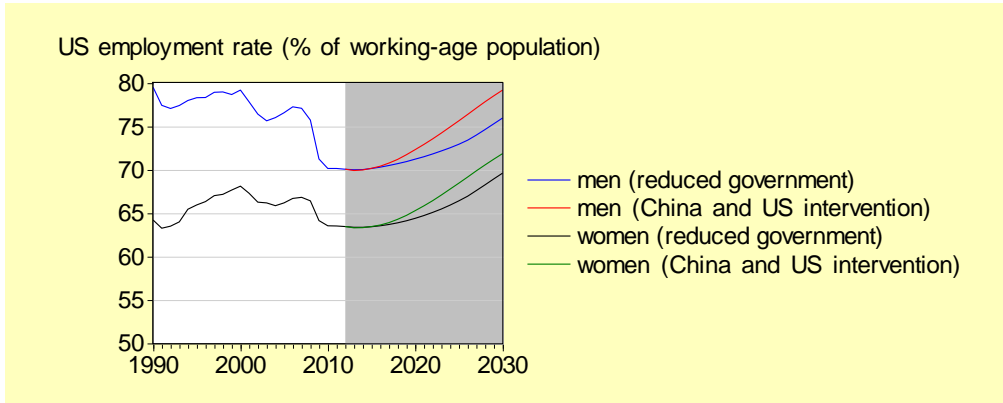




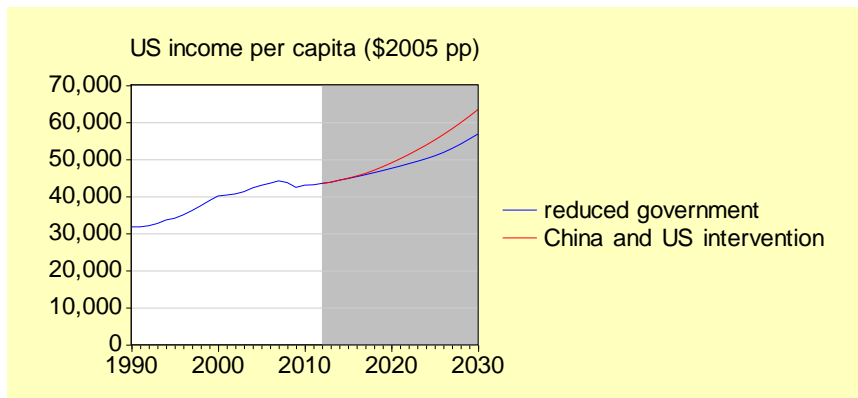
# WP1 revised historical data and scenarios



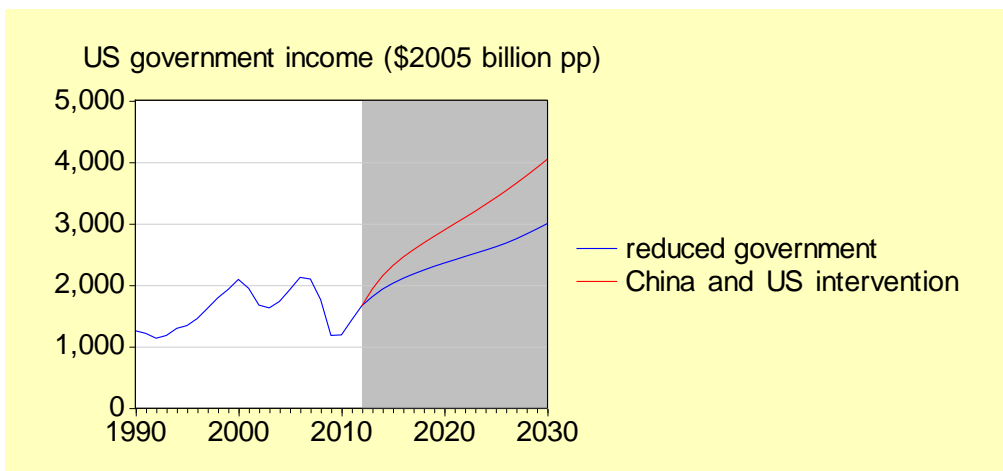
Faster GDP growth provides gains in jobs but as the working-age population continues to grow the recovery in employment rates is slow, especially for men. The male employment rate does not return to the level of the 1990's much before 2030.



Average income per capita rises steadily to a level nearly 50% higher than now, maintaining the US position as the wealthiest large country.



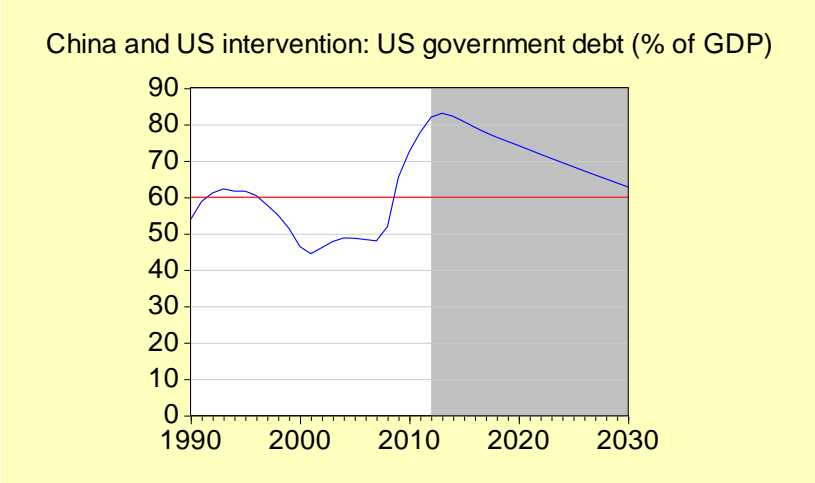
Government income (revenue less grants, subsidies and interest payments) more than doubles in real terms.



**WP1 revised historical data and scenarios**

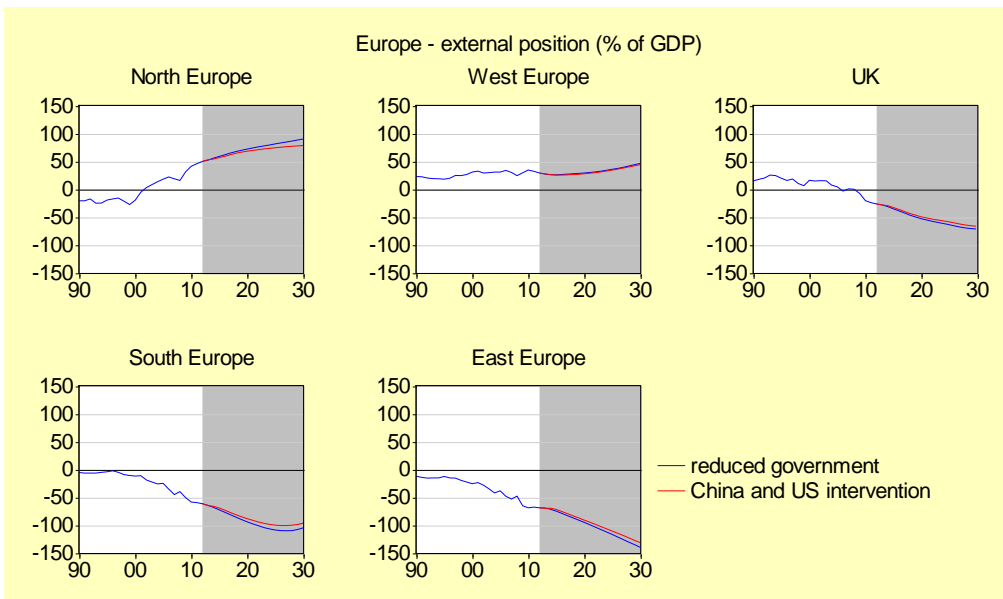
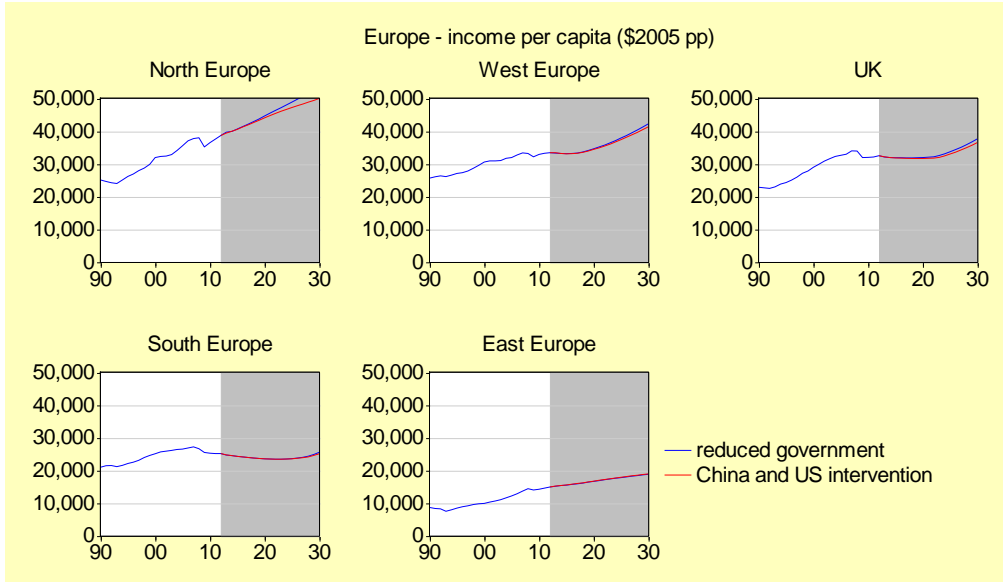


Government debt increases from 13 to 18 trillion (current dollars) or 11 to 14 trillion (2005 dollars). The ratio of debt to GDP eventually declines to 63%, about the same level as in the early 1990s prior to the "peace dividend" that brought the debt down to 44% of GDP in the year 2001.



Outlook for Europe

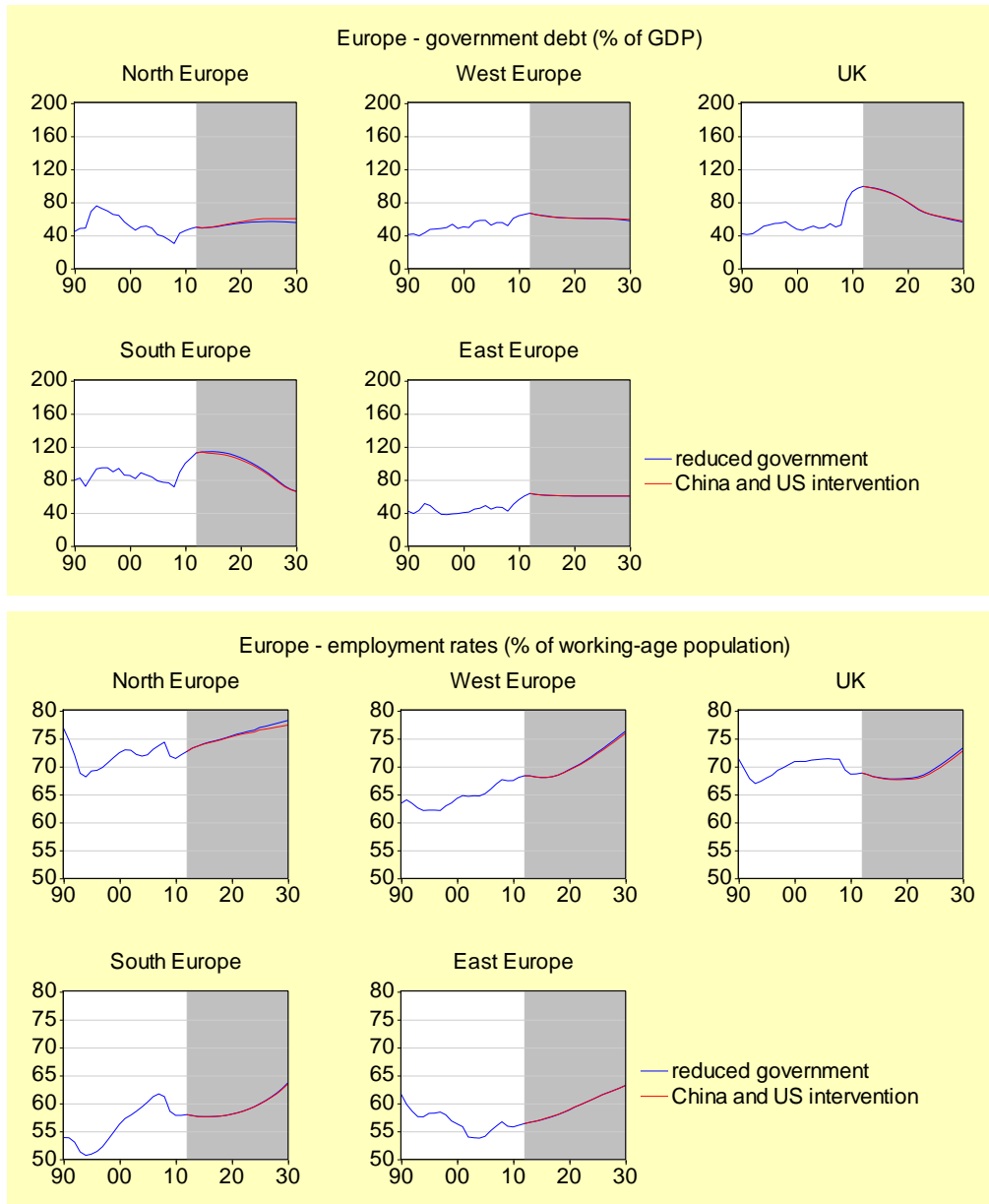
The spin-off for Europe from policies of China and the US discussed above appears marginal. There are no significant cumulative benefits to Europe's per capita income and external positions.



# WP1 revised historical data and scenarios

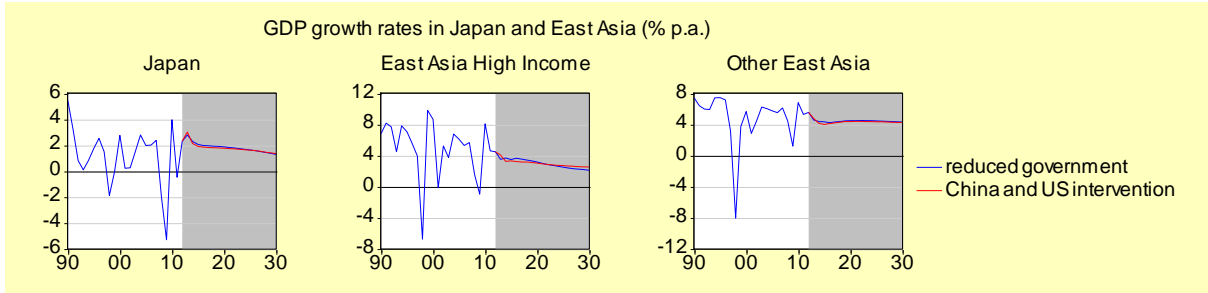


The impact on debt/GDP ratios and employment rates in Europe is imperceptible.

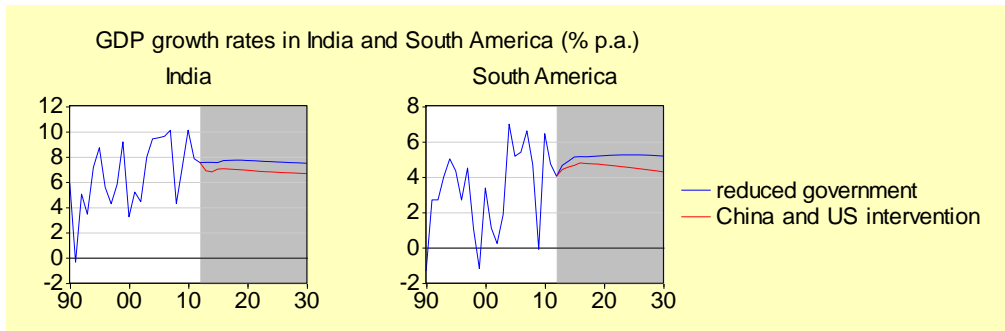


**Outlook for other parts of the world**

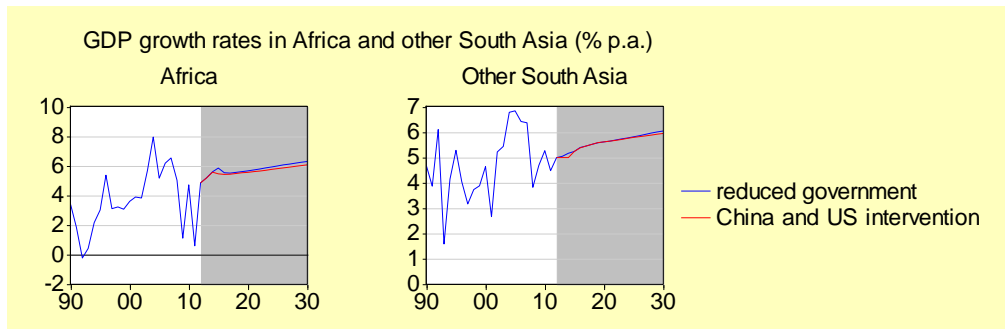
GDP growth in Japan and other countries in East Asia is hardly affected by China's domestic growth policy.



India and South America are affected adversely by US investment policies and improved growth prospects in the US that reduce pressure for industrial relocation.



There is no net benefit for other countries in South Asia and Africa.



What energy-exporting blocs gain from investment in higher oil and gas supply they lose on account of the lower world oil price (compare with the first scenario) which reduces incentives to develop alternative energy sources.

### Scenario 3 Regionalisation

The third global scenario takes up the theme of regionalisation in which neighbouring countries in different parts of the world endeavour to strengthen their prospects by forging closer political and economic relationships with each other and more particularly with the largest or strongest country in the region that is most capable of providing leadership and security to the group.

This scenario pays attention to the potential for

- i) an American group centred on the US with Canada, Mexico, Central America and the Caribbean (but not South America) as partners
- ii) a Far East group centred on China with Japan, Korea and Asean countries as partners
- iii) a European group with some level of partnership with Russia and other CIS countries as well as Turkey and other countries in the Middle East and North Africa.<sup>6</sup>

Countries in South America, Africa South of the Sahara and Other Asia (including the CIS and West Asia as well as India) are assumed to form weaker regional groups in the attempt to defend their interests in the face of three more powerful groups above.

#### Specific assumptions

The scenario retains assumptions about China and US interventions from Scenario 2.

In Europe's case two new policy directions are assumed. On the one hand fiscal and monetary institutions and policies within Europe are reshaped with the objective of supporting internal growth and cohesion and on the other hand financial, trade and energy policies are designed to integrate Europe more closely with neighbouring regions and achieve faster and more diversified economic development. By assumption these policies find at least some degree of acceptance in the partner countries.

Similar packages aimed at financial security, reduced trade risks, internal expansion and convergence of lower-income partners are adopted by the other regional groups. In each region or group a level of supra-national government coordinates monetary and balance of payments policies, investment incentives, trade preferences and energy policies.

Regional management of finance and economic policy seems to offer a number of advantages if there is sufficient political momentum in favour of integration and stronger government within each region. The need for internal cohesion drives management of internal markets and financial systems with mutual support for orderly exchange rate movements to maintain appropriate cost relationships and coordinated trade and industrial policies providing incentives for investment and

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<sup>6</sup> For clarity and consistency with other scenarios the model uses the same division of the world into 19 blocs (see Appendix A). The groupings suggested here are formed by aggregation of these blocs. Therefore the EUX group (Europe plus neighbours) includes all parts of Europe plus North Africa, West Asia and the CIS while the USX group (US plus neighbours) includes the US itself plus Central America and the Caribbean and the Other Developed bloc (Australia, New Zealand and Israel as well as Canada).

# WP1 revised historical data and scenarios

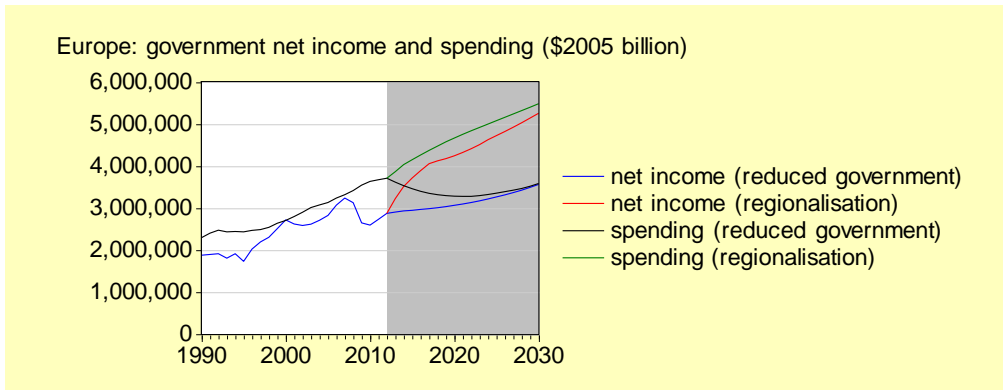


infrastructure development. Each large regional group could be relatively self-sufficient in energy and raw materials and manage long-term development of demand and supply.

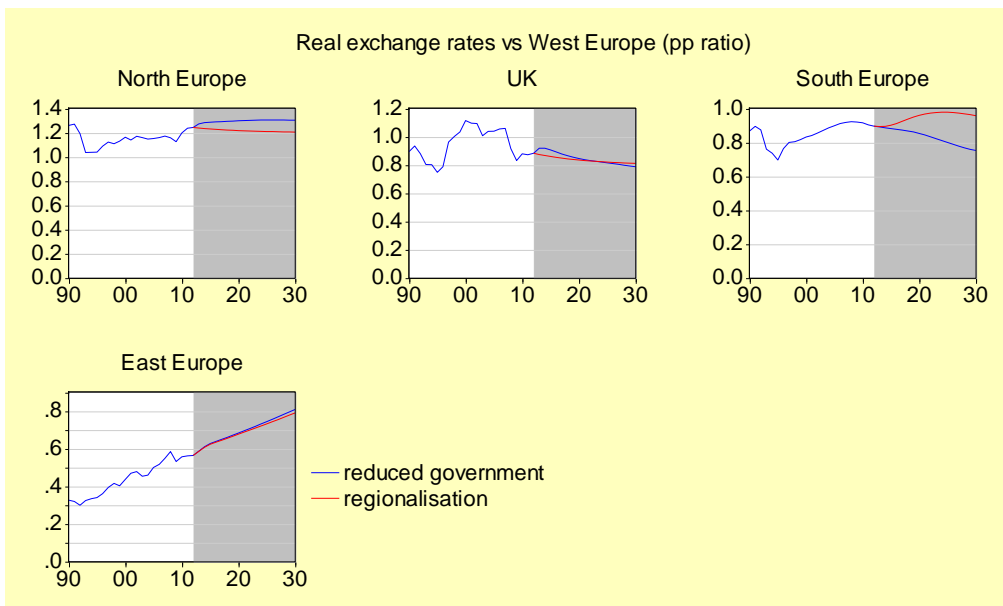
Regional cooperation, although difficult to make effective, may at least be easier to manage than global cooperation. Large regional groupings may be less vulnerable to economic and financial problems originating in other parts of the world and sustained long-term growth of the three more powerful regions (East Asia, North America and Europe) could improve opportunities for economies in the South to expand exports of goods and services in which they have specific advantages.

## Outlook for Europe

In Europe the combination of policies mentioned above makes it possible to achieve sustained growth of government income and spending



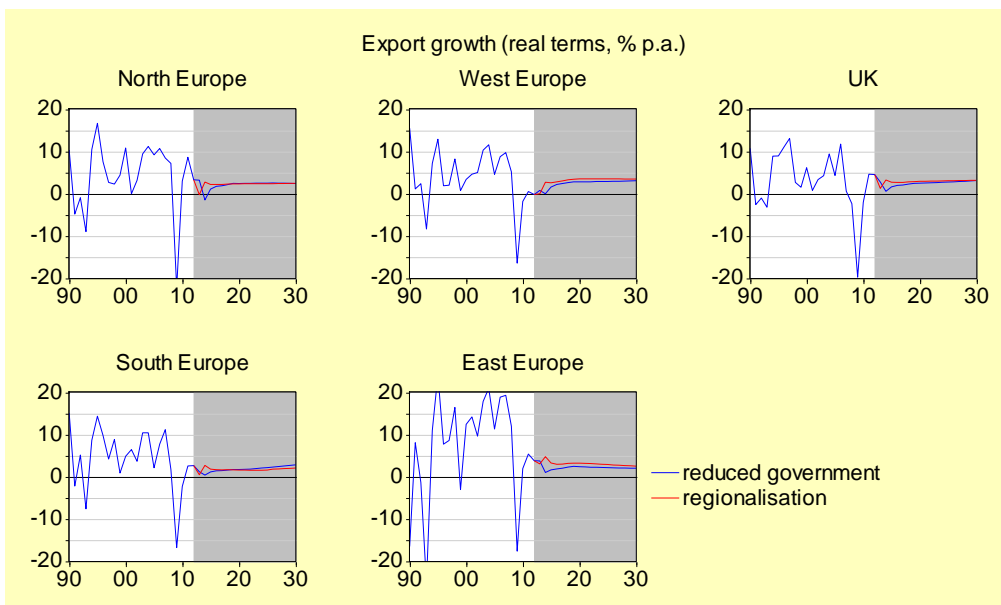
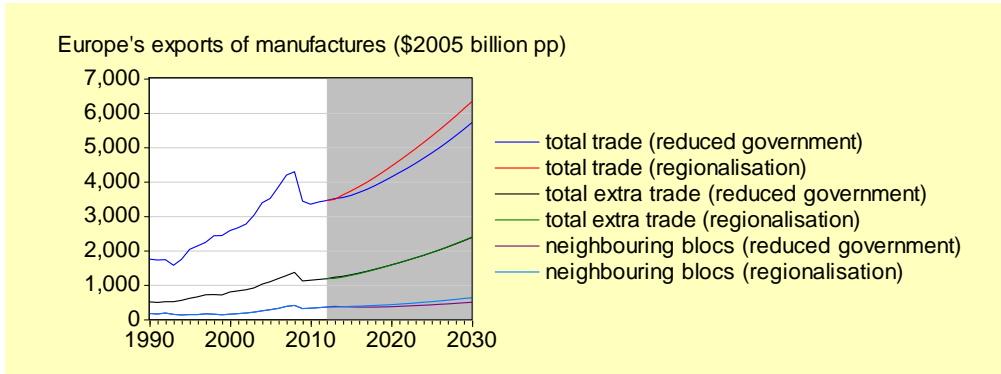
Independent exchange rates would continue to provide flexibility for North Europe and the UK but East Europe would lose competitiveness.



# WP1 revised historical data and scenarios



All parts of Europe gain some benefit from faster growth of industrial trade within Europe and with neighbouring regions, compensating for any loss of markets due to regional preferences in other parts of the world.

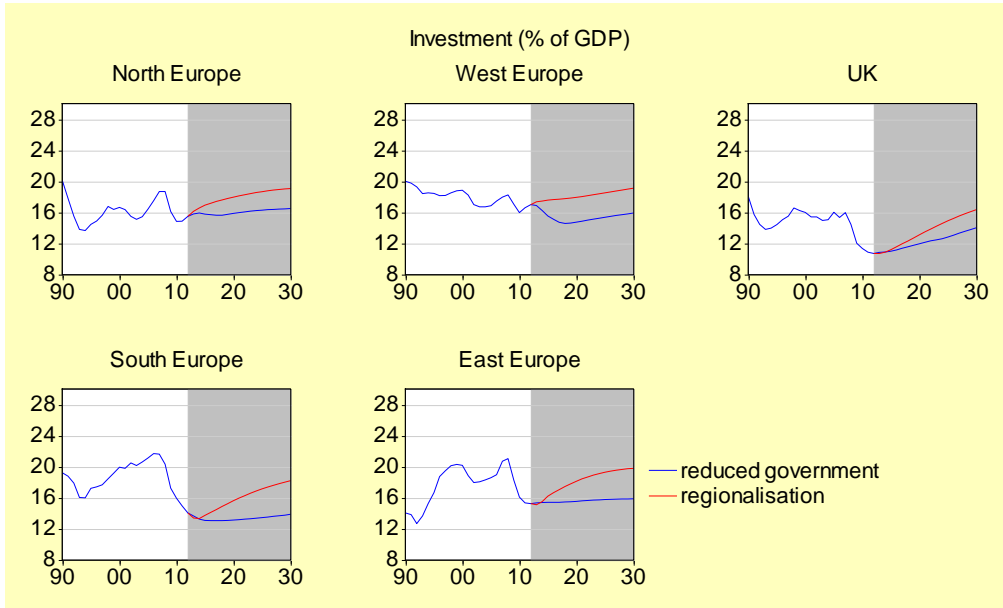




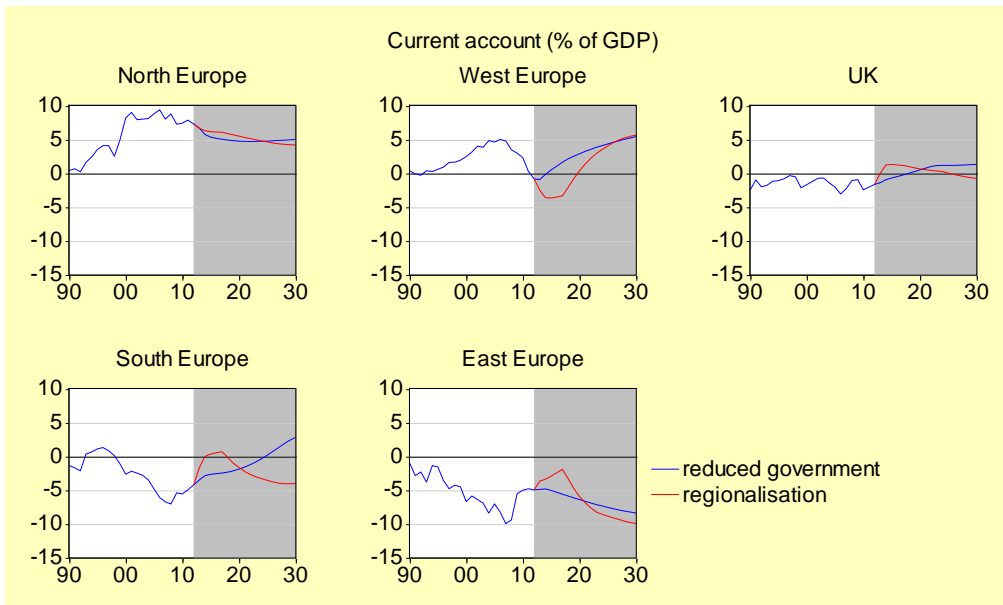
# WP1 revised historical data and scenarios



With faster export growth a virtuous growth-investment cycle follows.



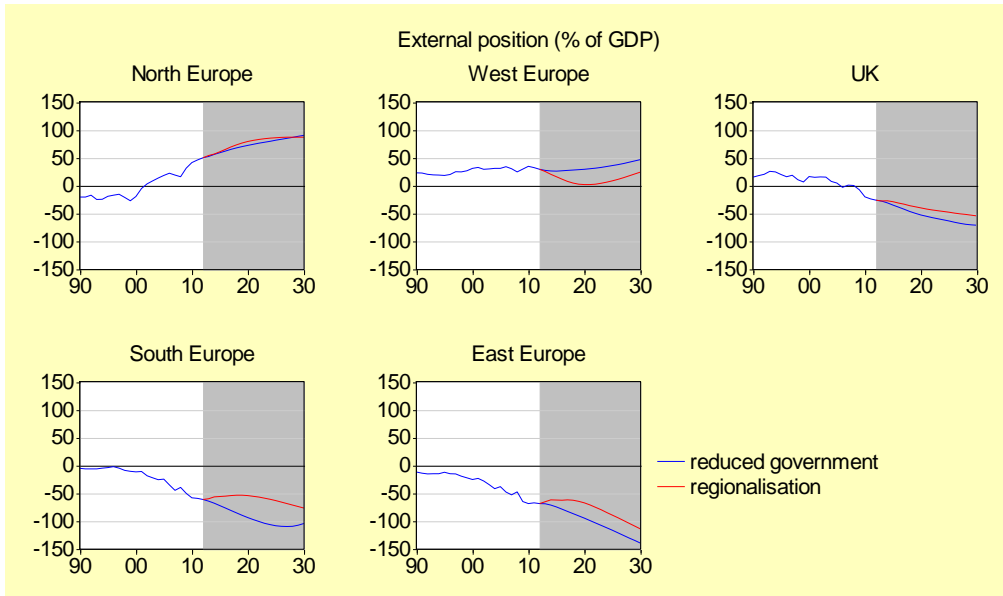
Current account imbalances similar to those in the past with a high rate of capital inflow to East Europe and to a lesser extent South Europe support increased investment in these regions.



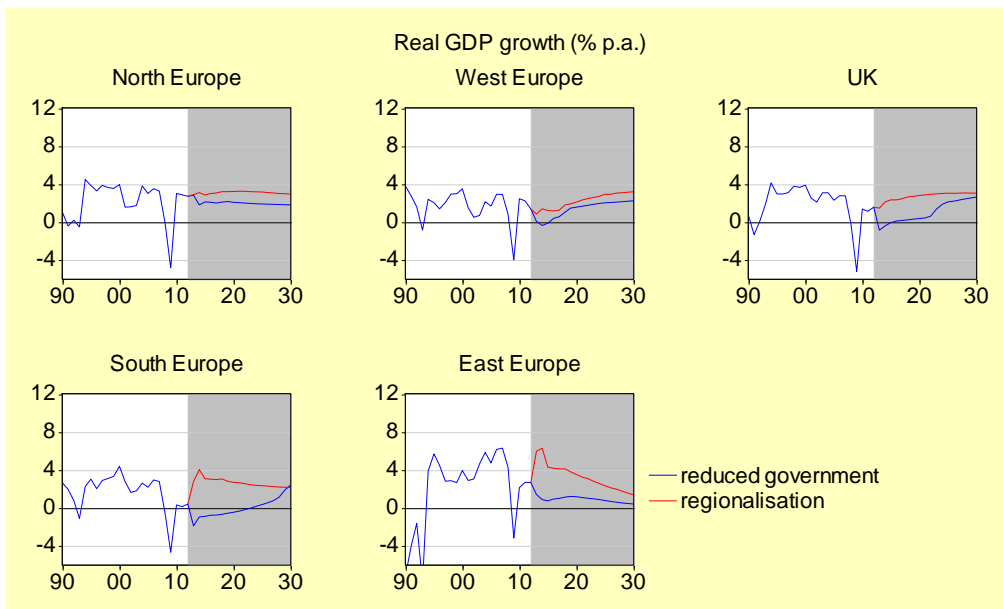
# WP1 revised historical data and scenarios



Net liabilities of the UK and South and East Europe increase gradually relative to GDP. The pattern is not much different from that in the first two global scenarios despite the large investment program assumed for "Regionalisation".



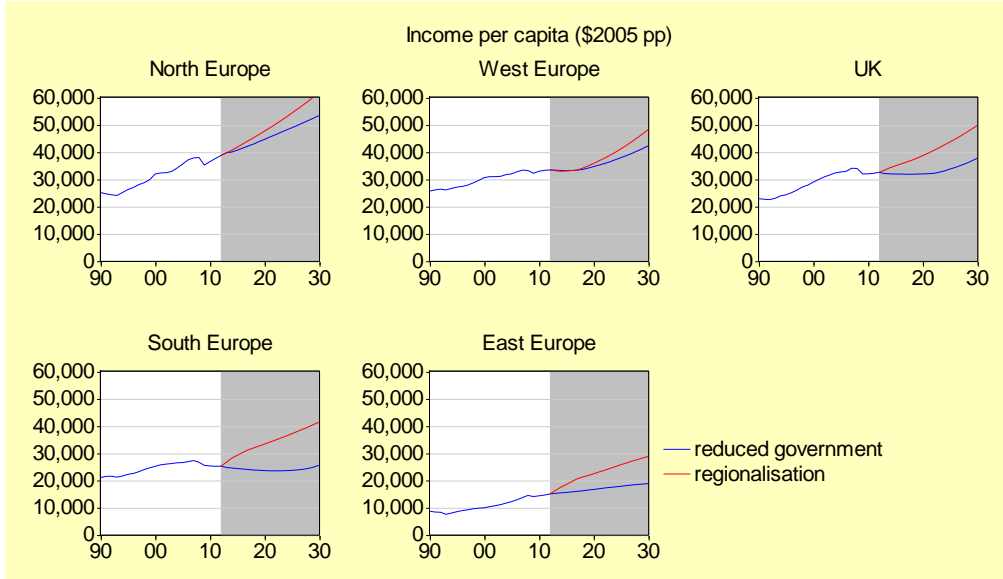
GDP growth is 1-2% p.a. faster in all parts of Europe.



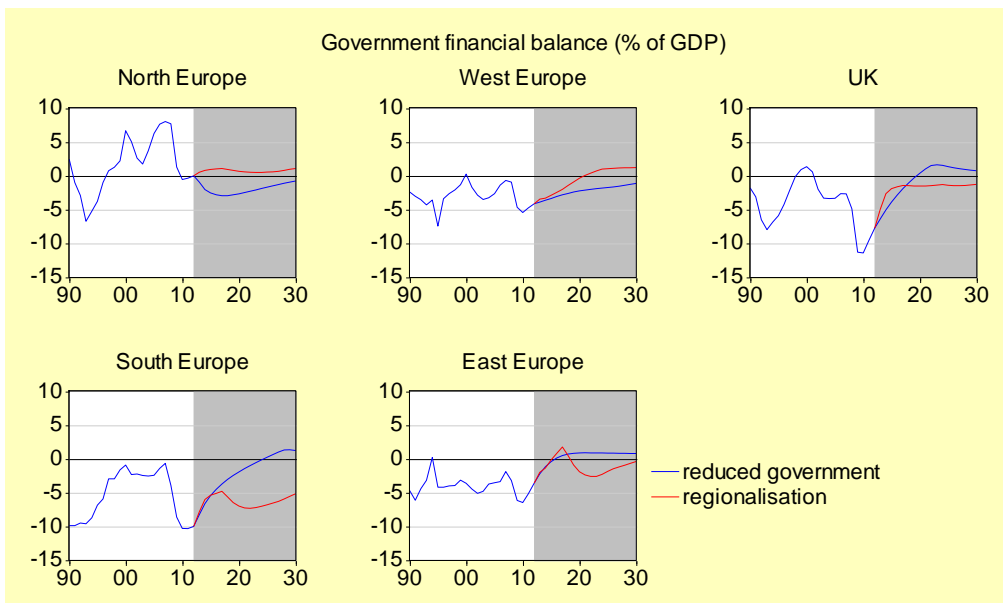
# WP1 revised historical data and scenarios



By 2030 the gain to income per capita in Europe as a whole as compared with the preceding scenarios is around \$10,000 p.a. in 2005 purchasing power units with North Europe and the UK reaching levels of \$60,000 and \$50,000 per person respectively, West Europe reaching \$48,000, South Europe reaching \$41,000 and East Europe reaching \$29,000 per person.



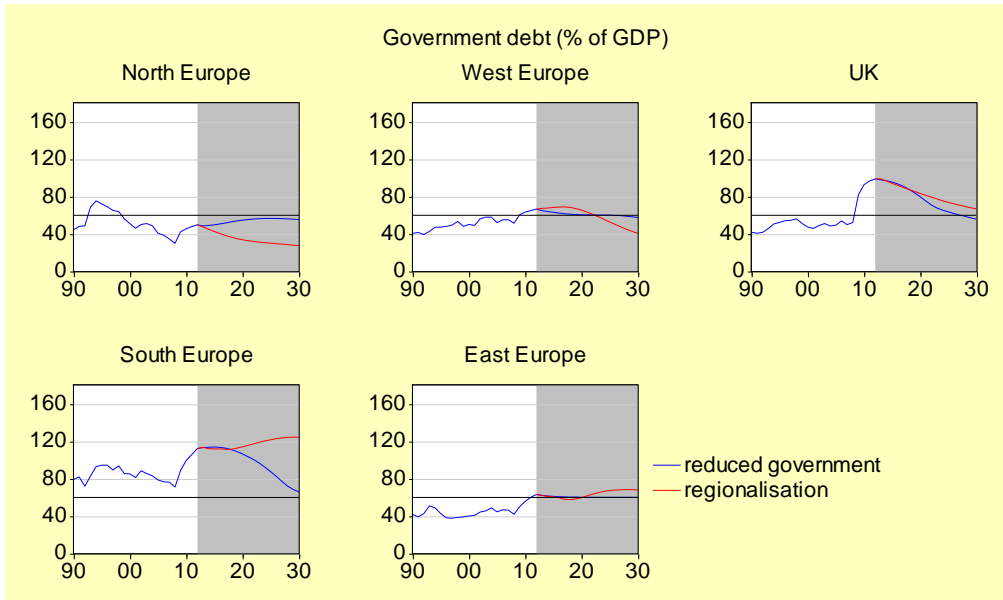
Given sustained GDP growth, government financial deficits are reduced without severe fiscal austerity except in South Europe where spending to support job creation generates continued budget deficits in the range 5-8% of GDP.



# WP1 revised historical data and scenarios



Debt to GDP ratios fall to 40% in North and West Europe, reduce to 70% in the UK, increase slightly and stabilise at 70% in East Europe and level off at around 120% in South Europe.



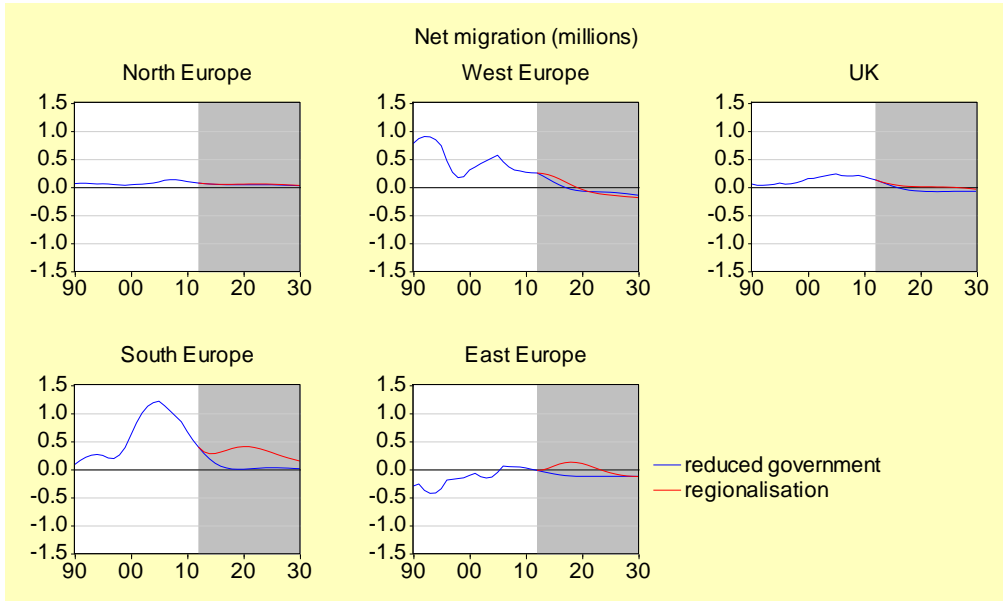
Employment prospects improve in all parts of Europe, especially for women.



# WP1 revised historical data and scenarios

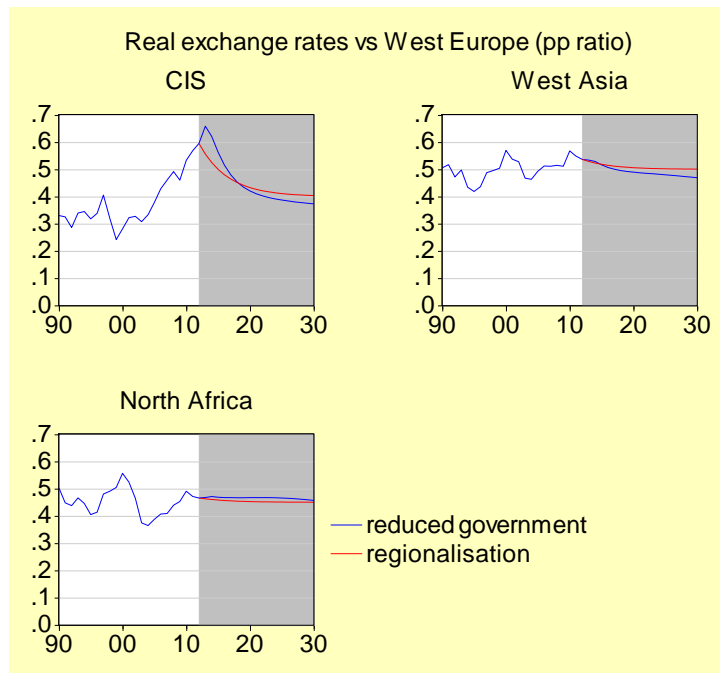


With improved GDP growth and employment rates net immigration to South Europe continues at a moderate rate.



## Outlook for neighbouring regions

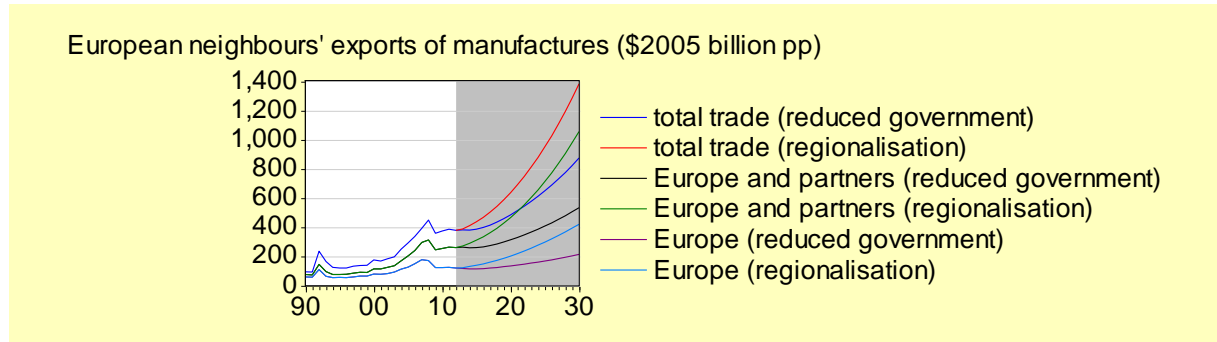
Monetary cooperation and management of capital flows to assure financial stability and steady growth of trade and investment in each region is targetted on real exchange rates shown in the graph below.



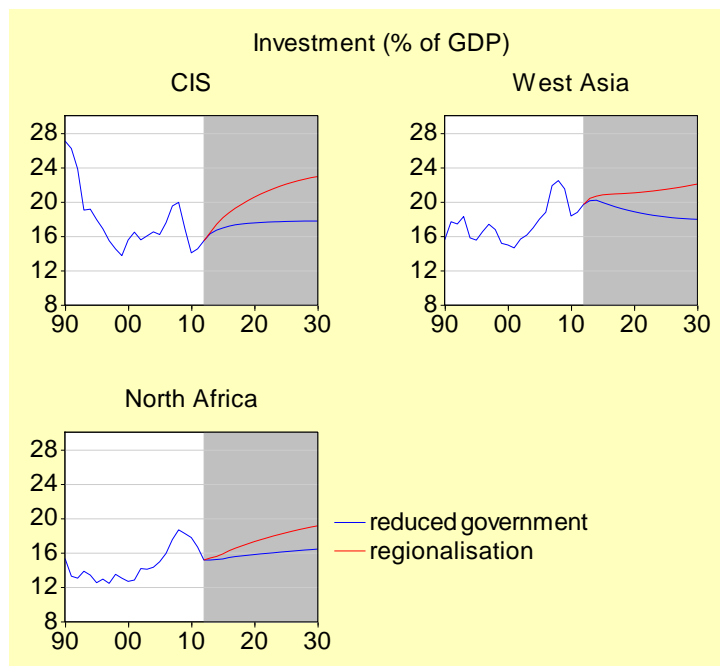
# WP1 revised historical data and scenarios



With trade preferences and faster growth of domestic demand in Europe, total industrial exports by neighbouring regions increase more than three-fold from \$400 billion in 2005 purchasing power to \$1.4 trillion. Exports to Europe account for 34% of this trade (\$480 billion), exports within and between the neighbouring regions account for 45% (\$640 billion) and exports to the rest of the world 21% (\$310 billion).



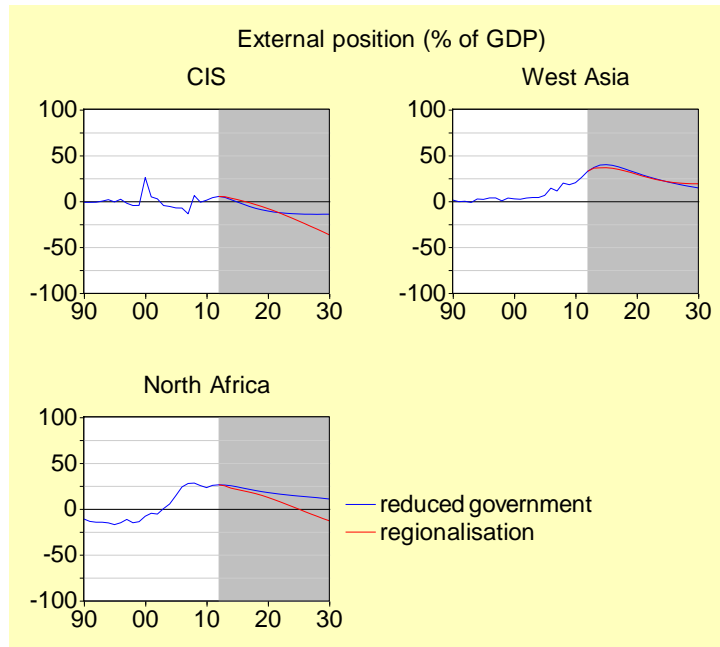
One response to export growth, exchange rate stability and mutual financial support is a substantial increase in investment.



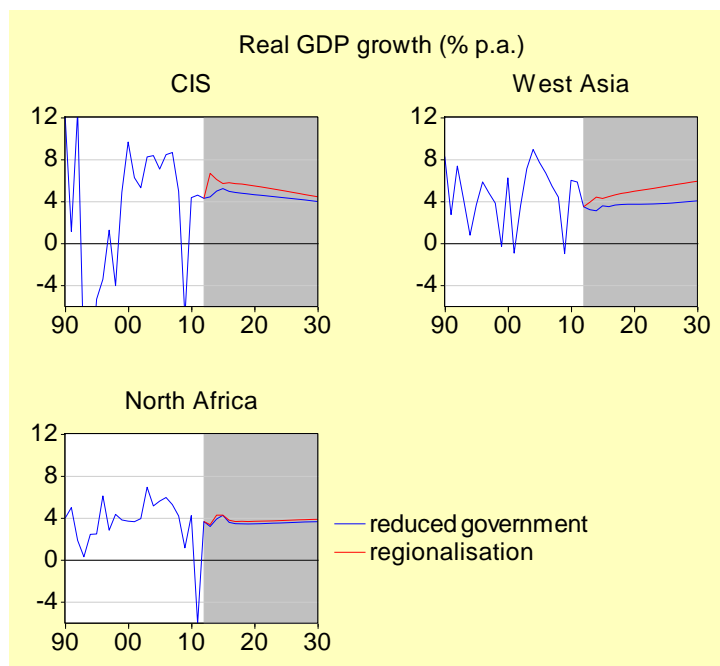
## WP1 revised historical data and scenarios



This results in a gradual increase in net liabilities of the CIS group as around 10% of the investment is financed by net capital inflows rather than domestic savings.



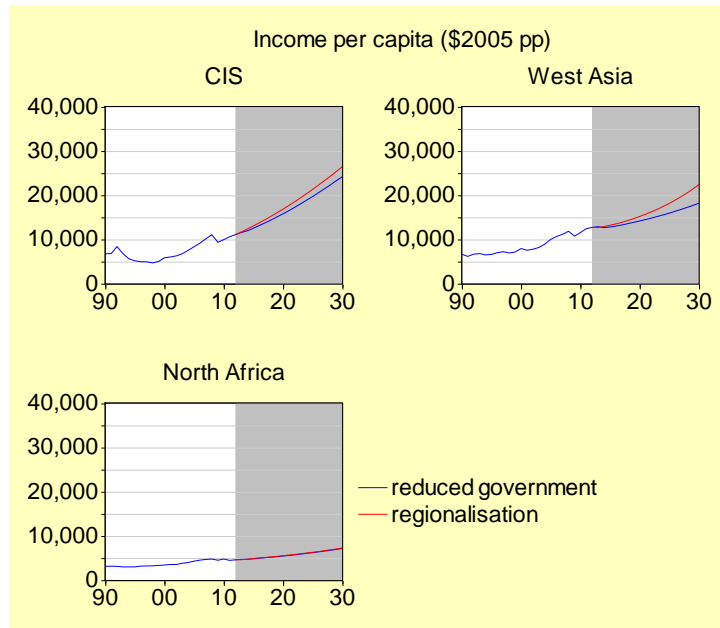
GDP growth in West Asia accelerates significantly.



# WP1 revised historical data and scenarios

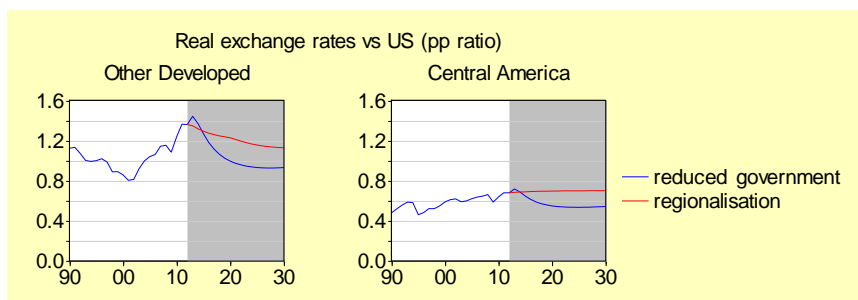


By 2030 per capita income is 18% higher in the CIS group, 28% higher in West Asia and 8% higher in North Africa than under alternative scenarios. The relatively small gain to North Africa is largely explained by higher costs of food and raw material imports and very weak capacity for industrial exports. Ultimately a new momentum for industrial exports could be expected beyond 2030.



## Outlook for US and neighbours

The scenario assumes that the US seeks an accommodation with its partners that maintains cost ratios as in the following graph.

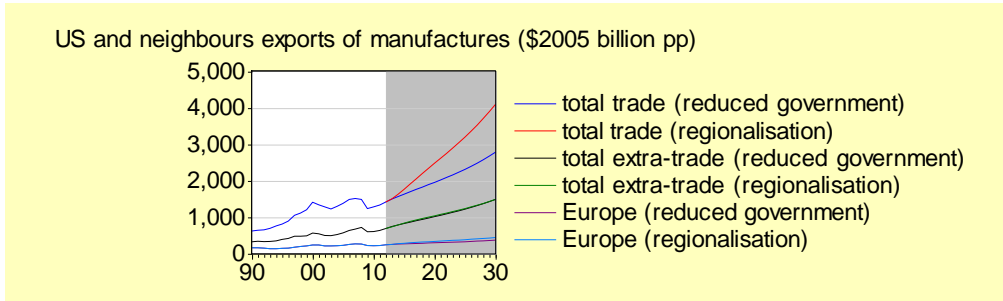




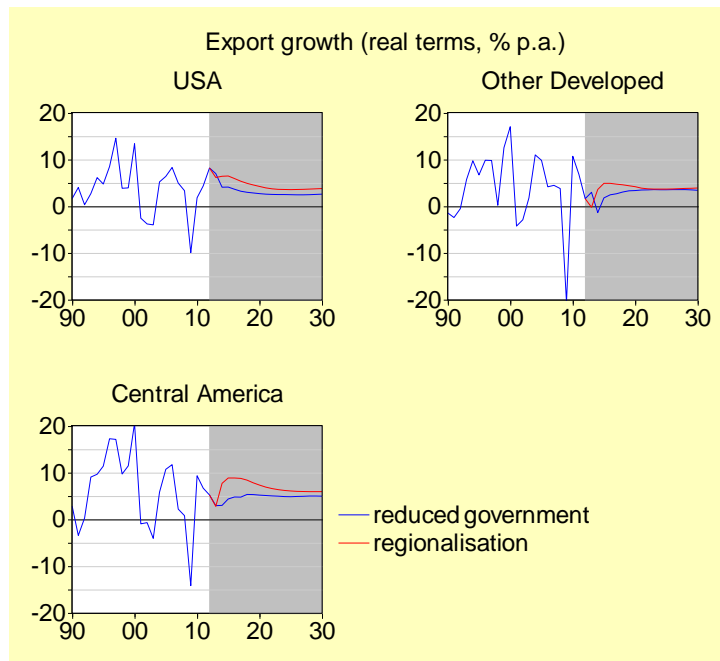
# WP1 revised historical data and scenarios



Policies similar to those discussed above generate a large increase in industrial trade within the group. Exports of manufactures to Europe and other parts of the world grow less rapidly but are little affected by protectionism.



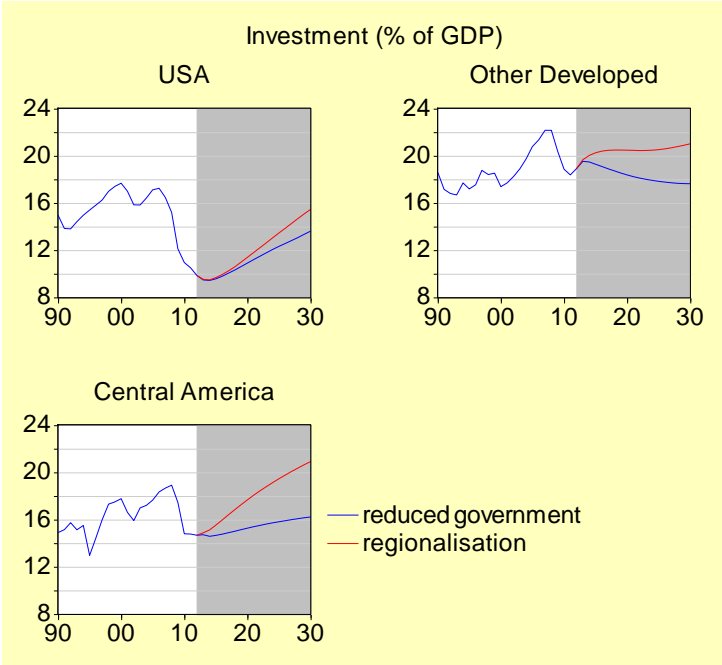
All partners achieve faster export growth with large gains to Central America.



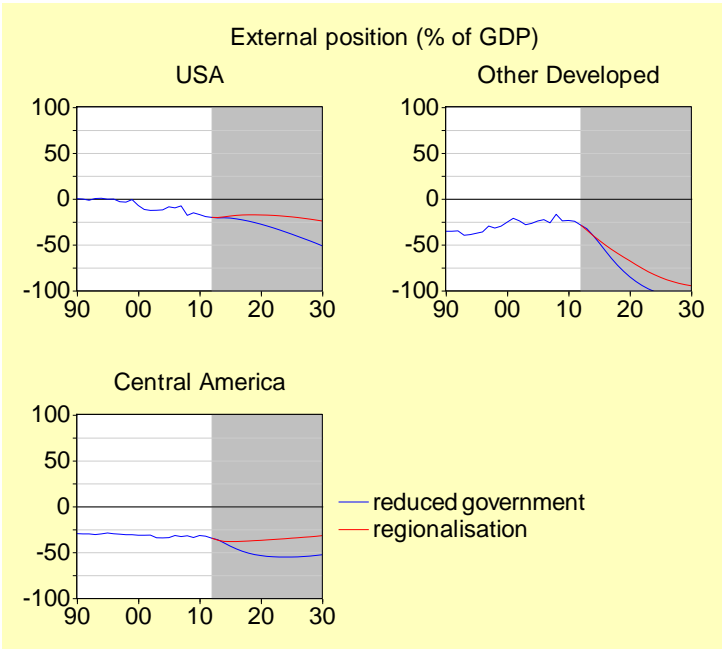
**WP1 revised historical data and scenarios**



There is a also a large increase in investment in partner countries.



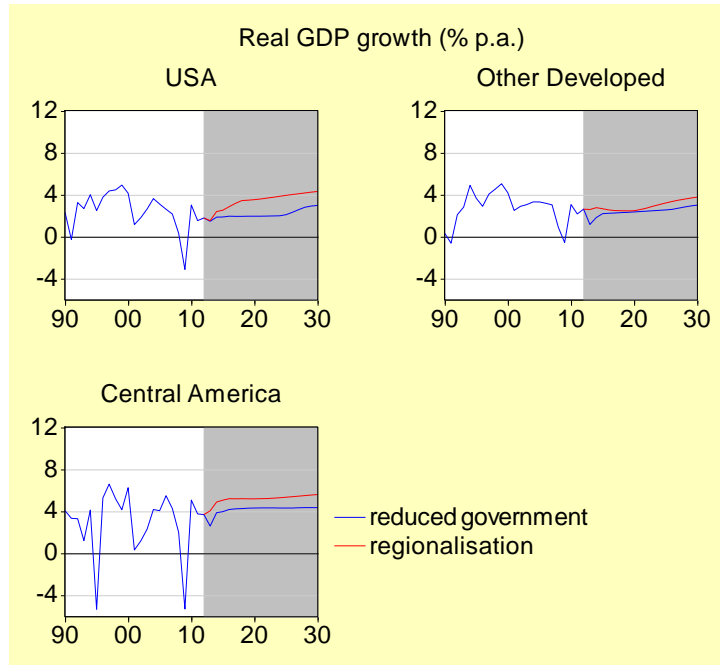
Net liabilities of the US and Central America stabilise at their present level relative to GDP while those of the Other Developed group increase as 20-30% of the investment is financed by net capital inflows.



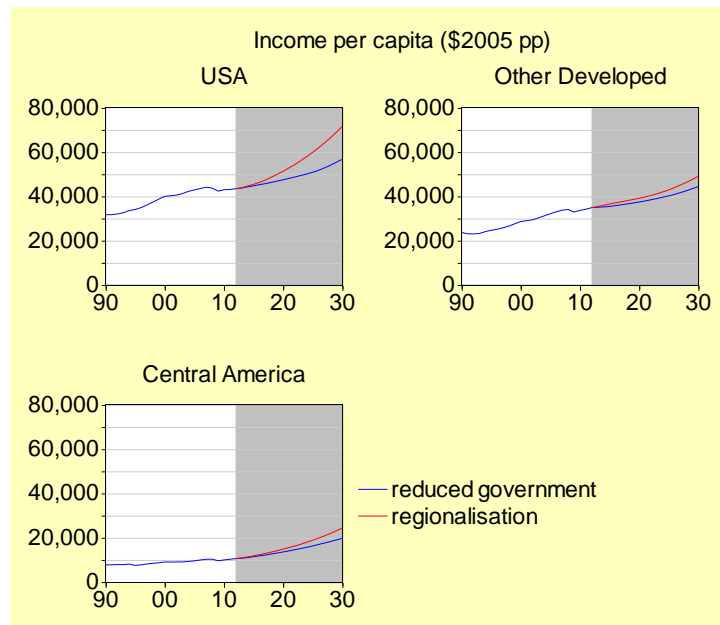
# WP1 revised historical data and scenarios



GDP growth in the US and the Other Developed group picks up to 4% per year while growth in Central America is in the range 5-6% per year.

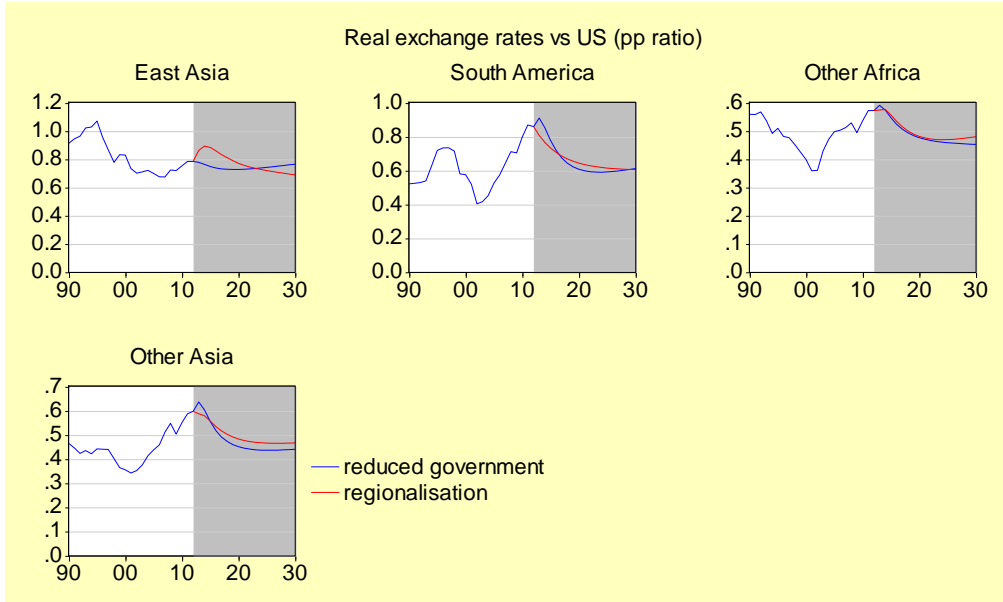


By 2030 per capita income in the US is 13% higher and in partner countries 15-25% higher than in the previous scenario where the US had much less scope for growth policies.

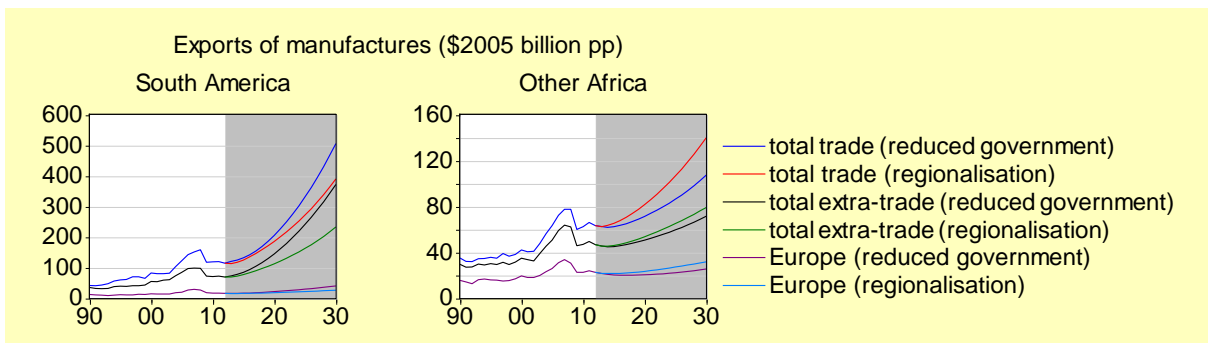
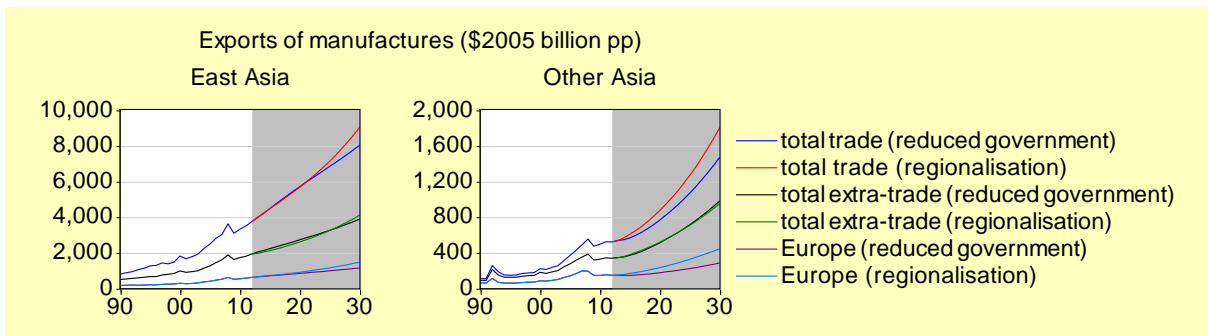


Outlook for rest of world

From the perspective of most of the rest of the world defensive policies in the two large regional groupings centred on the US and Europe do not reduce trade opportunities.



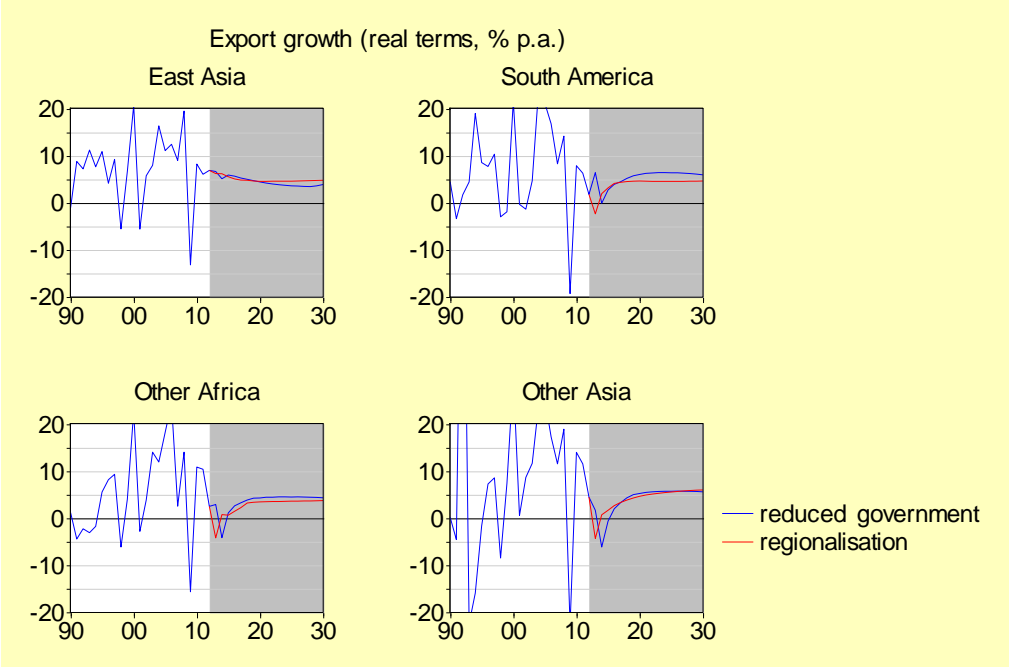
Real exchange rates are little affected and exports of manufactures increase at higher rates than in preceding scenarios. The main exception is South America whose industrial exports to North America are badly affected.



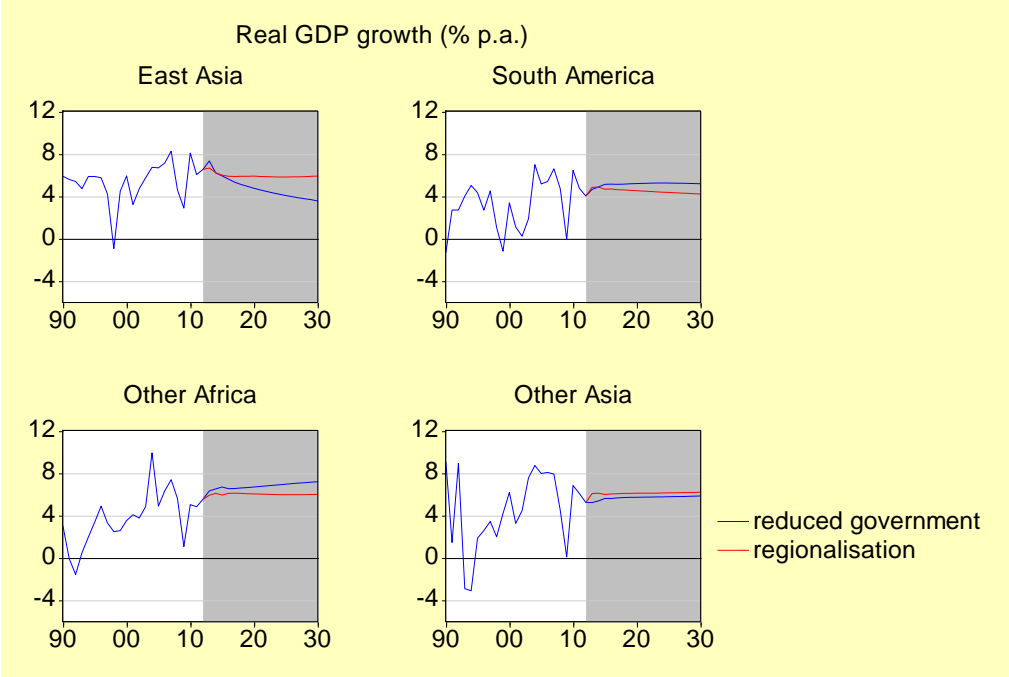
**WP1 revised historical data and scenarios**



Overall export growth reflects this pattern with South America's total exports growing 1.5-2% p.a. slower than in the "Reduced government" scenario.



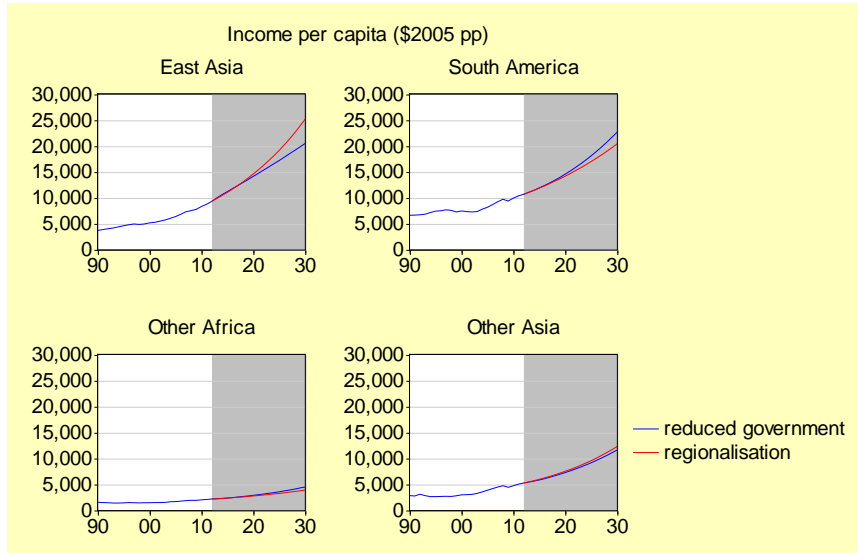
Overall GDP growth in East Asia is maintained at a higher rate than in preceding scenarios as other countries in East Asia benefit from closer integration with China. GDP growth in South America and Other Africa is slower due to protection in Europe and the US. The rest of Asia (CIS, West and South Asia) benefits from European policies favouring neighbouring regions and is able to maintain GDP growth despite protectionism in North America and East Asia.



## WP1 revised historical data and scenarios

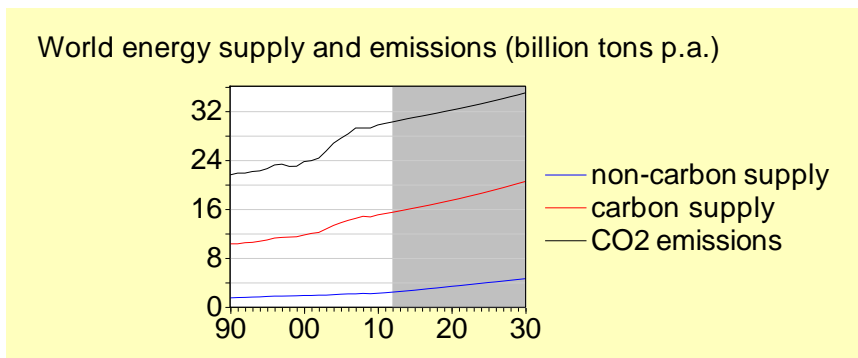


South America and Other Africa suffer some loss of per capita income relative to the "Reduced government" scenario in which South America and Africa benefit from lower protection in the US and Europe. Income per capita in East Asia as a whole increases significantly as intra-region exports grow at the expense of suppliers from outside the region.



## Global energy supply and emissions

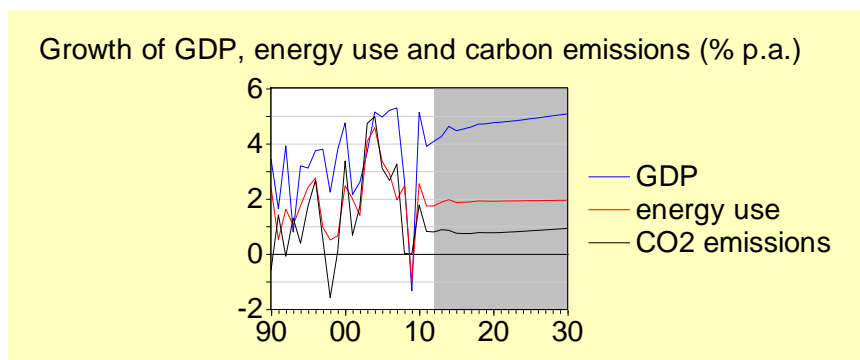
Increased supplies of oil and gas combined with slow growth of non-carbon energy sources imply further increases in global CO<sub>2</sub> emissions from around 30 billion tons per year now to 35 billion tons in 2030.



## WP1 revised historical data and scenarios



With world GDP growth reaching 5% per year, energy use rises 2% per year and CO2 emissions increase by 1% per year.





### Scenario 4 Multipolar collaboration

The final global scenario assumes regional cooperation is complemented by a level of global cooperation that makes it possible for the world as a community to tackle common problems with regard to financial imbalances, energy security and emissions and development of low-income countries.

#### Specific assumptions

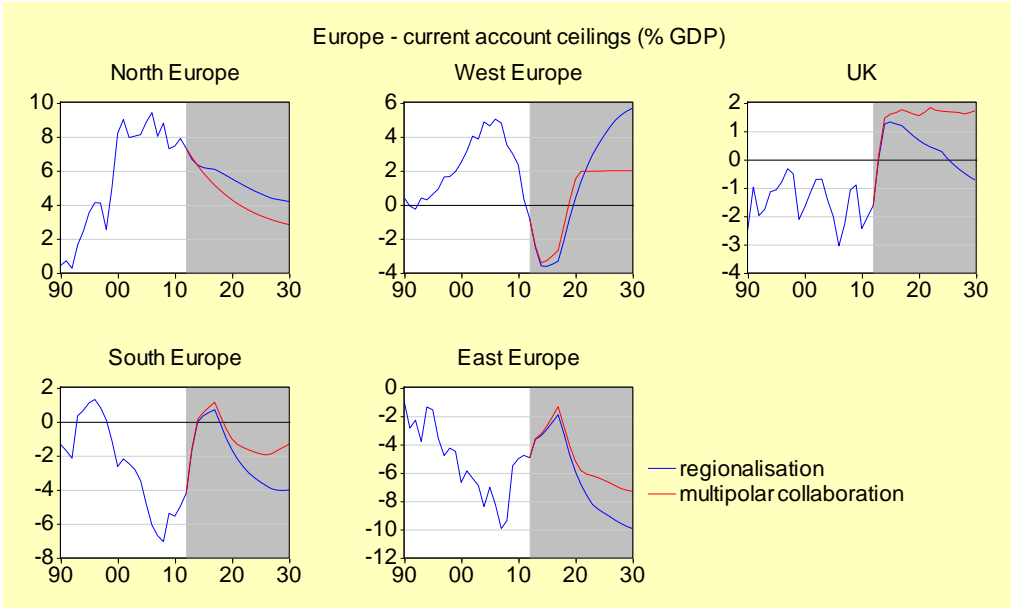
The scenario assumes financial imbalances are reduced by establishing target ceilings on current account surpluses and external positions of Japan and other East Asian high income countries as well as North and West Europe. At the same time all blocs pursue increased energy saving, expansion of non-carbon sources of supply and other improvements to protect the local and global environment, eventually stabilising global CO2 emissions.

Policies to reduce global imbalances include measures to limit surpluses and unbalanced external positions of successful countries on the one hand and measures to assist sustained catch-up by low income countries on the other.

More rapid development of low-income countries is facilitated by multilateral financial support for sustained growth of government services, investment and domestic demand in India and South America and guarantees for low income countries in Africa and South Asia that include a minimum level of exchange reserves to reduce vulnerability to exchange crises and funding for steady expansion of government services and infrastructure.

#### Ceilings on current account surpluses

In Europe, expansion of domestic demand and imports by North and West Europe to bring surpluses down to the target 2% level sustains a current account surplus in the UK, contains South Europe's deficit at around 2% of GDP and substantially reduces the otherwise huge deficit of East Europe.

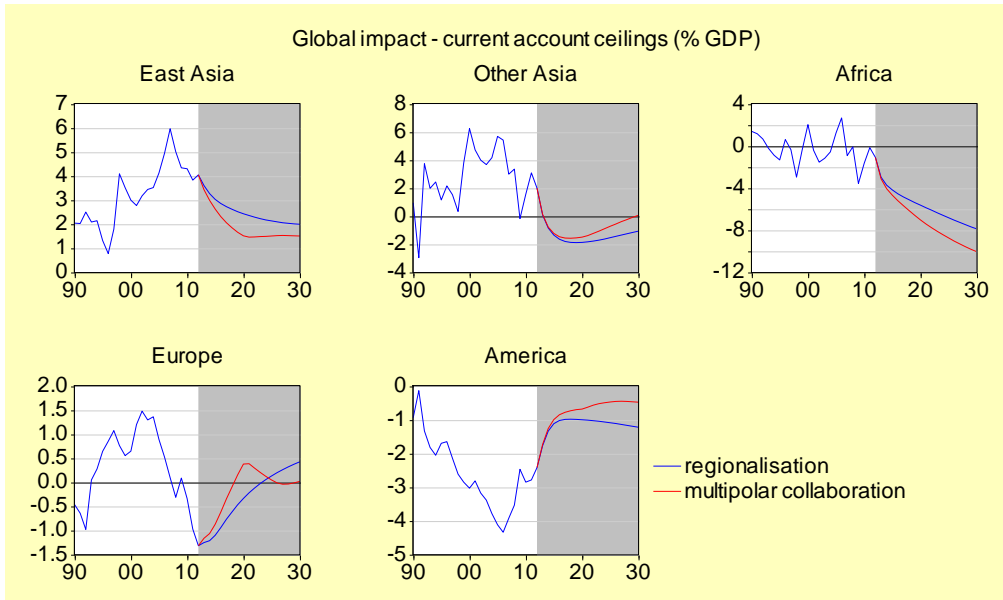




# WP1 revised historical data and scenarios

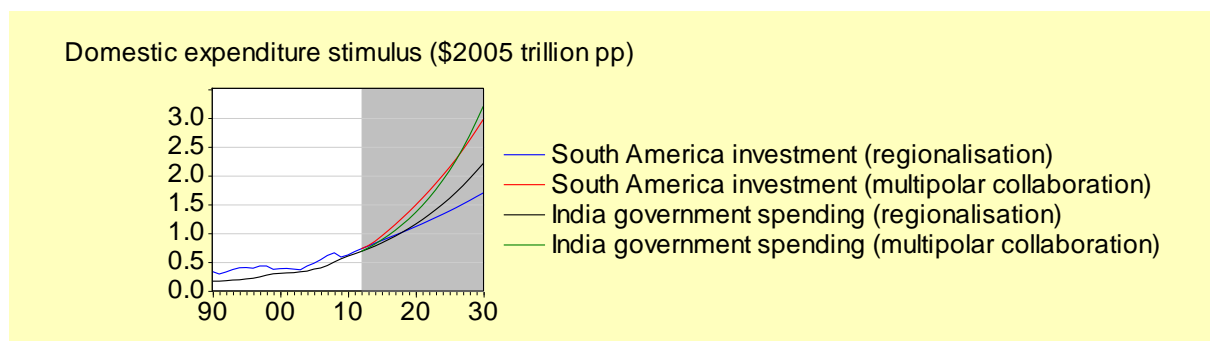


Globally the current account surplus of East Asia is reduced to 2% of GDP and that of Europe remains broadly in balance while deficits of America and Other Asia as a whole reduce to near zero. Africa has increased current account deficits financed by inward investment and multilateral lending.



## Domestic expansion in South America and India

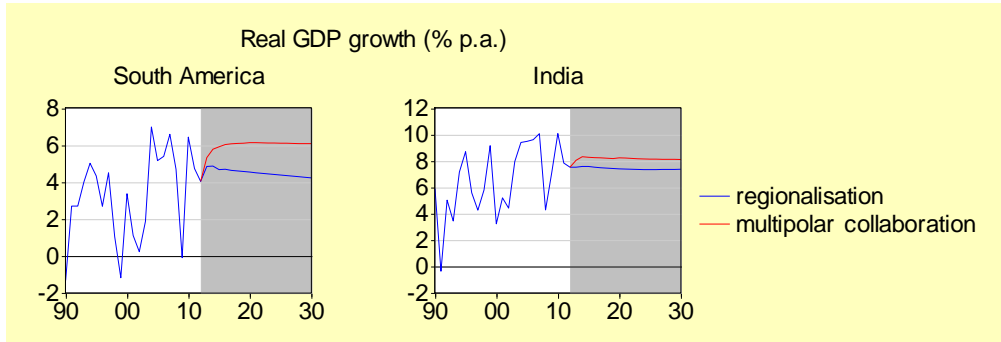
The second new element in this scenario is a reinforced effort by South America and India to maintain a high rate of economic GDP growth despite negative pressures from the formation of protective regional groupings in the North. In the case of South America the main focus is investment which otherwise lags behind while in India it is government services.



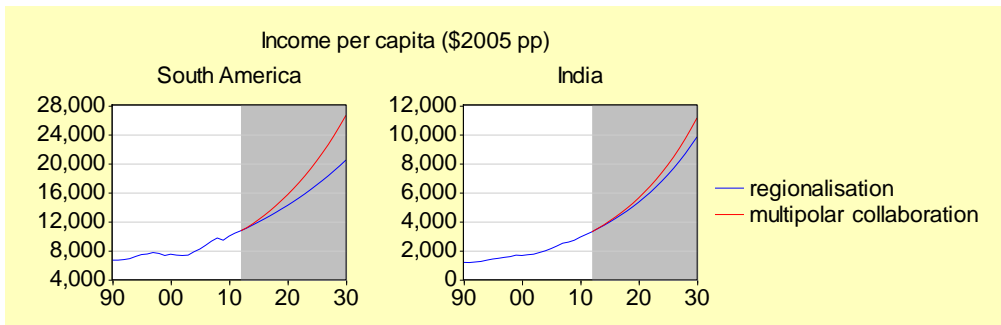
# WP1 revised historical data and scenarios



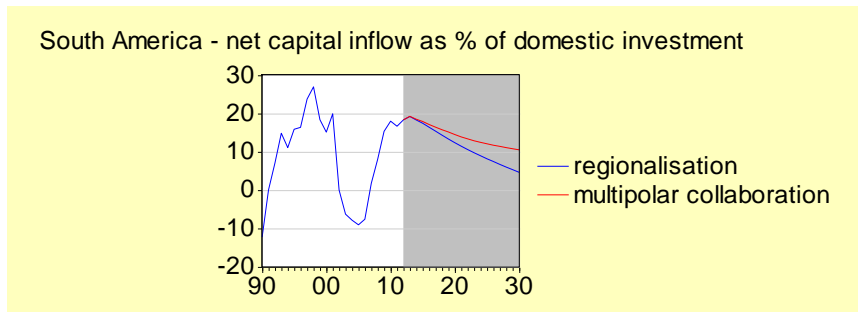
The stimulus to domestic demand sustains a higher GDP growth rate in both blocs, particularly South America.



By 2030 income per capita is much higher, in the case of South America reaching the current level in South Europe and in India's case reaching the current level in South America.



To achieve these results South America has to rely on net capital inflows covering up to 20% of domestic investment. India's trade balance is stronger due to a low level of import dependence and by 2030 the external position is roughly square.

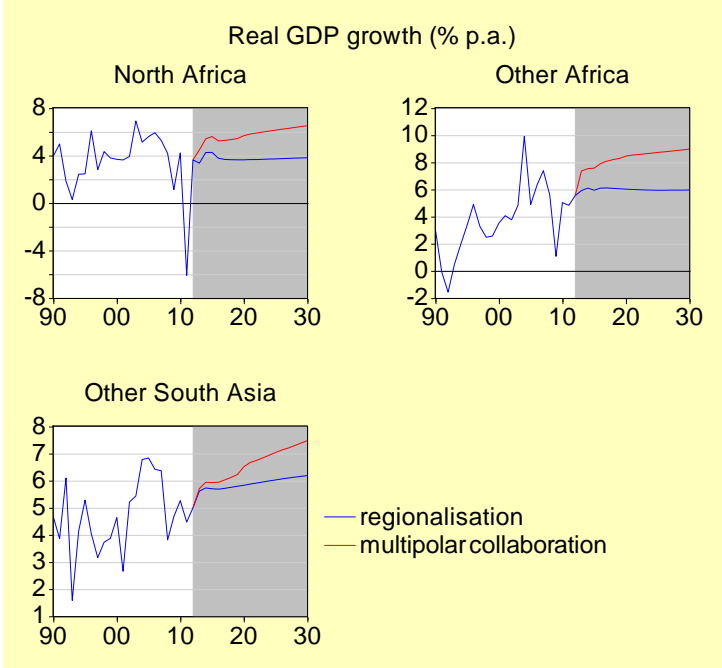




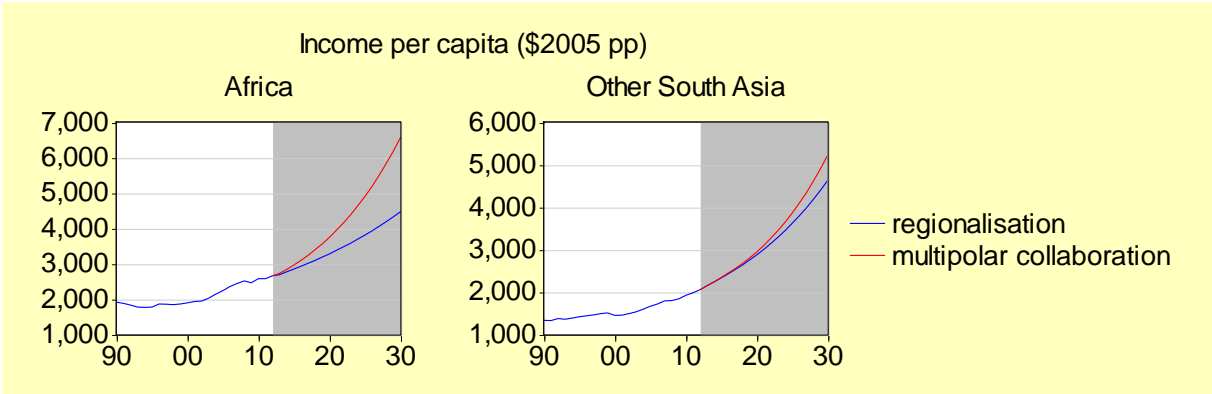
**Support for low income countries**

The third new element in this scenario is a renewed multilateral effort to accelerate economic growth in low income countries in Africa and South Asia. As mentioned above this comprises support for sustained growth of government services and infrastructure and financial assistance to guarantee a minimum level of exchange reserves.

These programs raise GDP growth rates in Africa to 6-9% and in South Asia to more than 7%.

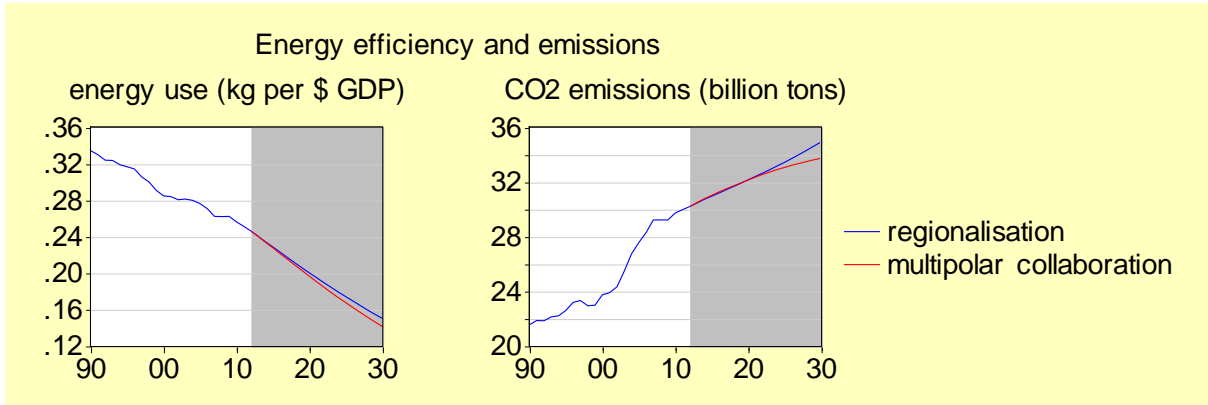


Per capita income increases substantially in both regions although in 2030 the level in South Asia (excluding India) at \$5,000 in 2005 purchasing power remains around one-tenth of the level in Europe.



**Energy security and global emissions**

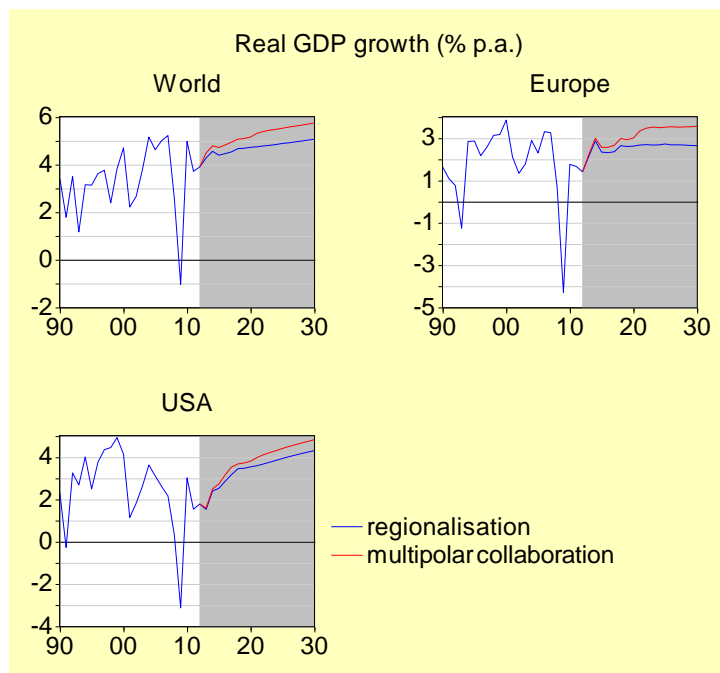
The final element in the scenario is a widespread global effort to improve energy security and reduce emissions by energy saving, investment in non-carbon supplies and other efficiency improvements while maintaining the price of oil at the present level in real terms. Although the growth of energy use is not rapid and non-carbon energy sources make a larger contribution, especially after 2020, this scenario requires a steady increase in fossil fuel supplies at around 1% a year.



Given universal efforts to improve energy efficiency it appears possible to stabilise if not yet reduce global CO2 emissions.

**Global economic growth and growth in Europe and the US**

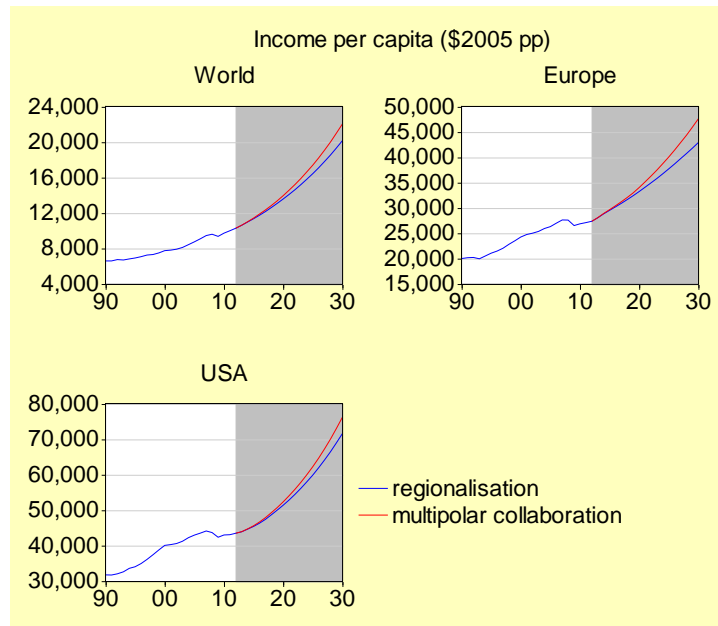
This scenario assumes optimum conditions for economic development resulting in real GDP growth rising to 6% p.a. for the world as a whole, 3.5% in Europe and over 4% p.a. in the US. The consequence is significant improvements in employment rates, especially for women.



## WP1 revised historical data and scenarios



Average per capita income in the world as a whole measured in \$2005 purchasing power units, reaches a level of \$22,000 per person per year, equal to that in South Europe today, while the average in Europe rises to \$45,000, higher than the current level in the US, and by 2030 the average in the US rises to \$75,000 per person per year.





European variants

This section reviews variant scenarios that examine alternative hypotheses for European institutions and policies under two of the global contexts examined above - Reduced government and Regionalisation. The variants explore more radical possibilities for the future evolution of Europe than those assumed in the main global scenarios, ranging from breakup of the Eurozone at one extreme to increased integration and centralisation in what may be termed a Federal Europe on the other.

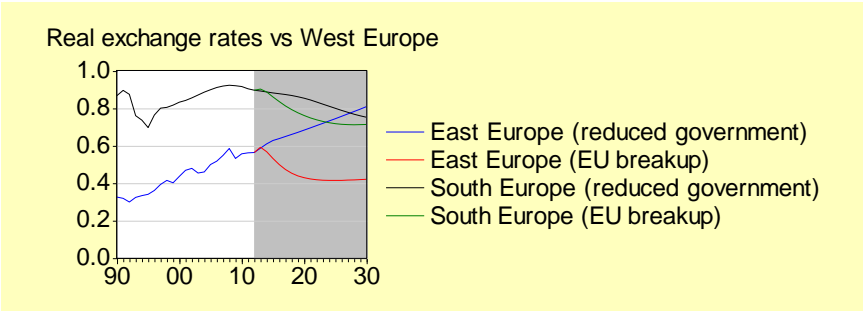
S1A EU breakup

Breakup of the Eurozone is widely forecast as a possible outcome of current political and financial tensions and cracks in the unity of member states of the European Union have recently re-appeared with the UK refusing to participate in proposals to increase centralised financial regulation and control of fiscal policies. The hypothesis of Eurozone breakup is here examined in the global "Reduced government" context as this is the most pessimistic global context from Europe's perspective and the one in which breakup seems most plausible.

The scenario assumes breakup starting in 2013 with some existing members of the Eurozone splitting off and adopting what may be called 'national Euros' while other countries that are due to switch to the Euro, particularly in East Europe, decide to retain existing national currencies and maintain exchange rate flexibility versus the main Eurozone countries in West Europe. In addition to breakup of the common Euro currency, the scenario assumes a significant hiatus in investment and consumer spending within Europe and a reduction in imports from within and outside Europe together with intensified financial constraints on government and domestic financial institutions.

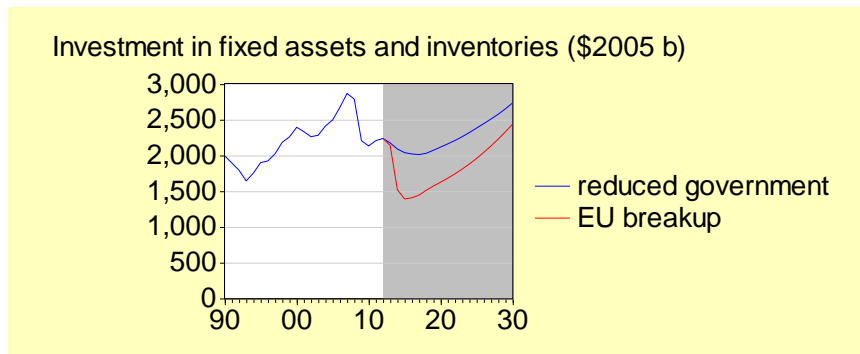
Fragmentation of the Euro currency area

Cancellation of adoption of the Euro by new members and departure of some existing members would effectively make Europe once again a multi-currency system. Model-based simulation of the consequences of breakup shows a moderate fall in relative costs in South Europe and a much larger parting of the ways for East Europe where relative costs have hitherto been rising from a very low level in the early 1990s and where adoption of the Euro combined with ongoing domestic inflation would otherwise be expected to push up relative costs to around the same level as South Europe by the late 2020s. As will be seen further below, the restoration of a very low cost level in East Europe could potentially have important consequences not only for East Europe itself but also for industrial competitors in other parts of Europe and the rest of the world including North America and East Asia.

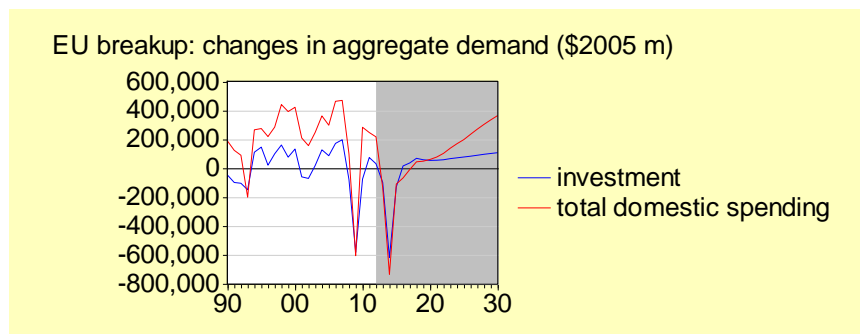


*Loss of confidence on the part of investors and consumers*

Aggregate demand within Europe is seriously depressed by loss of confidence on the part of corporates forced to re-evaluate existing business plans which would inevitably delay investments in Europe and in the global context encourage relocation of a proportion of new projects to other parts of the world.

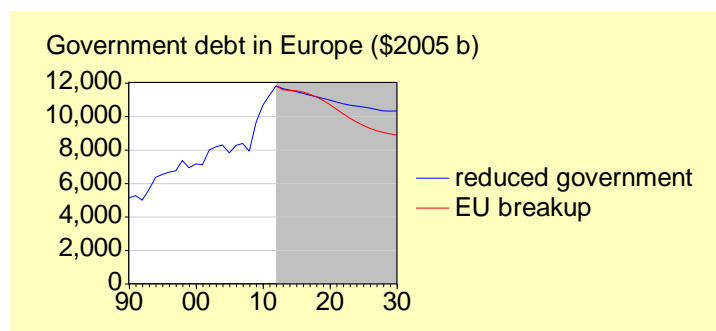


A major reduction in investment spending would in turn trigger reductions in inventories, imports and employment with adverse consequences for household income and government revenues. The reduction in aggregate demand following EU breakup may be somewhat more severe than the recent collapse in 2009 and much more severe than the recession in the early 1990s.



*Financial constraints on government and domestic financial institutions*

Fragmentation of the Eurozone and renewed recession in Europe will weaken domestic financial institutions and intensify pressures on government to reduce spending and outstanding debt as well as aggravating reductions in inventories and investment by businesses and households.



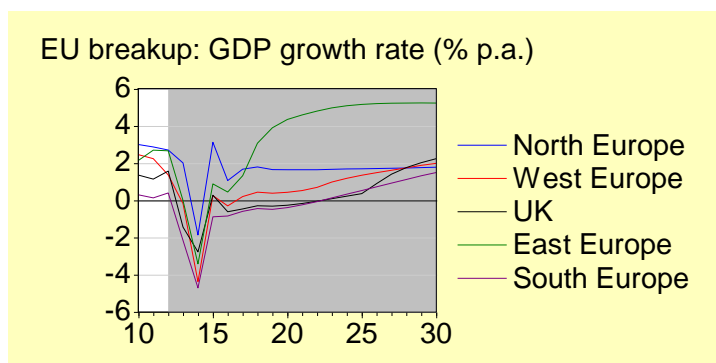
## WP1 revised historical data and scenarios



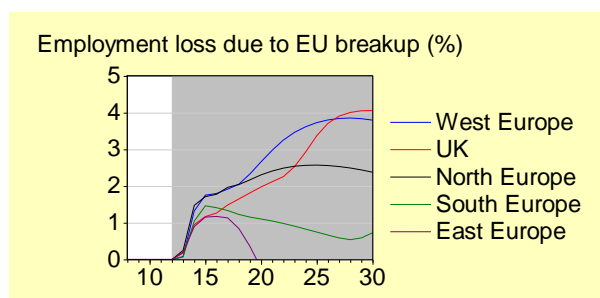
Since European governments are already under considerable pressure to reduce spending and deficits, it is unlikely that they could do much more in the short run but the breakup context will oblige them to be more cautious and adopt lower target ceilings for debt to GDP ratios in the longer term.

### *GDP and employment in Europe*

Recovery from recession of domestic demand following EU breakup will come sooner or later depending on the underlying strength of the economy in each part of Europe.



North Europe should be least affected and may experience rapid recovery to achieve a stable long-term real GDP growth rate averaging 2% p.a. East Europe, if it abandons adoption of the Euro and devalues national currencies, could potentially take advantage of Eurozone breakup to attract investment from other parts of Europe and maintain rapid growth of exports similar to that which occurred in the past. West Europe would be more severely affected by internal recession and reduced competitiveness relative to East Europe but should at least emerge from recession and achieve a positive growth rate after two or three years. The recession may be much longer drawn out in the UK and South Europe where a substantial reduction in relative costs is less likely to be achieved than in East Europe and where prospects for recovery are uncertain with or without Eurozone breakup.

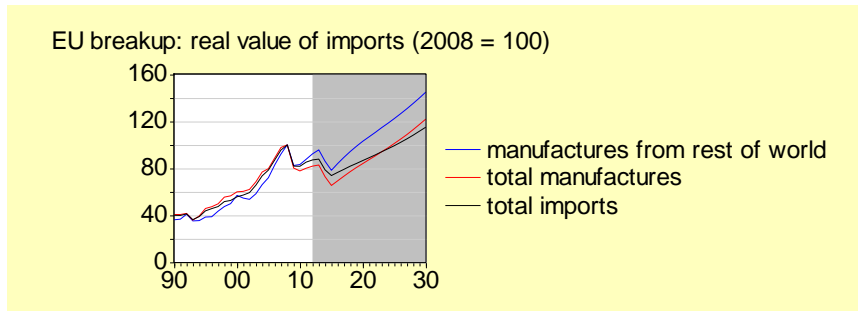


The long-term impact of EU breakup on employment would be more severe in the UK and West Europe where productivity growth is likely to remain positive than in South Europe where aggregate output per employed person has already fallen substantially since 2008 and is likely to fall again in the context of continuing recession with pressure from abundant supplies of low-cost labour. East Europe on the other hand could recover from adverse employment impacts by 2020 and thereafter may gain more jobs than will be possible if East European governments maintain conservative financial policies and adopt the Euro as a common currency.

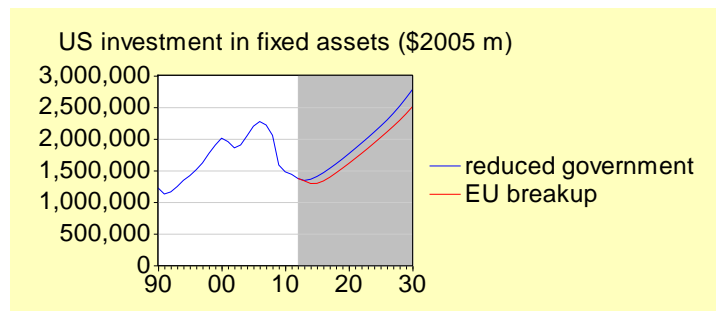


*Impact on the rest of the world*

EU breakup is bound to impact other parts of the world due to contraction of European imports.

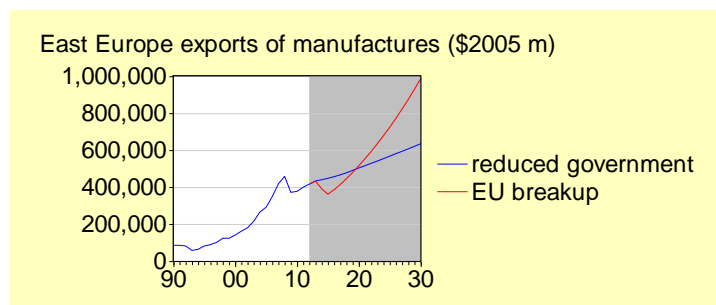


The impact may be more severe for the US, causing a significant reduction in investment in the USA itself, due to the heavy involvement of financial institutions and industrial corporations operating across the North Atlantic in European markets.



*Potential emergence of East Europe as a low-cost manufacturing exporter*

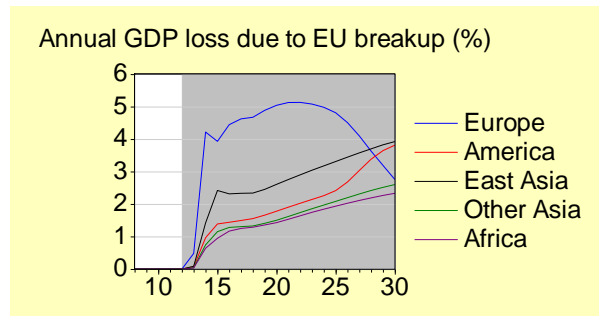
At the same time, as European markets eventually start to recover, East Europe, freed from Eurozone constraints, could emerge on the European and world stage as a competitive, low cost exporter capable of taking significant market shares away from China and other global suppliers



## WP1 revised historical data and scenarios



In this instance North America and East Asia will pay a double penalty: first loss of exports due to the European recession and second, loss of market shares in Europe and other parts of the world due to the emergence of stronger, low-cost European competition.



Therefore the longer-term outcome could be that GDP losses attributable to EU breakup are larger in other world regions than in Europe itself. With flexible exchange rates and low-cost production centres in South and East Europe as well as strong technology development in West and North Europe it is possible that, freed from the constraints of the Eurozone, the European economy as a whole could become a stronger competitor in world markets and achieve higher levels of GDP than in the case where the Eurozone is maintained in its current form. This theme will be examined further below in the final scenario presented here - "Multi-speed Europe".



### S3A Federal Europe

The second variant for the evolution of European institutions and policies considered in this paper is "Federal Europe". A much expanded federal level of government may be regarded as an alternative to EU breakup in the global context of "Reduced government". Here the hypothesis of Federal Europe is examined in a more optimistic or supportive global context as a variant of the "Regionalisation" scenario which assumes increased centralisation and policy coordination at the regional level in other parts of the world. The "Regionalisation" context is supportive of Federal Europe since it allows a greater role for government with faster growth of GDP and internal trade in each world region, providing an explicit rationale for the adoption of similar policies in Europe.

The Federal Europe hypothesis is of particular interest if it is considered as a pre-condition for implementation of more decisive financial and macro-economic policies at the European level. Not only would a federal system permit faster and more systematic responses to the changing global context but also, as the federal budget is enlarged, could provide policy-makers with better opportunities for dealing with specific problems in individual member states, industries and localities. It is arguable that European policies assumed in the main "Regionalisation" scenario reviewed in the preceding section of this report could only be implemented convincingly in the context of a more centralised European system with a large federal budget.

Here we assume the same policies as in the main "Regionalisation" scenario with progressive introduction of a large federal budget in Europe requiring revenue of up to 15% of the combined GDP of member states by 2020.<sup>7</sup> A similar budget arrangement was assumed in the main scenario but total revenue was limited to 5% of GDP meaning that financial impacts were small. It must be stressed that differences between results under the Federal Europe scenario and those in the main scenario are exclusively attributable to the financial impact of the very much higher level of contributions to and receipts from the federal budget in each part of Europe. Although a large federal budget may in practice have major effects on European policies, such feedbacks are deliberately excluded here in order to focus attention on the financial impact.

The distribution of revenue burdens and expenditures under a federal budget system evidently depends on the bases on which federal taxes are assessed and criteria for allocation of expenditure. This exercise assumes two sources of revenue - VAT and carbon tax - and five types of expenditure which are respectively population-related (per capita), focussed on children and the elderly (dependents), subsidies for job creation in areas of low employment (employment support), interest subsidies for highly-indebted member states (debt relief) and subsidies for expenditure on government services (service standards). Detailed assumptions about budget contributions and payouts are set out in Appendix C.

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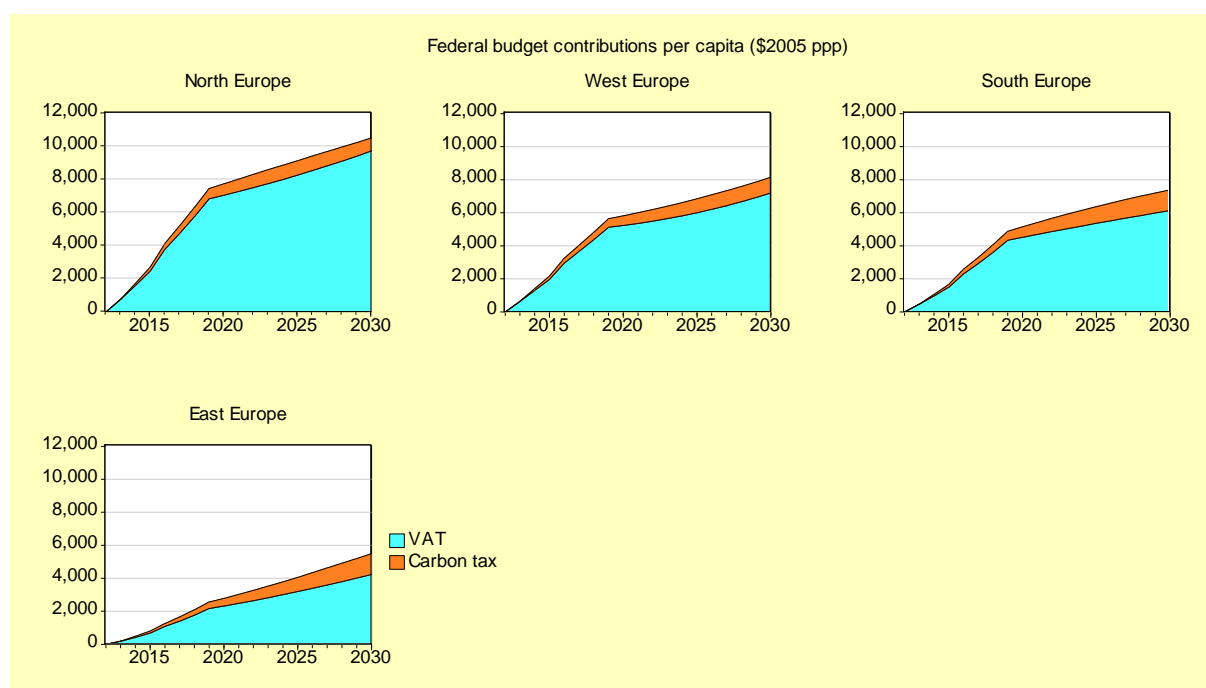
<sup>7</sup> Excluding the UK but, given the structure of the model, including other European countries that are not yet members of the EU.

**Table 1 Components of the federal European budget**

Category	Heading	Maximum share of budget (%) <sup>1</sup>	2020 budget estimate (\$2005 billion)	% of European GDP
Revenue	VAT	80	2,082	12.0
	Carbon tax	20	274	1.6
	Total		2,355	13.6
Expenditure	Per capita	30	781	4.5
	Dependents	50	1,301	7.5
	Employment support	20	96	0.6
	Debt relief	20	180	1.0
	Service standards	20	134	0.8
	Total		2,492	14.4
Surplus (+) or deficit (-)			-136	-0.8

<sup>1</sup> The figures shown are maxima. Expenditure and revenue will not balance on a year by year basis as needs and resources are assumed to be conditional on current circumstances in each member state. Carbon tax contributions are conditional on levels of emissions while expenditures on employment, debt relief and service standards are conditional on employment rates, levels of government debt and resources available for government services. In general the budget will be in deficit when many member states are unable to achieve threshold standards and require assistance from the federal level and may be in surplus if most member states are able to achieve threshold standards.

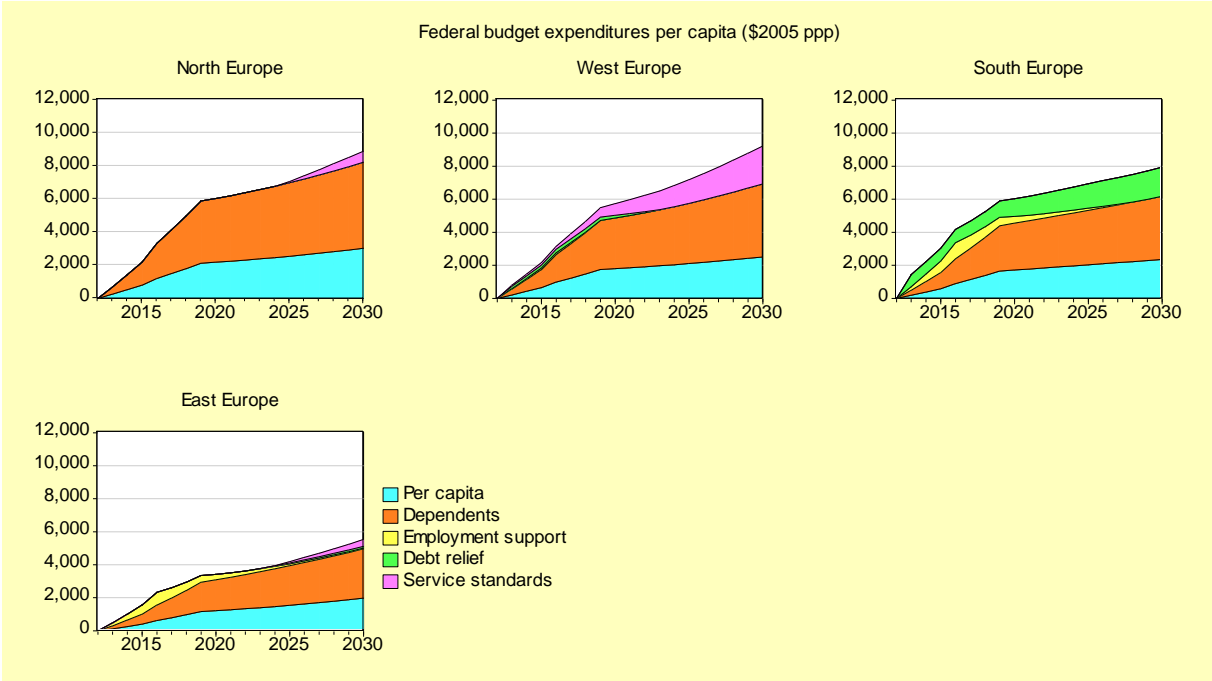
Looking first at the distribution of contributions (revenue), the VAT element in each region of Europe reflects the level of consumer spending per capita and is therefore much higher in North and West Europe than in East Europe although it is roughly equal in all regions as a share of GDP. The carbon tax element increases gradually and is more nearly equal per capita but makes only a small contribution as the tax rate is assumed to be capped at \$400 per ton of CO<sub>2</sub>.



**WP1 revised historical data and scenarios**



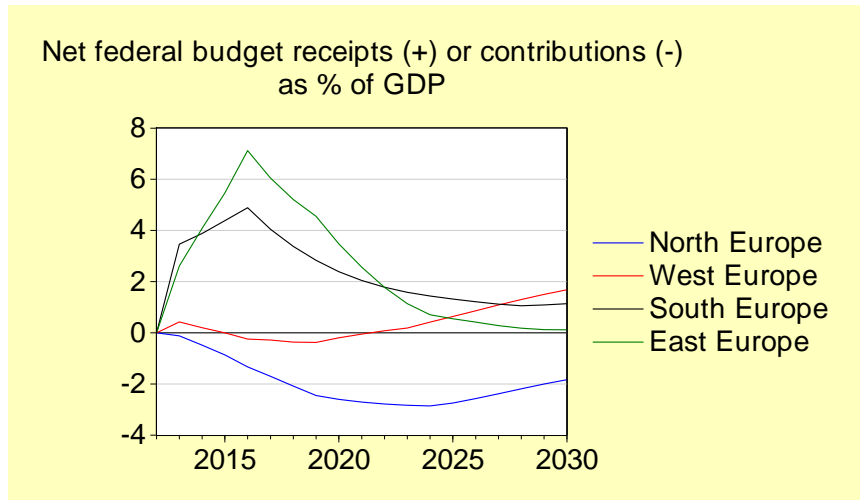
In 2030 total expenditure (receipts) ranges from \$5,500 per person (2005 ppp) in East Europe to \$9,200 in West Europe. Expenditures allocated on a per capita basis are around \$2,000 and differ only because of variations in price levels in different regions. Expenditures related to dependents (children and the elderly) are higher in North and West Europe where working-age people form a lower proportion of total population. Other expenditures are much more variable as they are conditional on specific performance indicators in each region. Employment support is significant in South and East Europe in the period up to 2020 but fades thereafter as target employment rates are achieved. Debt relief is significant in South Europe throughout the period to 2030. Expenditure allocations to support service standards (health, education, administration etc.) become more important in West Europe and to a lesser extent North and East Europe in the 2020's as government budgets lag behind increases in per capita income implying pressure on service standards due to rising expectations and costs of delivery.



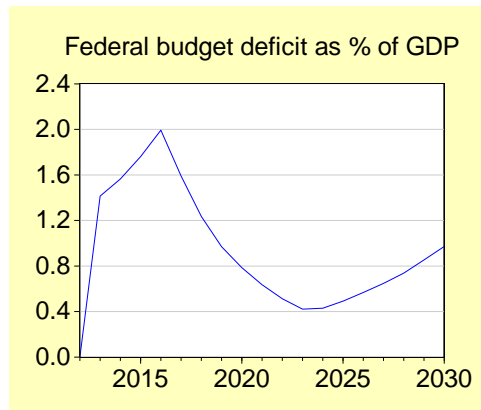
## WP1 revised historical data and scenarios



The criteria and allocations under different revenue and expenditure headings combine to determine net receipts (+) or contributions (-) of each region. The main net contributor is North Europe but the total value of net contributions from North Europe is small as the population is quite low. The main net beneficiary is South Europe. East Europe has substantial net receipts in the period to 2020 but in the 2020s the situation in East Europe improves sufficiently to reduce East Europe's net receipts to a very low level.



Combining the outcome for different parts of Europe it emerges that the federal budget remains in deficit overall throughout the period to 2030 with the deficit remaining below 1 % of European GDP in the 2020s.

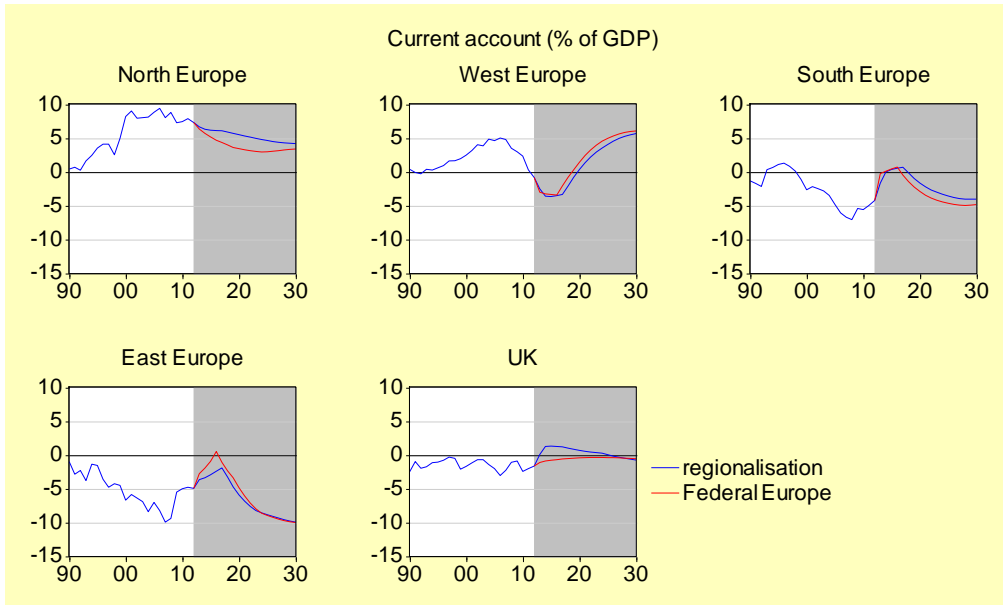


# WP1 revised historical data and scenarios

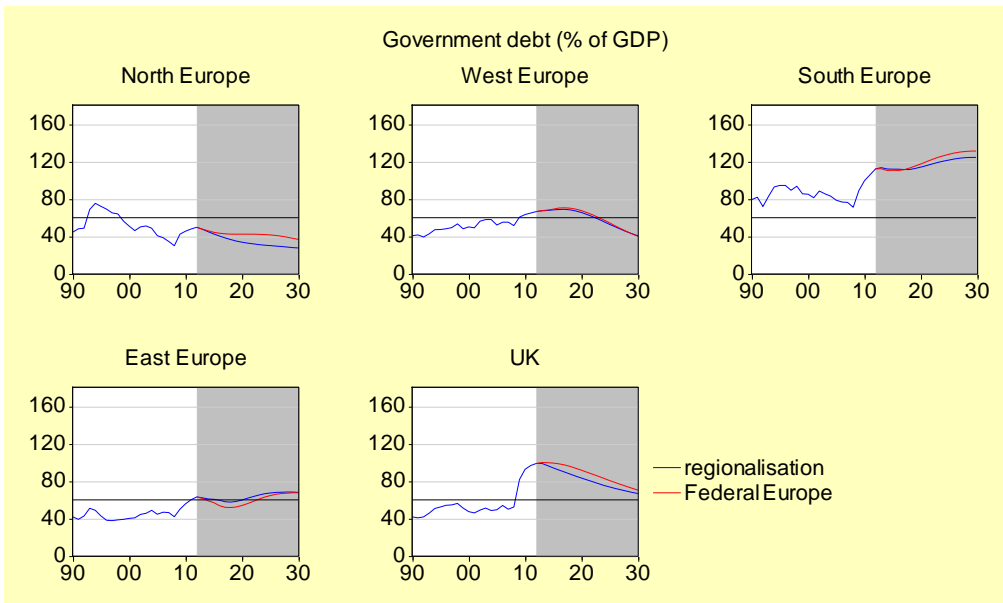


## Economic and financial impacts in Europe

The federal budget has a relatively minor impact on the current account surplus or deficit in each part of Europe.



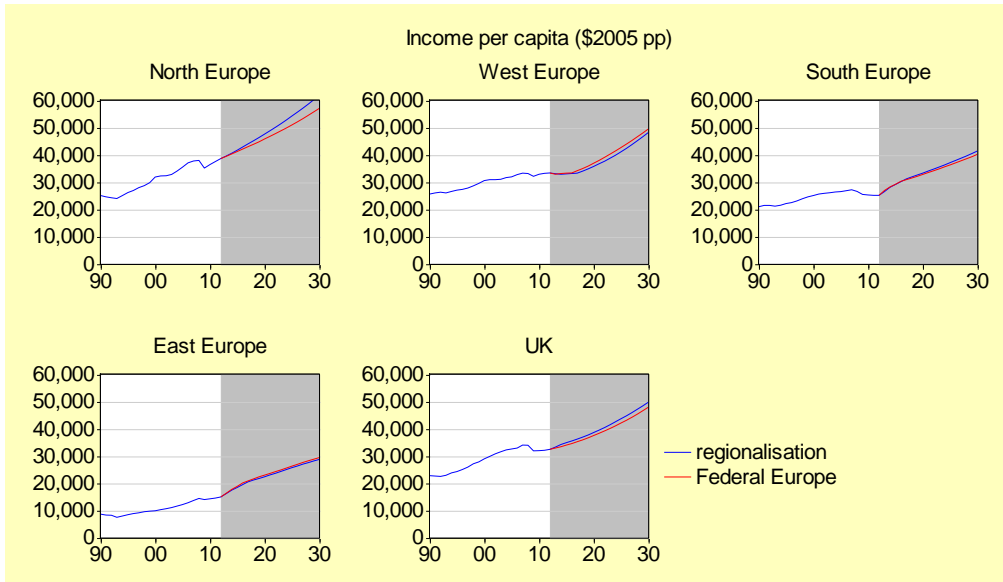
The impact on government debt to GDP ratios is also quite small as national budgets adjust in response to federal transfers and GDP reduces or increases.



# WP1 revised historical data and scenarios

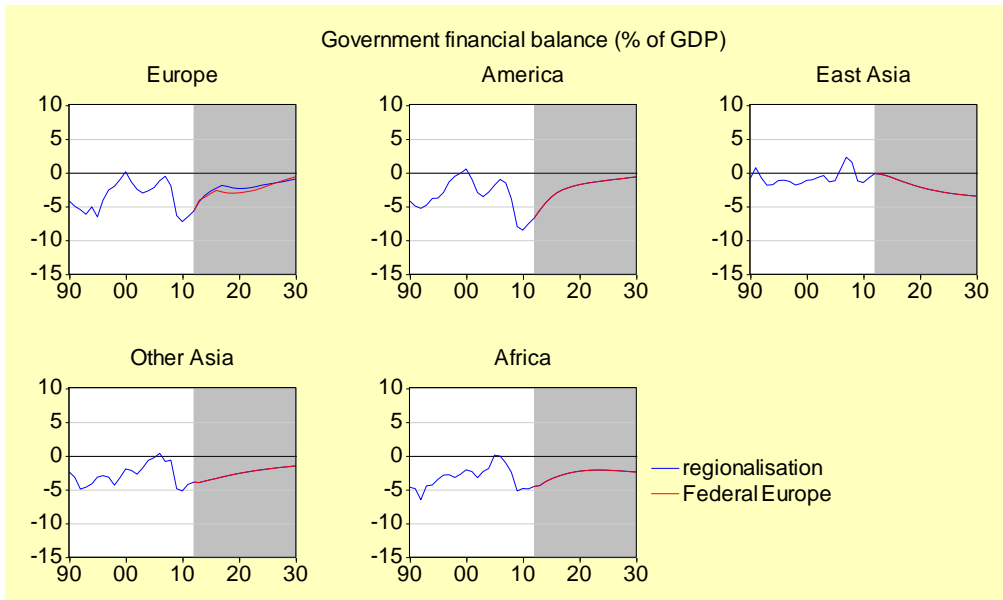


The impact on income per capita of financial transfers generated by the federal budget is again modest. By 2030 East and West Europe have gained around 2.5% by 2030, South Europe loses 3%, the UK 4% and North Europe 8% as compared with the main "Regionalisation" scenario which assumes a federal budget capped at 5% of GDP.



## Global impact

Unsurprisingly, expansion of the federal budget system in Europe has virtually no impact on financial and economic indicators in other parts of the world.



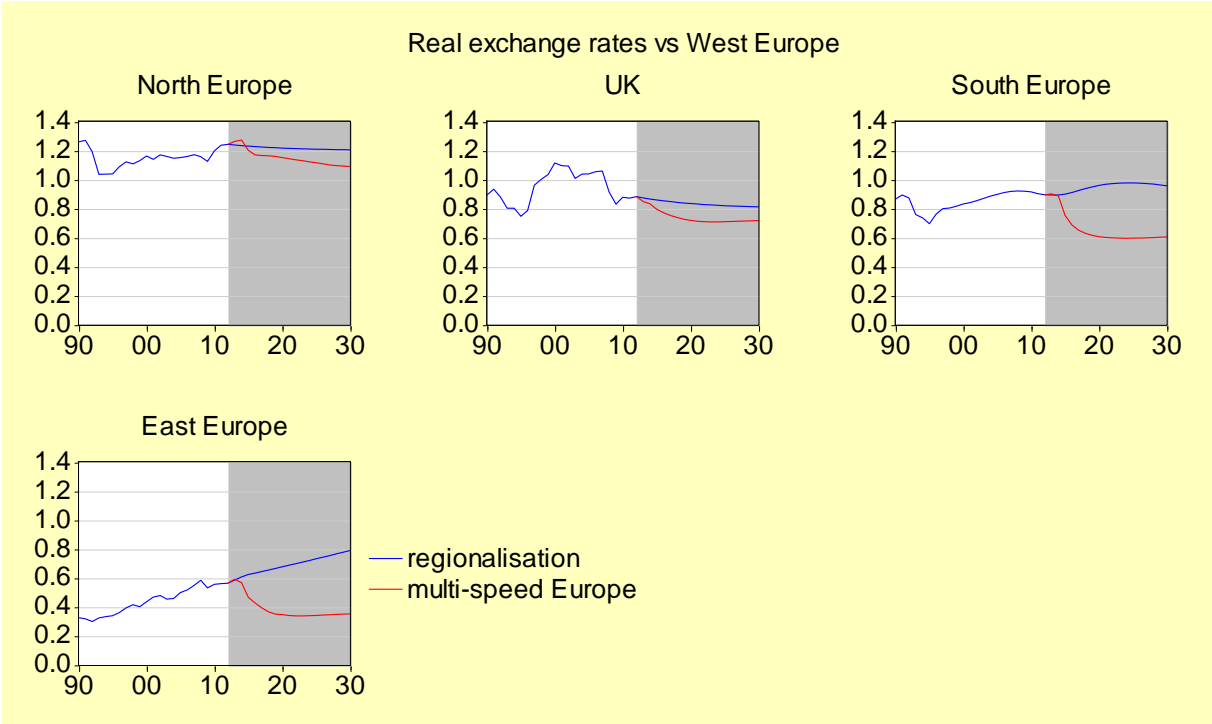




**S3B Multi-speed Europe**

This variant scenario considers the potential impact of a looser European financial system in which individual countries or country groups retain independent currencies. In particular East European countries do not adopt the Euro and the main South European countries leave the Eurozone, adopting 'national' Euro's with flexible rates of exchange against the original Euro which is assumed to remain the benchmark currency for Europe as a whole and to continue in use as a local currency in Germany and other core West European countries. There is no federal budget but other European policies are coordinated in a manner similar to the main "Regionalisation" scenario. Individual countries or groups of countries in different parts of Europe coordinate macro-economic policies in a flexible manner retaining some degree of common support for highly-indebted Southern European countries and continuing to provide investment and trade privileges to neighbouring regions although on a smaller scale than in the main "Regionalisation" scenario and the "Federal Europe" variant.

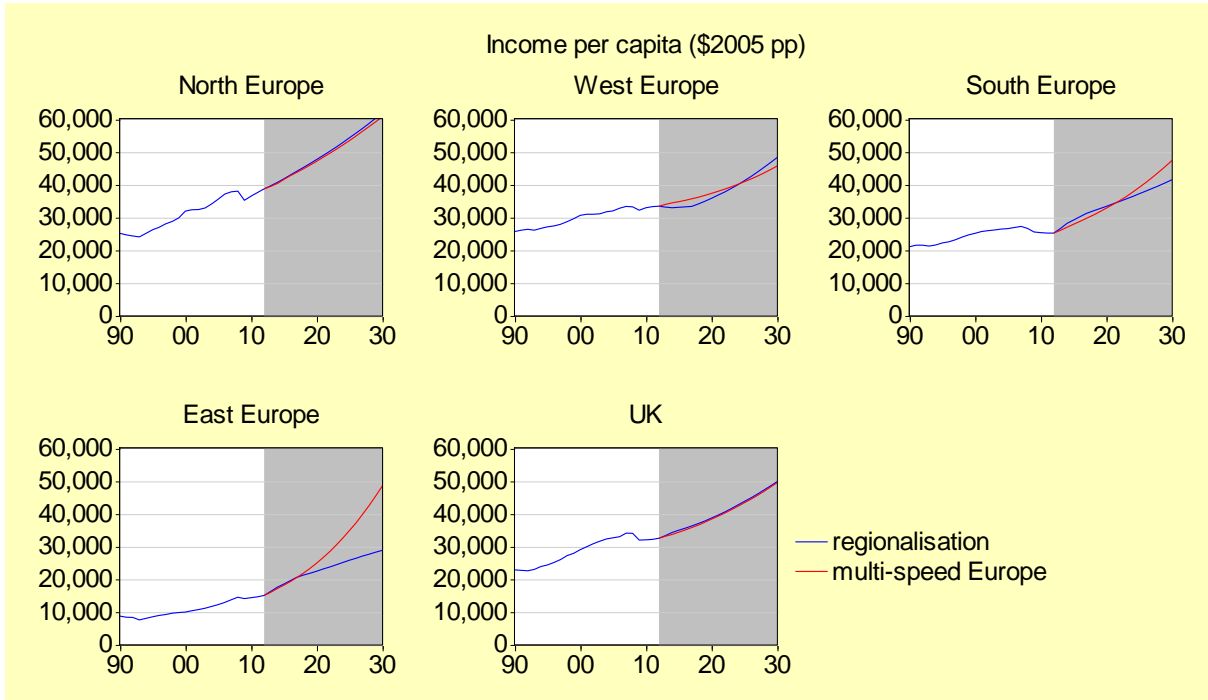
It is assumed that South Europe will undertake substantial nominal devaluation over a period of several years in order to bring relative costs down to a level at which exports are substantially more competitive in European markets and other parts of the world. East Europe implements a similar pattern of devaluation aimed at generating export-led GDP growth at a rate sufficient to achieve convergence of per capita income with other parts of Europe by 2030. West Europe's real exchange rate versus other parts of the world does not rise significantly as financial markets grasp the potential impact of increased competition from countries in South and East Europe which significantly reduces growth of West Europe's exports.



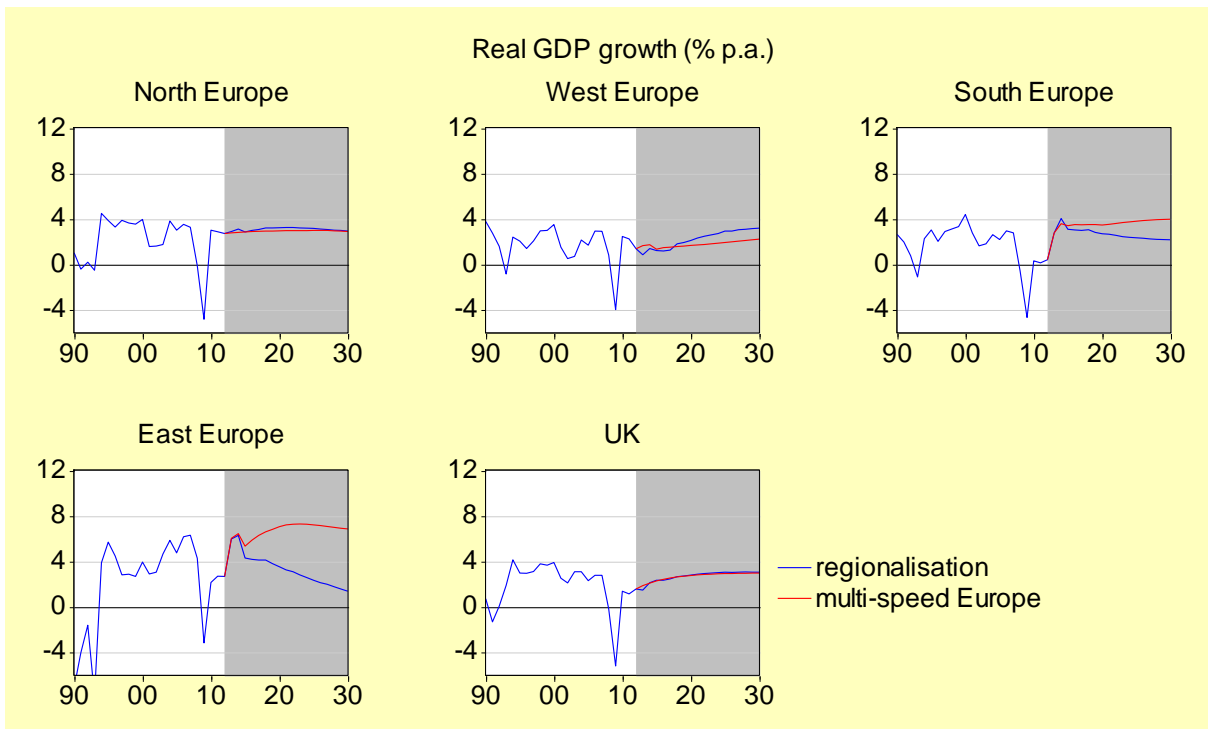
# WP1 revised historical data and scenarios



This scenario comes close to convergence in terms of income levels as the UK, West, South and East Europe reach around \$50,000 (2005 ppp) per capita by 2030 while North Europe reaches \$60,000.



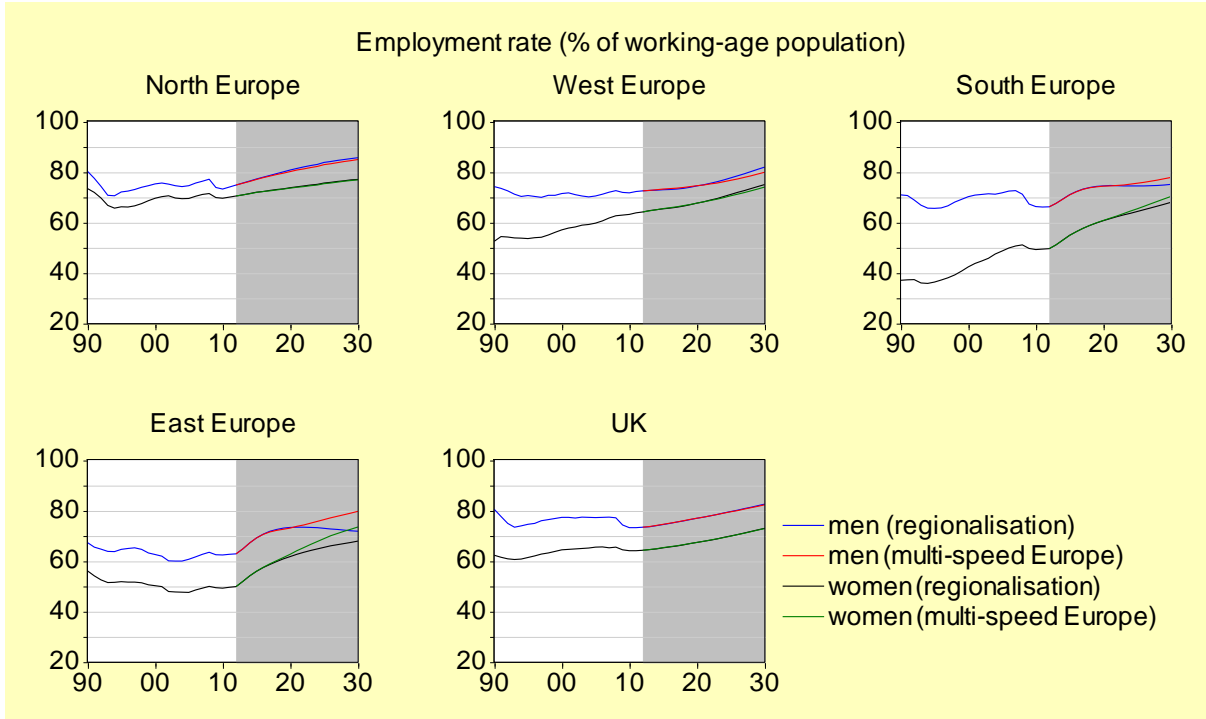
West Europe's GDP growth is somewhat slower than in the main scenario due to competition from South and East Europe where GDP growth is much faster due to real exchange rate devaluation.



# WP1 revised historical data and scenarios

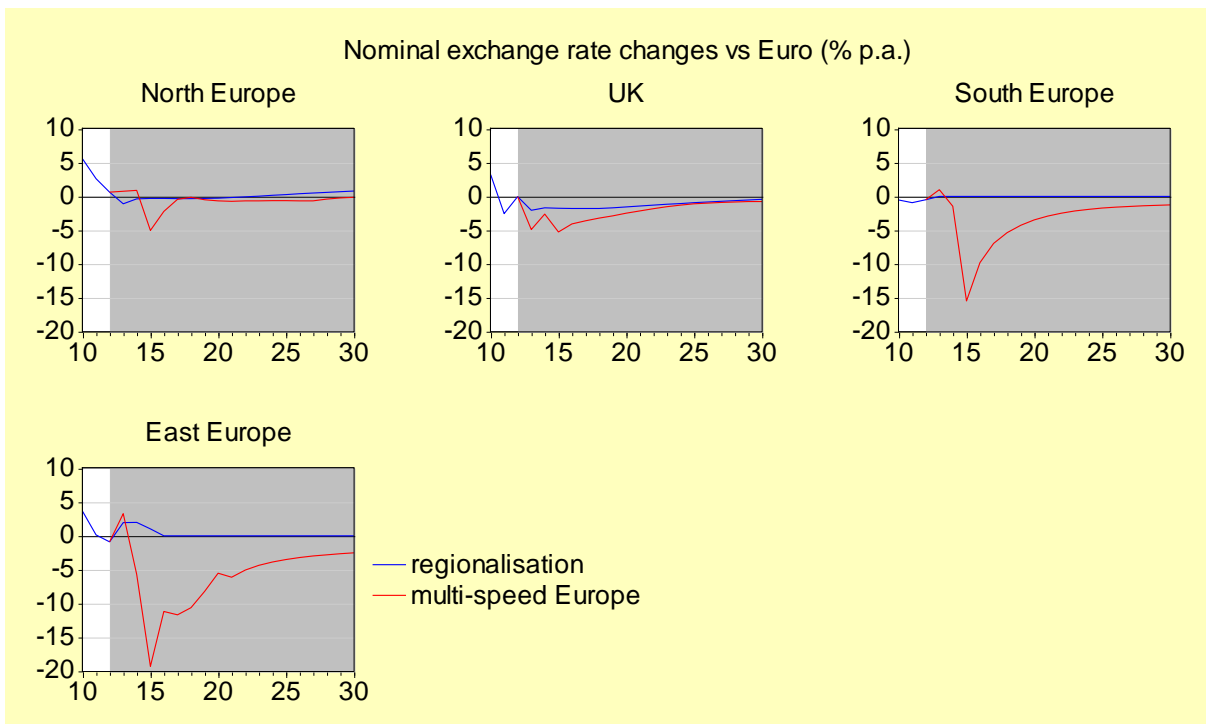


Employment rates in South and East Europe improve correspondingly without significant losses in other regions.



East and South Europe continue to attract net immigration although not at a very high rate.

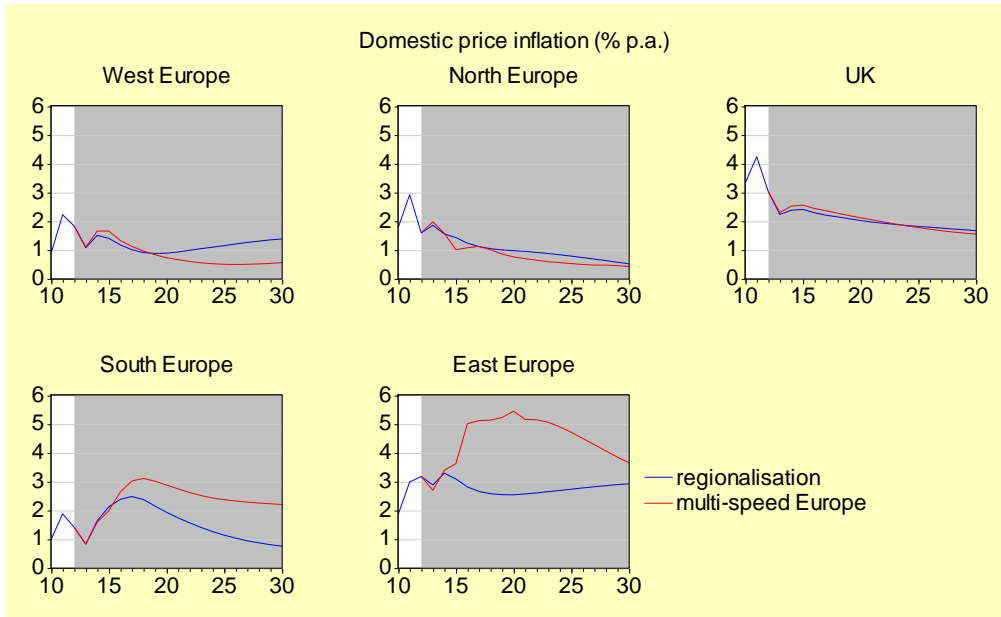
Given that quite large nominal devaluations are implied in East and South Europe, there will be some inflationary feedback.



# WP1 revised historical data and scenarios

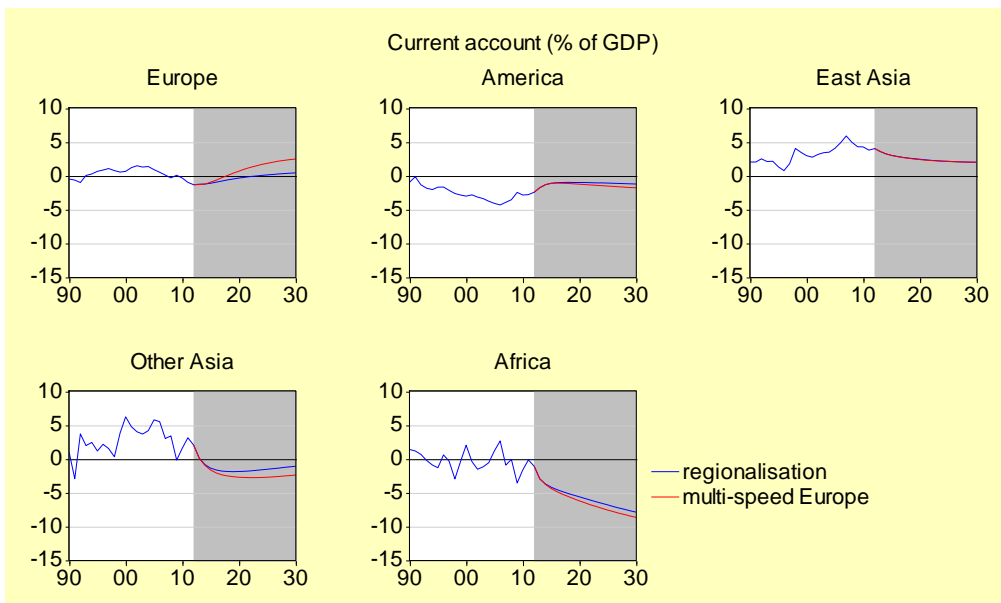


The inflation feedback is considerably smaller than it might have been two or three decades ago when energy and raw material prices fixed in world markets constituted an important component of domestic costs. In the case of South Europe, the substantial nominal devaluation is estimated to boost domestic price inflation by around 1.5% p.a., continuing in the long run. The estimated inflation impact in East Europe is more substantial (3% p.a.) but gradually reduces after 2020.



## Impact on other world regions

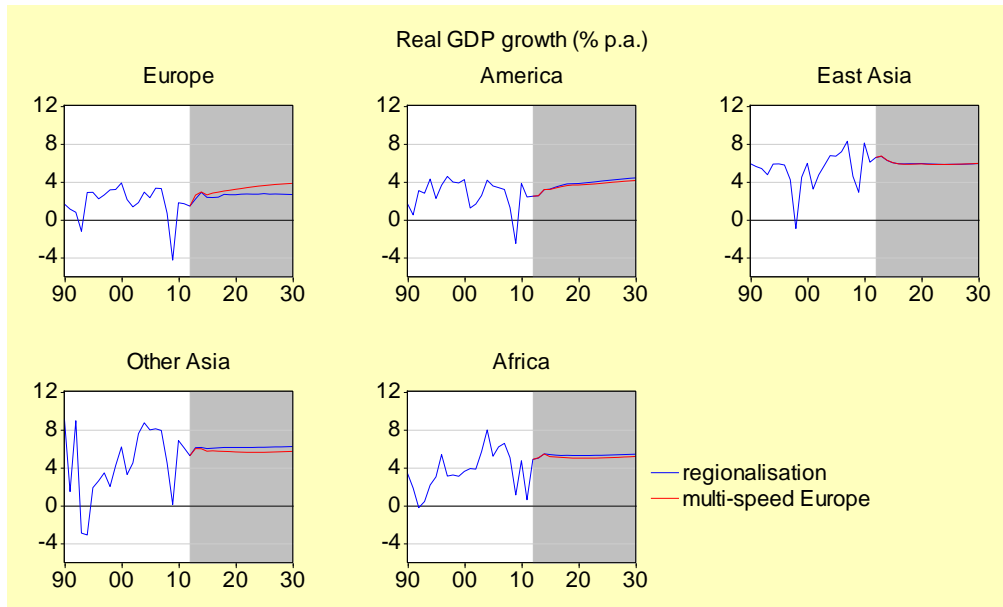
Europe's current account moves into surplus implying some weakening of current accounts of other blocs - in particular Other Asia.



## WP1 revised historical data and scenarios



This is reflected in small reductions in GDP growth in other regions.



Eventually, by 2030, income in Europe increases by 11% compared with the main scenario (regionalisation) while aggregate income of other global regions is reduced by 2.6%. There is a small reduction (0.7%) in aggregate income of the world as a whole.



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## APPENDIX A Scope and methodology of the macro model

The role of the macro-model in the AUGUR project is to provide historical time series and projections within a defined, formal framework that provides an account of inter-relationships between the different domains including trade, finance, demography, energy, income and well-being, allowing different assumptions to be made about future policies and behaviour, coordinated or otherwise, in each part of the world.

### Scope: timescales, blocs, variables

Historical experience and future prospects for Europe and other parts of the world are reviewed using a common set of variables represented by annual series. Historical data cover the four decades from 1970 to 2009 with estimates up to 2012 based on the latest World Economic Output (WEO) published by the IMF and World Bank. Scenarios extend the annual series to 2030 under alternative assumptions about future policies, trends and shocks.

The term 'bloc' is used to describe a country or country group. The macro model divides the world into 19 blocs, 5 in Europe (North, Central, East, South and West), 4 large countries outside Europe (USA, Japan, China and India) and 10 regional groups differentiated by income level (Africa North and South, West Asia, CIS, Other South Asia, East Asia High Income and Other East Asia, Central America, South America and Other Developed). Blocs are aggregated in 5 world regions (America, Europe, Africa, East Asia and Other Asia).

Variables analysed and projected by the model are constructed from global databanks published by UN organisations supplemented by data from Eurostat and OECD. Original series are converted to 'real' terms to make them comparable through time and across countries and adjusted where necessary to satisfy accounting identities. Bloc data are aggregated from country data. Topics covered include

- private income and expenditure (consumption, fixed investment, changes in inventories), savings and wealth
- government income (revenues less grants), expenditure on goods and services, asset transactions and debt
- exports and imports, distinguishing raw materials, energy, manufactures and services
- balance of payments, exchange reserves and external positions
- GDP, demography, migration and employment
- energy supply and use and CO2 emissions
- inflation, interest rates and exchange rates
- bank deposits and lending
- well-being (HDI, income distribution, infant mortality and life expectancy)

### Methodology: historical analysis and scenario-building

The basis of the macro model is a set of variables and equations that determine their value in each year and bloc. The world economy is treated as a closed system and all





variables are endogenous.<sup>8</sup> A preliminary analysis of historical series shows that each group of variables has a characteristic pattern of variation which is not very different across blocs. Financial variables are the most volatile, real economy variables show persistent trends with much less short-term volatility while demographic variables adjust slowly with long-term trends.

Behaviour is modelled by non-linear equations that capture observed dynamics and feedbacks. The econometric equation for each behavioural variable provides a description of historical data in terms of a standard response pattern (dynamics and influence of other variables) and bloc-specific intercepts and residuals. The baseline for scenarios assumes residuals fade away, leaving trends and feedbacks to determine outcomes subject to the accounting constraints.

Scenarios are constructed by superimposing policy rules, changes in trend and/or shocks in specific blocs. The objectives of policy are flexible and may be specified as targets, ceilings or floors with any number of behavioural variables (instruments) being adjusted to move outcomes more or less vigorously towards target values. Policy rules do not necessarily achieve their assumed objectives as adjustment of behavioural adjustments are limited in the light of historical evidence about the degree to which each instrument has departed from the standard response pattern in the past.<sup>9</sup>

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<sup>8</sup> A few demographic variables are treated as pre-determined over the period of interest - notably the child and elderly populations and natural growth of population. Projections to 2030 for these variables are mid-range estimates by the UN Population Division.

<sup>9</sup> In a few cases where specific institutional changes are assumed, such as adoption of the Euro, behavioural adjustments required to achieve the target are forced regardless of past experience.

## APPENDIX B Technical assumptions for each scenario

The following tables provide full details of different behavioural assumptions specified for the baseline and each governance scenario.

### Baseline assumptions

The baseline is aligned with WEO (April 2011) up to 2012. Historical residuals decay to zero from 2013 onwards. Baseline assumptions are retained in all scenarios unless noted otherwise.

The main features of the baseline in this exercise are assumptions about fiscal austerity in response to financial pressures in Europe together with adjustments to underlying trends of several behavioural variables to improve plausibility of the baseline projection.

<i>Purpose</i>	<i>Description</i>	<i>Code</i>
Maintain the Euro in South Europe and foreshadow East Europe's adoption of the Euro in 2015	South and West Europe have same nominal exchange rate movements	call Target("rxu_EUS", "rxna_EUS-rxna_EUC", "0", 100,100)
	East Europe's nominal exchange rate converges in 2015 and inflation in East Europe continues at 2% p.a.	call Target("rxu_EUE", "rxna_EUE-rxna_EUW", "2 2 1 *0", 100 ,100) call Target("pvi_EUE", "pvi_EUE-pvi_EUW", "2", 100,100)
Moderate long-run shifts in export market shares	Reduce China's long-run gain and West Europe's long-run loss of export markets for manufactures	sxmu_CN_ins = -0.01 sxmu_EUW_ins = 0.005
Prevent declines in government spending as % of GDP	Government spending adjustment in East Europe, CIS and China	G_EUE_a = 0.03 G_CI_a = 0.03 G_CN_a = 0.02
Reduce projected government asset accumulation	Accumulation of financial assets by government in North Europe	IAGO_EUN_a = -0.04
Prevent Japan's real exchange rate rising to a very high level	Real exchange rate adjustment in Japan	rxu_JA_a = -0.05
Prevent major declines in GDP growth rates in Japan and China	Savings and investment adjustments in China and Japan	SP_CN_a = -0.02 IP_CN_a = -SP_CN_a SP_JA_a = 0.5*SP_CN_a IP_JA_a = -SP_JA_a
Prevent negative inflation as growth slows down	Cost inflation adjustments in China and CIS	pvi_CN_a = 0.04 pvi_CI_a = 0.06
China's balance on primary commodities	Prevent the emergence of large surpluses when GDP growth slows down	BA0U_CN_a = -0.001

## WP1 revised historical data and scenarios



### Scenario 1 Reduced government

Note: policy rules in this and the following scenarios are subject to a 95% confidence limit on the size of adjustments relative to historical residuals for the same variable and bloc.

<i>Purpose</i>	<i>Description</i>	<i>Code</i>
Europe: reduce government debt	Government debt should be brought down to 60% of GDP	call Ceiling("G_EUS", "LG_EUS/VV_EUS", "0.6", 0.1, 30) call Link("IAGO_EUS", "G_EUS", 0.5) call Ceiling("G_EUE", "LG_EUE/VV_EUE", "0.6", 0.1, 30) call Link("IAGO_EUE", "G_EUE", 0.5) call Ceiling("G_UK", "LG_UK/VV_UK", "0.6", 0.1, 30) call Link("IAGO_UK", "G_UK", 0.5) call Ceiling("G_EUW", "LG_EUW/VV_EUW", "0.6", 0.1, 30) call Link("IAGO_EUW", "G_EUW", 0.5) call Ceiling("G_EUN", "LG_EUN/VV_EUN", "0.6", 0.1, 30) call Link("IAGO_EUN", "G_EUN", 0.5)
UK: limit current account deficits	Consumer spending is restricted when necessary to limit balance of payments deficits to 5% of GDP	call Floor("SP_UK", "CA\$ _UK/Y\$ _UK", "-0.05", 0.3, 20)
Negative impact of European crisis	Drop in investment in North and West Europe	IP_EUC_ins.fill(s) -0.04, -0.06, -0.06, -0.04, -0.04, -0.02 IP_EUN_ins = 0.5*IP_EUC_ins
	Reduced intra-Europe migration	call Ceiling("NIMU_EUN", "100*(NIMU_EUN/NE_EUN)", "0.5", 100, 20) call Ceiling("NIMU_EUC", "100*(NIMU_EUC/NE_EUC)", "0.0", 100, 20) call Ceiling("NIMU_EUE", "100*(NIMU_EUE/NE_EUE)", "0.0", 100, 20) call Ceiling("NIMU_EUS", "100*(NIMU_EUS/NE_EUS)", "0.5", 100, 20) call Ceiling("NIMU_EUW", "100*(NIMU_EUW/NE_EUW)", "0.2", 100, 20)
Limits on government revenue in US, Other Developed and Europe	Targets for net revenue as % of GDP	call Target("YG_US", "YG_US/VV_US", ".15", 1, 30) call Target("YG_OD", "YG_OD/VV_OD", ".20", 1, 30) call Target("YG_EUN", "YG_EUN/VV_EUN", ".25", 1, 30) call Target("YG_EUC", "YG_EUC/VV_EUC", ".20", 1, 30) call Target("YG_EUE", "YG_EUE/VV_EUE", ".20", 1, 30) call Target("YG_EUS", "YG_EUS/VV_EUS", ".20", 1, 30) call Target("YG_EUW", "YG_EUW/VV_EUW", ".20", 1, 30)
Asset sales and spending cuts to reduce government debt/GDP ratio in US, Other Developed and Japan	Ceilings for government debt as % of GDP	call Ceiling("G_US", "100*LG_US/VV_US(-1)", "60", 100, 10) call Link("IAGO_US", "G_US", 1) call Ceiling("G_OD", "100*LG_OD/VV_OD(-1)", "60", 100, 10) call Link("IAGO_OD", "G_OD", 1) call Ceiling("G_JA", "100*LG_JA/VV_JA(-1)", "150", 100, 10) call Link("IAGO_JA", "G_JA", 1)
Trend to locate industrial production in India and South America	Increased share of world export markets for manufactures taken by India and South America	sxmu_AMS_ins = 0.05 sxmu_IN_ins = 0.05

## WP1 revised historical data and scenarios



<i>Purpose</i>	<i>Description</i>	<i>Code</i>
Trend to extract more primary commodity exports from Africa and South America	Increased net exports of primary commodities from Africa and South America	$BA0U\_AFS\_ins = 0.003$ $BA0U\_AFN\_ins = 0.5 * BA0U\_AFS\_ins$ $BA0U\_AMS\_ins = 0.5 * BA0U\_AFS\_ins$

### Scenario 1a EU breakup

Rules specified below are additional to those in scenario 1 except where noted.

<i>Purpose</i>	<i>Description</i>	<i>Code</i>
Europe: tighter targets for government debt	Government debt should be brought down to 40-50% of GDP	$call\ DropRules("G\_EUN\ G\_EUW\ G\_EUE\ G\_EUS\ G\_UK")$ $call\ DropRules("IAGO\_EUN\ IAGO\_EUW\ IAGO\_EUE\ IAGO\_EUS\ IAGO\_UK")$ $call\ Ceiling("G\_EUS", "LG\_EUS/VV\_EUS", "0.4", 0.1, 30)$ $call\ Link("IAGO\_EUS", "G\_EUS", 0.5)$ $call\ Ceiling("G\_EUE", "LG\_EUE/VV\_EUE", "0.4", 0.1, 30)$ $call\ Link("IAGO\_EUE", "G\_EUE", 0.5)$ $call\ Ceiling("G\_UK", "LG\_UK/VV\_UK", "0.5", 0.1, 30)$ $call\ Link("IAGO\_UK", "G\_UK", 0.5)$ $call\ Ceiling("G\_EUW", "LG\_EUW/VV\_EUW", "0.5", 0.1, 30)$ $call\ Link("IAGO\_EUW", "G\_EUW", 0.5)$ $call\ Ceiling("G\_EUN", "LG\_EUN/VV\_EUN", "0.6", 0.1, 30)$ $call\ Link("IAGO\_EUN", "G\_EUN", 0.5)$
	Drop limits on government income	$call\ DropRules("YG\_EUN\ YG\_EUW\ YG\_EUE\ YG\_EUS\ YG\_UK")$
Limit external deficits of South and East Europe	Consumer spending is restricted when necessary to limit balance of payments deficits to 5% of GDP	$call\ Floor("SP\_EUS", "CA\$\_EUS/Y\$\_EUS", "-0.05", 0.3, 20)$ $call\ Floor("SP\_EUE", "CA\$\_EUE/Y\$\_EUE", "-0.05", 0.3, 20)$
Europe: investment and trade collapse	Reduced spending on fixed investment and inventories	$IP\_EUS = 0$ $IP\_EUS\_ins.fill(s) -0.03, -0.3, -0.15, -0.075, -0.03$ $IP\_EUW\_ins = IP\_EUS\_ins$ $IP\_UK\_ins = IP\_EUS\_ins$ $IP\_EUN\_ins = IP\_EUS\_ins$ $IP\_EUE\_ins = IP\_EUS\_ins$ $IV\_EUS\_ins = 0.02 * IP\_EUS\_ins$ $IV\_EUW\_ins = IV\_EUS\_ins$ $IV\_UK\_ins = IV\_EUS\_ins$ $IV\_EUN\_ins = IV\_EUS\_ins$ $IV\_EUE\_ins = IV\_EUS\_ins$
	Temporary hiatus in imports of manufactures	$MM\$\_EUW\_ins.fill(s) -0.05, -0.1, -0.05$ $MM\$\_EUS\_ins = MM\$\_EUW\_ins$ $MM\$\_UK\_ins = MM\$\_EUW\_ins$ $MM\$\_EUN\_ins = MM\$\_EUW\_ins$ $MM\$\_EUE\_ins = MM\$\_EUW\_ins$

**Scenario 2 China and US intervention**

Rules specified below are additional to those in scenario 1 except where noted.

<i>Purpose</i>	<i>Description</i>	<i>Code</i>
China: stabilisation policies	adjust domestic demand to maintain gradually reducing GDP growth	call Target("SP_CN", "@pc(V_CN)", "8 7.5 7 7 7 7 7 *6.5", -500, 20) call Link("IP_CN", "SP_CN", -1)
	gradually increase government spending to 18% of GDP	call Target("G_CN", "G_CN/VV_CN", "0.18", 0.1, 15)
	gradually eliminate the external surplus and stabilise the external position	call Target("rxu_CN", "CA\$_CN/Y\$_CN", "0", -0.1, 20)
	stringent energy saving and investment in non-carbon energy sources so that coal production can be stabilised around its present level	call Target("ED_CN", "@pc(EPC_CN)", "1", 100, 30) call Link("EPN_CN", "ED_CN", -1)
US recovery	downward pressure on dollar exchange rates	call Target("rxu_US", "@pc(rx_US)", "-2", 100, 100)
	weaker debt/GDP target and higher target for government income (different from S1)	call DropRules("G_US IAGO_US YG_US") call Ceiling("G_US", "100*LG_US/VV_US(-1)", "70", 100, 10) call Link("IAGO_US", "G_US", 1) call Target("YG_US", "YG_US/VV_US", ".18", 1, 30)
	moderate energy saving	ED_US_ins = -0.01
US and China invest in oil and gas	investment and production of gas, oil (and coal ?) in key producing areas, maintaining the world oil price around the present level in real terms	call Target("EPC_WA", "pe_w", "1.5", -10, 100) call Link("EPC_CI", "EPC_WA", 1) call Link("EPC_ACX", "EPC_WA", 1) call Link("EPC_OD", "EPC_WA", 1) call Link("EPC_AFN", "EPC_WA", 1) call Link("EPC_US", "EPC_WA", 1)
Relocation of industries to India and S America	restore normal trends (different from S1)	sxmu_AMS_ins = 0 sxmu_IN_ins = 0

### Scenario 3 Regionalisation

Rules specified below are additional to those in scenarios 1 and 2 except where noted.

Purpose	Description	Code
Europe: carbon tax and federal budget	Carbon tax increasing by \$25 per year from 2013 onwards	series ttco2_EUW_ins = @iif(@trend()<43,0,25*(@trend()-43)) for %b EUN UK EUS EUE series ttco2_{%b}_ins = ttco2_EUW_ins next
	Federal budget rising to 5% of GDP by 2017	(see Appendix C for details)
Europe: macro-economic and financial policies	Stable real exchange rates for non-Eurozone members	call Target("rxu_EUN", "rx_EUN/rx_EUW", "1.2", 1, 10) call Target("rxu_UK", "rx_UK/rx_EUW", "0.8", 1, 10)
	Drop migration restrictions and cuts in government budgets (different from S1 and S2)	call DropRules("NIMU_EUN NIMU_EUC NIMU_EUE NIMU_EUS NIMU_EUW") call DropRules("YG_EUN YG_EUC YG_EUE YG_EUS YG_EUW")
	Government spending and labour market policies to create jobs	call DropRules("G_EUN G_EUW G_UK G_EUS G_EUE") call DropRules("IAGO_EUN IAGO_EUW IAGO_UK IAGO_EUS IAGO_EUE") for %b EUN EUW UK EUS EUE call Floor("G_" + %b, "NE_" + %b + "/NWP_" + %b, "0.70", 0.1, 20) call Link("NEAM_" + %b, "G_" + %b, 2) call Link("NEAF_" + %b, "G_" + %b, 2) next
	Drop constraint on current account deficits in the UK	call DropRules("SP_UK")
	Investment stimulus	IP_EUW_ins = 0.01 IP_EUN_ins = IP_EUW_ins IP_UK_ins = IP_EUW_ins IP_EUS_ins = IP_EUW_ins + 0.01 IP_EUE_ins = IP_EUW_ins + 0.01
Europe: cooperation with neighbouring blocs	Investment stimulus	IP_CI_ins = IP_EUW_ins + 0.02 IP_WA_ins = IP_WA_ins + 0.02 IP_AFN_ins = IP_AFN_ins + 0.02
	Trade preferences (manufactures)	sxmu_ss_pp_ins for each supplier and market (Europe, N Africa, W Asia and CIS) excluding intra-trade within Europe stimulus levels: partner imports from Europe: 0.03 partner exports to Europe and other neighbours: 0.05
North America: sustained growth of demand and balanced development	Drop restrictions on government income	call DropRules("YG_US YG_OD")
	Stable real exchange rates	call Target("rxu_OD", "rx_OD/rx_US", "1.2", 1, 20) call Target("rxu_ACX", "rx_ACX/rx_US", "0.7", 1, 20)
	Investment incentives to promote convergence	IP_US_ins = 0.01 IP_OD_ins = IP_US_ins + 0.01 IP_ACX_ins = IP_US_ins + 0.02

## WP1 revised historical data and scenarios



<i>Purpose</i>	<i>Description</i>	<i>Code</i>
	Trade preferences (manufactures)	sxmu_ss_pp_ins = 0.07 for each supplier ss and partner pp within the group
East Asia: sustained growth of demand and balanced development	Stable real exchange rates	call Target("rxu_JA", "rx_JA/rx_CN", "2.5", 1, 20) call Target("rxu_EAH", "rx_EAH/rx_CN", "2", 1, 10) call Target("rxu_EAO", "rx_EAO/rx_CN", "0.8", 1, 20)
	Maintain or increase government spending as share of GDP	call Target("G_EAH", "G_EAH/VV_EAH", "0.18", 0.1, 10) call Target("G_EAO", "G_EAO/VV_EAO", "0.18", 0.1, 10)
	Investment rebalancing	IP_JA_ins = IP_CN_ins + 0.1 IP_EAH_ins = IP_CN_ins + 0.01 IP_EAO_ins = IP_CN_ins + 0.02
	Trade preferences (manufactures)	sxmu_ss_pp_ins = 0.02 for each supplier ss and partner pp within the group
Other Asia: exchange rate management and trade preferences	Stable real exchange rates with main partners or competitors	call Target("rxu_IN", "rx_IN/rx_US", "0.4", 1, 20) call Target("rxu_ASO", "rx_ASO/rx_IN", "0.9", 1, 20) call Target("rxu_CI", "rx_CI/rx_EUW", "0.4", 1, 20) call Target("rxu_WA", "rx_WA/rx_EUW", "0.5", 1, 20)
	Trade preferences (manufactures)	sxmu_ss_pp_ins for each supplier ss and partner pp within the group imports to India and Other S Asia: 0.03 imports to CIS: 0.05 imports to W Asia: 0.08
Rest of world exchange rate management and trade preferences, loss of privilege as source of primary commodity exports	Stable real exchange rates with main partners or competitors	call Target("rxu_AFN", "rx_AFN/rx_EUW", "0.45", 1, 20) call Target("rxu_AFS", "rx_AFS/rx_EUW", "0.4", 1, 20) call Target("rxu_AMS", "rx_AMS/rx_US", "0.6", 1, 20)
	Trade preferences (manufactures)	sxmu_AFN_AFN_ins = 0.05 sxmu_AFS_AFN_ins = 0.05 sxmu_AFN_AFS_ins = 0.05 sxmu_AFS_AFS_ins = 0.05 sxmu_AMS_AMS_ins = 0.08
	Cancel trend for increased net exports of primary commodities from Africa and South America	BA0U_AFS_ins = 0.0 BA0U_AFN_ins = 0.5*BA0U_AFS_ins BA0U_AMS_ins = 0.5*BA0U_AFS_ins

### Scenario 3A Federal Europe

Additional to rules in scenario 3.

<i>Purpose</i>	<i>Description</i>	<i>Code</i>
Europe: federal budget	Federal budget rising to 15% of GDP by 2020	(see Appendix C for details)

## WP1 revised historical data and scenarios



### Scenario 3B Multi-speed Europe

Rules below are additional to those in scenario 3.

<i>Purpose</i>	<i>Description</i>	<i>Code</i>
Europe: federal budget	No federal budget (different from S3 and S3a)	
Eurozone breakup	Target real exchange rates on achievement of GDP growth targets	call DropRules("rxu_EUN rxu_EUW rxu_EUE rxu_EUS rxu_UK") call Floor("rxu_EUE", "@pc(V_EUE)", "8", -20, 20) call Floor("rxu_EUN", "@pc(V_EUN)", "3", -20, 20) call Floor("rxu_EUS", "@pc(V_EUS)", "6", -20, 20) call Floor("rxu_UK", "@pc(V_UK)", "3", -20, 20)
	Suspend E Europe inflation target	call DropRules("pvi_EUE")
Europe: cooperation with neighbouring regions (weaker than in S3 and S3A)	Investment stimulus	IP_CI_ins = IP_EUW_ins + 0.005 IP_WA_ins = IP_WA_ins + 0.005 IP_AFN_ins = IP_AFN_ins + 0.005
	Trade preferences (manufactures)	sxmu_ss_pp_ins for each supplier and market (Europe, N Africa, W Asia and CIS) excluding intra-trade within Europe stimulus levels: partner imports from Europe: 0.01 partner exports to Europe and other neighbours: 0.02

### Scenario 4 Multipolar governance

Rules below are additional to those in scenario 3.

<i>Purpose</i>	<i>Description</i>	<i>Code</i>
Global carbon tax	Carbon tax increasing by \$25 per year from 2013 onwards	series ttco2_EUW_ins = @iif(@trend()<43,0,25*(@trend()-43)) for %b EUN UK EUS EUE series ttco2_{%b}_ins = ttco2_EUW_ins next
Increased GDP growth and reduced c/a surpluses in North and West Europe, Japan and East Asia High Income	Current account ceiling equal to 2 % of GDP, achieved through reduced savings and increased imports of manufactures and services	call Ceiling("SP_EUN", "100*CA\$_EUN/Y\$_EUN", "2", 100, 10) call Link("MM\$_EUN", "SP_EUN", -1) call Link("BS\$_EUN", "SP_EUN", 1) call Ceiling("SP_EUC", "100*CA\$_EUC/Y\$_EUC", "2", 100, 10) call Link("MM\$_EUC", "SP_EUC", -1) call Link("BS\$_EUC", "SP_EUC", 1) call Ceiling("SP_JA", "100*CA\$_JA/Y\$_JA", "2", 100, 10) call Link("MM\$_JA", "SP_JA", -1) call Link("BS\$_JA", "SP_JA", 1) call Ceiling("SP_EAH", "100*CA\$_EAH/Y\$_EAH", "2", 100, 10) call Link("MM\$_EAH", "SP_EAH", -0.5) call Link("BS\$_EAH", "SP_EAH", 0.5)
Growth targets in India and S America	Targets for domestic expenditures and government spending	call Target("IP_IN", "@pc(H_IN)", "8", 25, 50) call Target("IP_AMS", "@pc(H_AMS)", "6", 25, 50) call Target("G_IN", "@pc(G_IN)", "9", 100, 100) call Target("G_AMS", "@pc(G_AMS)", "5", 100, 100)



## WP1 revised historical data and scenarios



<i>Purpose</i>	<i>Description</i>	<i>Code</i>
Provision of reserves to low income regions	Financial support from global financial institutions and central banks in high income regions	call Floor("R\$_AFS", "R\$_AFS/(RX_AFS*VV_AFS)", "0.2", 0.1, 30) call Floor("R\$_ASO", "R\$_ASO/(RX_ASO*VV_ASO)", "0.2", 0.1, 30)
Government revenue and spending in low income regions	Target growth rates for government spending and target levels of revenue relative to GDP	call Target("YG_AFN", "YG_AFN/VV_AFN", ".15", 1, 30) call Target("G_AFN", "@pc(G_AFN)", "7", 100, 100) call Target("YG_AFS", "YG_AFS/VV_AFS", ".15", 1, 30) call Target("G_AFS", "@pc(G_AFS)", "9", 100, 100) call Target("YG_ASO", "YG_ASO/VV_ASO", ".15", 1, 30) call Target("G_ASO", "@pc(G_ASO)", "8", 100, 100)

## APPENDIX C Assumptions for a federal budget

The budget structure is defined by a special function MBDef which records the member blocs and revenue and expenditure headings. The budget is formed for each future year by considering first the overall size of the budget as a percent of the combined GDP of member blocs and then estimating revenue and expenditure components with targets or ceilings on the share of the total budget accounted for by each heading. The allocation to member blocs is calculated using a specific tax or expenditure base. A ceiling may be imposed on the effective rate (ratio of revenue or expenditure to the base) and thresholds may be defined so that liability to contribute revenues or eligibility for expenditures is limited to blocs in which the relevant indicator exceeds the threshold.

The following headings defined for scenario 3 (Regionalisation) are carried over to variants of S3 and to S4 (multi-polar collaboration).

Category	Heading	Tax base	Threshold	Rate limit
Revenue	VAT	C consumer spending	0	none
	Carbon tax	CO2*ttco2 tax revenue	0	50% of carbon tax revenue
Expenditure	Per capita	N population	0	none
	Dependents	NCP+NOP children and elderly	0	none
	Employment support	NE(-1) number of employed persons	70% NWP(-1) target employment rate as % of working-age population	\$20,000 per job (shortfall)
	Debt relief	LG government debt	60% VV debt ceiling as % of GDP	5% p.a. on debt exceeding the threshold
	Service standards	G_? government spending on goods and services	50%(N+NCP+2NOP) *YN/3 target spending level to achieve service standard	50% of spending shortfall

The target revenue level relative to GDP and weights assigned to different headings are defined for each scenario (S3, S3A and S4) by the function MBBuild as below.

Category	Heading	S3	S3A	S4
Revenue	Total as % of GDP	5	15	5
	First year for full implementation	2017	2020	2017
Revenue	Max allocations as % of budget total			
	VAT	50	80	50
	Carbon tax	50	20	50
Expenditure	Max allocations as % of budget total			
	Per capita	30	30	30
	Dependents	50	50	50
	Employment support	20	20	20
	Debt relief	20	20	20
	Service standards	20	20	20