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EAST GERMANY, WEST GERMANY, AND THEIR MEZZOGIORNO PROBLEM: AN EMPIRICAL INVESTIGATION

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ABSTRACT

East Germany, West Germany, and their Mezzogiorno Problem: An Empirical Investigation*

Economic and monetary reunification in Germany has proved to be more expensive than previously thought – and not just for the Germans. If a 'Mezzogiorno' problem of continuing fiscal transfers to the East and possible migration flows westwards are to be avoided, there must be convergence in productivity levels. This paper analyses possible convergence paths and the policy regimes which accelerate convergence. The intention is to illustrate the (albeit less extreme) problems facing a European monetary union of asymmetric and incompletely converged economies. Working from first principles, or with the aid of an econometric model, shows that convergence sufficient to avoid a 'Mezzogiorno' problem is likely to be slow: perhaps 30-40 years in the German case despite very fast growth in the East. Second, it is not clear that the process is incentive compatible: a substantial part of the servicing and subsidizing costs must be paid by other (non-German) economies in the union without any obvious compensating benefits. Third, to reduce the need for continuing transfers actually requires a policy which promotes price and wage flexibility in the depressed region. This appears to run counter to current market integration in Europe. Such 'unpleasant arithmetic' is an important contribution to the monetary union debate, because without it the smooth running of a union of incompletely converged economies will certainly be compromised.

JEL classification: F36, E62, E24
Keywords: monetary union, economic convergence, fiscal transfers, price flexibility

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NON-TECHNICAL SUMMARY

It has always been known that the economic and monetary union of the two Germanies would be an expensive operation, but the overwhelming view during 1990, both from financial markets and policy-makers, was that these costs could be absorbed relatively easily by using the international capital markets and the German budget deficit. Few spillovers onto the main performance indicators for Germany (or the European Community (EC)) were expected. If there were worries, they were that the Exchange Rate Mechanism (ERM) might be strained to the point of realignment. The prospects for containing inflation, unemployment, the fiscal deficit and external trade at or near their previous trend values, and for achieving full or near-complete catch-up in Eastern living standards within 5-10 years, were said to be good.

One year later the picture looks rather different and is threatening a significant political as well economic backlash. Fiscal expenditures in the East are much higher than anticipated. As a result, the markets are finding it harder to absorb the increases in debt. High interest rates and low productivity in the East have curtailed any trade-off in investment and output growth both between East and West, and between consumption and investment. This implies low productivity growth in the future and hence a continuing need for fiscal transfers and no obvious easing of the debt burden over the foreseeable future. Added to that are more persistent inflationary pressures than had been expected, larger output losses in the East, and the combined effects of high domestic interest rates and depressed demand from abroad (the recessionary EC economies with high ERM interest rates, but no corresponding demand impulses from currencies depreciating against the Deutschmark). These difficulties brought Germany to the brink of recession at the start of 1992. Convergence within ten years without continuing fiscal transfers to the East looks increasingly unrealistic.

This paper asks whether something has gone wrong, or whether we should have expected costs of this type and size all along? What does a realistic adjustment and convergence path look like in a monetary union between two rather different economies? In a reduced form, the relevance of this for the adjustment mechanism required for European monetary union between incompletely converged economies is obvious.

The analysis for the German case falls into two parts. Reasoning from first principles, we first consider alternative adjustment mechanisms which could bring about (or accelerate) the convergence of the two German economies onto a suitable equilibrium path. The main elements of the adjustment process are well known: supply-side changes (leading to a catch up in Eastern productivity levels); financing the savings-investment gap; and finally the taxation, fiscal deficit and exchange rate responses. These highlight the main difficulties to be

expected, leaving the severity of those difficulties open for evaluation by an econometric model. We reach two less conventional conclusions: first, full convergence is likely to take longer (about 30-40 years) than is usually supposed; and second, this slow catch-up in productivity terms risks a potential 'Mezzogiorno' problem in which either investment or labour (or both) need to be supported by continuing fiscal transfers which, as the servicing costs build up, are not self-liquidating.

The second part of the analysis applies a multicountry econometric model to the problem of estimating the costs of unification. We ask whether any new policies could be introduced to speed up or extend the convergence process, using the IMF's MULTIMOD model, adapted to include East German supply and demand. Comparing unification with present policies against no unification shows consistently higher output and incomes under unification – with a surge in 1990-91, a near recession in 1992-3, and a steady increase from 1995. The gains are unevenly spread between East and West, however, and the pressure on Western output capacity produces a little (but persistent) inflation and a larger trade deficit (which does not recover).

The costs of financing the fiscal deficit, and of the close control of the money supply needed to contain inflation at its low level, are high interest rates and a small rise in the effective DM exchange rate. The servicing costs of the deficit in those early years imply a near permanent rise in fiscal expenditures and hence the 'Mezzogiorno' effect. More seriously, they imply recessionary pressure on Germany's EC partner countries. Growth rates are 1–2% lower than otherwise, implying that one-third of the costs of reunification will be paid by Germany's EC partners.

The rate of productivity catch-up in the East is too slow to offset those effects within a 15–20 year horizon, and investment (which reacts to the anticipated slow growth in Germany as a whole, and in the EC) therefore lags behind conventional expectations. A number of alternative policies could be introduced to speed up convergence and reduce the financing burden. Some involve slower wage growth in the East or looser monetary control. They help a little, accelerating the productivity catch-up to 60% (instead of 50%) after 15 years, together with a little more output and investment. A more effective policy is investment subsidies. (This approach is for the moment being used by the German government.) Here the catch-up rises to 68% after 15 years, with substantial extra investment from 1995 onwards. These are expensive gains, however: the cost is a significant extra (non-liquidating) load on the budget and a sharp deterioration in the trade deficit as agents try to avoid their consumption being 'crowded out' by subsidized investment.

The most effective policy is a wage subsidy on Eastern employment that is self-liquidating with convergence on the West. This produces a 71% catch-up in

productivity after 15 years – or a full catch-up after 28 years – at a low (possibly negative) cost to the budget because of the significantly faster growth and investment that it induces. Budget revenues rise more than proportionately with growth. The key here is the degree of wage (and hence price) flexibility in the East, which this strategy makes possible. The subsidy drives a wedge between wages received and private unit labour costs while demand levels (driven partly by consumption wages) are maintained. Output prices, which are a mark-up on nominal variable costs, become more flexible downwards for producers in depressed regions, however. It also front loads the budget deficit at the time of the economic collapse, but because prices and labour costs are lower than otherwise, the growth impulse is enhanced with increases in real income compared to other strategies. That means higher fiscal revenues.

The fiscal deficit therefore does not last as long, which allows interest rates to fall, implying less pressure towards recession, less crowding out, less servicing costs and less load on the EC partners. The two crucial features here are therefore the time profile of the fiscal programme and the introduction of a policy which is explicitly directed at enhancing wage-price flexibility in those markets where there is disequilibrium. This provides an important object lesson for policy-making in a monetary union of asymmetric and incompletely converged economies.

"This Unity is Just the Beginning" Helmut Kohl, in the European Newspaper, 3 October 1991

1. INTRODUCTION

One year after economic and political union, euphoria in Germany has given way to dissatisfaction and worries about the future. Certainly the economic results so far have been very different from, and much worse than, the official view that no-one would be made worse off. As a result, the first anniversary of unification produced the first glimpses of political extremism, fuelled by uncertainty and concern at rapidly rising unemployment and prices in the East, and by protests in the West at the rising tax burden and migration. German economic performance, while not below average within Europe, has been weakened and, with a continuing need to support the Eastern zone, is likely to remain weak. Promises of convergence within 4-10 years look increasingly remote. The financial burden of supporting the East also compromises Germany's ability to provide the motor for European economic integration. One is bound to ask if something has gone wrong, or whether we should have expected these costs and difficulties all along? What does a realistic adjustment and convergence path actually look like?

Unification does seem to have had some unpleasant consequences. In the East, producer prices and productivity have fallen while wages have risen sharply. Massive increases in unemployment have followed, to the point where one worker in 2 is now unemployed or on short time, and where expected earnings are falling because unemployment is rising faster than wages. Meanwhile phasing out job guarantees and price subsidies is spreading the price-cost squeeze from employers to employees. In the

West, by contrast, there has been a surge in demand which has already doubled the inflation rate (to the European average of 5%) within one year.[1] That, together with the financing costs of larger than expected public expenditures, has led to an interest rate hike from 6% to 9%: a rise in the cost of capital of at least 50%, therefore. Production, which had risen from a 3½% growth rate in 1989 to touch 6% in early 1991, is now forecast to slump to 2% growth over 1992-3 according to IMF and OECD figures. That will be lower than other EC economies, and includes a trade deficit because consumption must be maintained during the investment expansion.

But the most serious difficulty is the uncontrolled expansion of the fiscal deficit. That has grown 10-fold in the past 18 months, from ½% of GNP to over 5% of GNP. The reconstruction costs and the fiscal/social transfers to the East turned out to be much larger than even expected by the financial markets. The suggestion that annual expenditures of DM 25bn would be needed were said by the government to be "far too high" in 1990, but one year later they were running at an annual rate of DM 100-140bn. Not only does an expansion that size crowd out other expenditures; it also reduces the nation's living standard to the extent of the extra service payments (or tax increases) in the future. On the other hand the ERM system will ensure that part of the financing costs will be borne by EC partner countries who must match the higher interest rates without a corresponding demand impulse.

Have the policy makers misjudged the situation? What adjustment path (including policy changes) should Germany follow to minimise disruption

and speed up convergence? How long is convergence likely to take? What spillover effects is this process having on EC growth, inflation and the European financial markets? Answers to these questions are crucial to the design of policy, both within Germany and outside. This paper aims to provide some systematic empirical analysis of the main issues. It is organised into two parts. Sections 2 and 3 provide a general analysis of the adjustment paths, the adjustment costs, and the speed and extent of convergence that can be expected. Then sections 4 to 6 make a more detailed empirical study of those features, and test the relative effectiveness of the various policy changes. Five points emerge:

a) whatever the model, convergence is likely to take a long time (perhaps 30-40 years)

b) this lack of convergence implies continuing fiscal support and a Mezzogiorno problem in the East

c) up to one-third of the costs will be borne by other EC countries

d) relative wage-price flexibility is crucial but not likely to emerge, so policy must be directed at creating that flexibility

e) the key indicator is the speed and extent of convergence in productivity levels (a 30% differential seems to be the minimum achievable even after 15 years).

But the paper also has a hidden agenda. The German economy will eventually be reconstructed but in the meantime it provides a unique laboratory for studying adjustment difficulties within an incompletely converged and asymmetric monetary union. That opportunity will not appear again. We find that the adjustment mechanisms work badly when

i) labour markets are sticky, and wages or prices are linked by bargaining or price arbitrage over national/regional borders.

ii) when debt burdens or fiscal transfers produce a conflict between the needs of greater coordination and greater fiscal discipline

iii) when convergence in productivity levels is slow, so that fiscal transfers are still needed although convergence in other (nominal) indicators is complete.

These are important issues because, despite all the effort devoted to identifying the circumstances in which a European monetary union would be of advantage, the EC has been able to give no indication of the policies needed to create those circumstances, nor of how the economy would be run once we get there. The German experience gives some insight into the difficulties and what can be done about them.

2. GERMAN ECONOMIC AND MONETARY UNION: THE POSITION AFTER ONE YEAR

2.1 East Germany

For East Germany, economic union has proved to be an extraordinarily painful experience. By December 1990 output had fallen to 46% of its 1989 level and may have fallen further since then. Meanwhile underlying unemployment (i.e. official unemployment, plus the various work creation, retraining, retirement and short time schemes funded by government) is estimated by the Institut für Weltwirtschaft in Kiel at between 3.5m and 4m workers in a total workforce of 8m. Other estimates suggest similar figures: the federal government's labour office suggests 3.4m, Münchau (1991) quotes 3.7m, and so on. At the same time vacancies had fallen to 14% of their level a year before. These figures underline just how severe

the recession is. But they also reveal that labour productivity has fallen 15% (output has declined by more than employment)

Integration and excess capacity have had their impact on prices and wages. During 1990, producer prices fell by 50% while wages rose 42% (and further in 1991). Meanwhile consumer prices increased by 11% in 1990, and rose further in 1991 as rents tripled and transport, energy and food subsidies were ended.

These figures show that unit labour costs must have risen at least 60% while the corresponding output prices were falling 50%. But some other costs have fallen. Corporate taxes, profits taxes and interest charges have all been reduced, while intermediate inputs are now changed at world prices rather than at shadow prices two to four times higher. Nevertheless Akerlof et al (1991) find that just one sector, and 14 out of the 116 corporations employing just 8% of the workforce, could cover their short run variable production costs even after allowing for all those changes. The remainder have negative net worth, and a 70% subsidy on short run costs would be needed just to secure the 55% employment level currently enjoyed. Faced with figures like these it is small wonder that investment spending in the East has declined and, with a few spectacular exceptions, Western firms have failed to invest.[2]

2.2 West Germany and the ERM

The extra spending generated by fiscal expansion, principally to maintain consumption in the East and to supply investment goods for the East, has produced a sudden boom in the West. Output growth rose to 5% during 1990,

peaked at 6% in early 1991, but has already slowed down and is projected to grow at only 2% in 1992. This income expansion has wiped out a record trade surplus in 1989: the current account surplus fell to a quarter of its previous value in 1990 and moved into a deficit of about ½% of GDP in 1991.

Those changes reflect the fact that domestic savings are insufficient to finance reconstruction in the East. But the direction of that trade deficit is also significant. The ERM regime has not allowed a revaluation of the DM to spread excess demand to France, Italy, or elsewhere in the EC. Instead monetary contractions and rising interest rates have been used to contain inflationary pressures. That has two consequences: the ERM currencies have risen together, relieving some of the demand pressure by transferring it outside the EC. And the ERM mechanism has spread high interest rates to the EC as a whole, causing recessionary pressures since elsewhere there are no other expansionary tendencies. To prove the point, Germany's trade surplus with the EC has continued to increase over the past two years, implying its trade with the rest of the rest of the world has swung sharply into deficit.

Thus, as far as West Germany is concerned, reunification is both a fiscal shock and an inflationary shock from demand transferred from the East. The fiscal shock is undoubtedly larger than anyone had expected. The purely Eastern component of fiscal expenditure is now said to be over DM140bn a year instead of the forecasted DM25bn in 1990 and DM50bn in 1991. The acceleration in the fiscal gap has also caused concern. Initially the financial markets were forecasting deficit increases up to

1½%-2% of GDP. In the event it jumped from ½% GNP in 1989 to 5¼% by the end of 1990, and is forecast by the IFO Institute to pass 6¼% in 1992. And that in turn has caused severe financing difficulties. The initial projections that these fiscal expenditures could be financed from domestic savings without increasing tax rates (extra growth was expected to supply much of the revenue) have proved quite inadequate. In fact borrowing has pushed interest rates up to around 9% (from 6% in 1989), and the Bundesbank has kept pace with its rates in an attempt to stem inflationary pressure. That risks imposing contractions on top of the projected 1992/93 slow down. Nevertheless, consumer price inflation has doubled over the past year, and wage inflation (now 7%) is running a bit ahead of productivity in real terms. As both still seems to be accelerating (the 3-month price and wage inflation have advanced to annual rates of 7% and 9½% respectively) we can expect inflation to persist.

3. ALTERNATIVE ADJUSTMENT PATHS

3.1 Productivity Differentials and the Catch up Process

Almost any analysis of the macroeconomic adjustments needed to accomplish a full economic integration between the two Germanies will focus on investment. But it is less usual to insist on equalising productivity levels to prevent the need for continuing fiscal transfers. At the same time living standards have to rise early on in the transition process, and ahead of new productive capacity, to prevent migration westwards and all the associated externality costs (congestion, higher house prices, overloaded social services etc). One possibility is that wage differentials drive migration. If so, the current policy of wage rises in advance of productivity, plus transfers via unemployment benefits and

subsidies on investment would be the answer. But that risks slowing investment down and postponing the catch up. The other possibility is that unemployment differentials (or the duration of unemployment) is a greater spur to migration, in which case subsidies to wages would be more effective.[3] But either way fiscal transfers are involved. The only way ultimately to eliminate such transfers, and hence avoid a permanent "Mezzogiorno" problem in the East, is to create a self-sustaining investment programme: that is, to equalise productivity levels so that unit labour costs can be equalised in both parts of the single German market. The appendix shows that, under conventional conditions, equal capital - labour ratios, wages and employment rates then follow. Ultimately therefore the catch up must be defined in terms of productivity levels. But within that, two strategies are possible: transfer payments plus direct investment (or investment incentives) vs. wage subsidies, possibly in conjunction with investment subsidies. Analysts have taken opposing positions on these two possibilities (Akerlof et al, 1991).

The distinction between a catch up in capital and a catch up in productivity presents two problems. First, investment can always be undertaken by the government if need be. In that sense it is controllable. But productivity is not; it is endogenous and can only be influenced by suitable supply side policies. Second, it may be harder to achieve a productivity catch up than a catch up in capital. The OECD (1990) points out that, if Western productivity continues to grow at 2% p.a., and if the East starts with productivity at 26% of the Western level,[4] then the East will need 20, 30 or 40 years to catch up if its productivity grows at 9.1%, 6.7% or 5.5% respectively. In contrast, if

Eastern capital (including infrastructure) is valued at DM 600bn in 1990, then it only needs capital growth of 10¼%, 8½%, or 7% over 15, 20 or 30 years (respectively) to catch up with the West's capital-labour ratio. As a relatively small part of the combined German economy, the latter seems quite manageable. But the former looks much more difficult, especially when it is recognised that the rapid development of West Germany during the 1950s or the East Asian NICs since the 1960s produced productivity growth rates of 6%-7% at most.[5]

Two lessons emerge from this. First, it may take very much longer to achieve complete convergence than has been supposed; 30-40 years looks likely. Second, it is misleading to define full integration as reaching a preassigned capital-output (or capital-labour) ratio, and then examine investment streams which will yield that ratio. Not only does it give the impression that full union can be achieved quicker than is in fact possible. It also risks creating a Mezzogiorno problem where either investment has to be supported by continuing fiscal transfers (and hence fiscal imbalances) to offset productivity differences; or because producers gather the subsidies and then pull out before the productivity gains come through.

3.2 Financing the Savings-Investment Gap

If it is not appropriate to impose investment figures exogenously, they can still be used as target values. Typical estimates range from DM55bn to DM 110bn per year for the next ten years.[6] Such estimates are based on achieving a per capita income of around $10,000 (in 1988 prices), roughly doubling East German GDP over the period (8% growth p.a.) with a constant

population. However these figures would only give East Germany a productivity level of 55% of the West. Nevertheless to obtain the same productivity levels as in the West after 30 years instead would require very similar annual investment expenditures (DM 65bn to DM 105bn). These figures are large but not unmanageable as targets: they represent 14%-26% of West German investment, or 4%-8% and of the EC's total annual investment.

The question is, where are the savings necessary to sustain such a prolonged investment programme going to come from? Eastern savings have largely been reduced by price rises and the need to allow consumption spending to run ahead of output. That leaves West German and OECD savings to finance the investment programme, matched by current account deficits to finance immediate consumption. However the current account deficits will be smaller to the extent that capital inflows will be linked to the imports of capital equipment. So we may expect some rise in the DM from the capital inflow, followed by a gradual decline as rising incomes then generate extra imports and as earlier price rises reduce competitiveness. These conclusions are entirely consistent with Melitz's (1991) theoretical model.

How does this affect the OECD economies? There are investment creation and investment diversion effects. Prices and output will rise in the capital goods exporting countries, but the rate of return on capital goods will tend to rise with the opportunities for profitable investment in the East. What then happens depends on the interest elasticity of savings in the OECD and West Germany. If they are highly elastic, savings will rise

while interest rates remain constant - leading to investment creation as the rate of return on the marginal OECD investment project is not increased. But if they are quite inelastic, total OECD investment must remain fixed - implying a rise in the rate of interest such that investment projects elsewhere are displaced to make room for projects in the East with higher rates of return. Which situation actually applies? Private consumption and savings, largely financed from current income according to a life-time pattern, are unlikely to be affected by changes in financial conditions. Public sector savings could however increase if taxes are increased. So far that option has been ruled out even in West Germany, and higher taxes might anyway depress private savings as the private sector anticipates lower tax rates when the investment payoff comes in. We must therefore expect that savings will not respond. If interest rates therefore rise, the net effect on West Germany (and perhaps Italy or the Netherlands) as the main suppliers of capital goods might be roughly neutral. But countries such as France, the UK or the US will lose out with higher interest rates but no extra income from that source. These spillover effects have to be added to the trade effects of section 2.2, where the US and Japan benefited at the expense of the non-German ERM countries.

If West Germany is to be the major supplier of capital goods, does it have the supply capacity? Begg et al (1990) argue it was already at full capacity production in 1989 so the disproportionate shift of demand to West German investment goods seems likely to provoke inflation. To the extent that OECD interest rates rise, aggregate demand will fall but not by enough to bring a large increase in demand for German goods back into

line with current supplies. Tax increases, a higher DM, or (if those are not permitted) tighter money and inflation will result.

3.3 Tax and Exchange Rate Responses

There is a second reason why Germany will have to run a current account deficit and why the DM will eventually fall. It is clear that fiscal transfers to the East are inescapable in the short term. Ideally these transfers would be financed by raising taxation because private savings are insufficient and bond financing would crowd investment out. For reasons of consumption smoothing, it would be helpful to spread the tax burden over time. But spreading the tax burden means that the revenues will be too small to cover the large transfers in the early years, but will more than cover them later as the catch up gathers pace and transfers diminish. In early years this revenue deficit will have to be financed by foreign borrowing since further domestic borrowing is ruled out; but in later years the excess over transfers will be repaid with interest. At the end of the day, aggregate wealth will have been reduced by the net present value of the transfers needed to service the "excess" consumption in the early years. Put more precisely, since Germany is already operating at full capacity, the capital build up in the East requires a temporary diversion of domestic production from consumption to capital goods. But the resulting consumption deficit can be made good by imports financed by foreign borrowing or liquidating foreign assets. In the first instance that is a simple current account deficit. But the excess of transfers, plus debt service payments or any loss of foreign income, adds to the current account deficit. Neither development is likely to have much impact on the DM's exchange rate to start with, especially as

households facing the prospect of higher taxes or lower foreign incomes are likely to start increasing their saving. But later on, when the tax-transfers operation is complete, the domestic part of permanent income and consumption will return to their previous levels.[7] But the foreign part (i.e. net foreign assets, and the income stream which they generated minus any debt service payments) will have fallen by the transitional cost of unification. Since that represents a fall in permanent income which is due entirely to a fall in foreign income, equilibrium could be re-established at initial exchange rate only if the marginal propensity to import were one; i.e. only if imports fall exactly as fast as Germany's foreign income falls. But the marginal propensity to import is less than unity. So in the long run the trade deficit will either persist or the DM must eventually fall.

4. THE SIMULATION FRAMEWORK

4.1 The MULTIMOD Multicountry Model

To calibrate the effects of the unification programme, we have used an empirical model - in this case the International Monetary Fund's MULTIMOD, which contains linked models for each of the group of 7 industrialised countries (the US, Japan, Canada, Germany, France, Italy and the UK). It also contains a model for the rest of the OECD as a block, and models for the OPEC countries and for the developing economies in Africa, Asia and Latin America. Each of these national or regional models is linked to the others through bilateral trade flows and through capital movements and exchange rates which in turn influence domestic financial markets.

A detailed description of the model, including a full discussion of its specification, properties, and tests of its simulation characteristics, will be found in Masson et al (1988, 1990); and some comparisons with other models, using an earlier version of MULTIMOD, are analysed in Bryant et al (1988). That discussion is not repeated here, but the appendix to this paper contains a summary detailing how the East German economy is incorporated.

4.2 The Baseline and the Reference Simulations

All the simulations reported in this paper are analysed relative to a baseline projection for Germany and the other G7 economies, had there been no unification at all. That is necessary to show the impact of unification itself on the relevant economic indicators. However, since we are also interested in examining different policies which might speed up convergence or reduce its costs, we take the unification simulation with no other policy changes to be a reference scenario. Policy changes can then be assessed by whether they produce better or worse outcomes compared to the reference scenario.

The baseline projection itself is identical to that used by the IMF in its own work with MULTIMOD; the endogenous and exogenous variables are made to follow the latest (1990) projections of the IMF's World Economic Outlook. Thus the model is not used to make its own forecasts but has the official forecasts imposed on it (and steady state growth paths beyond that) up to 2015. Forward looking expectations are solved to be equal to the outcome projected for the relevant future period, and we quote results to 2001 or 2005 although solutions were computed out to 2015 to remove the influence

of the terminal conditions.[8] This baseline is taken from Masson et al (1990) and reproduced as table A1. For West Germany it implies an annual GDP growth rate of 2.6% (the average for 1985-9). For East Germany we assume the GDP growth rate would be 4.4% p.a. (the average for 1980-87). It is assumed further that the capital growth rate is approximately in the line of the GDP growth rate. So if there were no unification, the capital-labour ratio would be about 30% of the West in 1990 and 35% in 2005.

5. THE COSTS AND BENEFITS OF UNIFICATION

Table 1 sets out the simulation results of the reference scenario; unification with no policy changes. All results are given as deviations from the benchmark (no unification) solution for the combined German economy. The implications for the endogenous tax rate changes, driven by the cost of financing the German fiscal deficit and the target of regaining the pre-unification (1989) debt to GNP ratio by the year 2000, are given separately in the first row of table 2. Constant monetary targets (the ratio of base money to GNP), continued unchanged from 1989, are also included.

5.1 Output and Growth

The reference scenario shows fiscal expansion and investment leads to an increase in income and national output in Germany as a whole, compared to the no-unification scenario. The underlying (no unification) rates of growth are 2.6% in 1990 and 1991, slowing to 2.3% in 1992 to 1994, and speeding up again later. Unification adds 1% to the growth rate of national income in 1990, 3% in 1991, ¼% in 1992. But it reduces income

growth by ¼% point in 1993. Thereafter income grows at the no unification rate until 1996, when the new investment programme begins to pay-off and income grows 1½% p.a. faster until 2001 and beyond. The average German should therefore feel better off in real terms throughout, even if there is a near recession in 1993-4.

For West Germany these results imply that aggregate demand rises 3¼%-4¼% in 1990, assuming that fiscal transfers and the remaining CMEA trade guarantees prevent demand in the East from falling by more than 5-10%. That is a remarkably accurate prediction of what actually happened (recall that all our calculations are all made using the information set available at the start of 1990). In 1991, aggregate demand peaks at 5¼%-6½% on the same assumptions. Again, that is a remarkably accurate reflection of what has been happening. But output growth at that rate, in an economy at full capacity, implies an increase in inflationary pressure in the future. The inflationary pressure will be small, however, as growth (in the West) slows to just 2.9% in 1992, 2% in 1993, 2.3% in 1994, before picking up with the impulse from the east in 1995 onwards; and as monetary contractions (operating from 1991 to 1995), and forward looking DM appreciations (operating from 1990 to 1993), help divert the build up of excess demand.

To get the corresponding picture for the East is more tricky. If we believe the old regime's net material product statistics and the current estimates of Eastern GNP, then without unification they could have expected income gains of DM 4.6bn per year in the early 1990s. Under the unification scenario, in which the East remains 10% of the combined German

economy, they gain about DM 5bn each year - but at a level of DM 180-190bn, instead of DM 105-110bn, as a result of fiscal transfers and other forms of income support. That implies a level shift but little extra growth. But if the East German economy had actually ceased to grow by 1989, then the short term gains are in growth rates as well as levels and Eastern Germans should feel better off on average.

Output also grows at a consistently higher rate. Restructuring the East German economy increases total output growth by 1% (on 2½%) in 1990, by 3½% (on 2½%) in 1991, but only 1½% and ½% (on the baseline's 2%) in 1992 and 1993. The acceleration in 1995 adds 3% (on 2½%) per year until 2001 and beyond. There are fluctuations therefore, but extra growth throughout. It is not easy to divide these numbers up between West and East. If Eastern output has fallen 50% since January 1990, it implies Western output must have risen at an annual rate of about 8½% over the two year period 1990-91. This is an extra 6% (on 2½%) and represents a capacity utilisation rate of 104% at the end of 1992 compared to 98% in pre-unification West Germany; i.e. the increases in output recorded in table 1 represent gains in actual rather than potential output. The suddenness of the surge in output in 1991 just reflects the fact that that fiscal expansion was much larger than had been expected. But Western output will only grow a further 2¾% in 1992 and 1½% in 1993, if the East continues its 10% growth in real output beyond 1992. So Western output growth rates fall below the no-unification scenario in 1993-5, although they pick up again to something faster than pre-unification rates after 1996. The level remains higher than pre-unification, however, because of the initial surge.

5.2 Inflation

The sudden rise in aggregate demand in 1990-2 does indeed produce an increase in the inflation rate, albeit with some delay. But the increase is fairly small - just ¾% points on an average inflation rate of 3%. What was not predictable from general considerations was that the inflationary pressure would only emerge during 1993-4 or that it would persist until 1998 before subsiding. Either prices are stickier than generally allowed for (so that the lags, including foreign effects, are longer than expected), or the authorities' anti-inflationary responses are initially successful but the effects wear off as agents react to inflation persistence and/or the authorities relent for fear of provoking recession during the downturn of 1993/4. The latter is the more likely explanation since the accompanying monetary contractions are steadily relaxed during 1994-97 (short term interest rates having peaked in 1993) and because the fiscal deficit is reduced but never removed.

In fact others working with different models, which might be expected to have rather different dynamic response patterns (e.g. Alexander and Gagnon (1990) with the Taylor model or McKibbin (1990) with the MSG model) have produced very similar results - so this price stickiness and small inflation response is unlikely to be a peculiarity of MULTIMOD. Also, as explained in the appendix, making inflation more responsive to excess demand does not change these results. Instead it must be the policy reactions, which are triggered by the demand expansion, which are responsible for keeping the lid on inflation so successfully - and their relaxation which allows it to persist. Short term interest rates rise 2% points during 1992-4 (on 6.8% leaving them only marginally lower than

their current 9¼% level) before returning to their benchmark level in 1996/7 and falling slightly below that in 1998-2000. Thus, compared to history so far, the model has predicted slightly less inflation, with some delay, and smaller policy reactions. That may be a fault of the model but it is a good predictive performance and confirms that the higher than usual German inflation may persist through the 1990s.

5.3 The Fiscal Deficit and Financing Costs

The financial markets appear to take these changes in their stride, with small rises in long interest rates being confined to just 1990-93 (although they rise again in 2000 as continuing fiscal support in the East prevents the extra fiscal deficit from being eliminated). Nevertheless fiscal expenditures do have to expand rapidly, and more rapidly than was supposed a year ago. The overall fiscal deficit starts at ½% of GDP in 1989 but rises by 2.2% in 1990 and 5.6% in 1991 as a result of unification - before running at 1%-1½% higher than otherwise from 1995-2001. On the evidence so far, it is a very accurate picture. Net additional expenditures, on current rates, run at DM 110bn per year, falling to around DM 30bn extra in the later 1990s because, rather like what has actually happened, this is done with hardly any tax increases before 1992. In fact average tax rates rise 3-4% over the period 1992-5 and by 5-6% from 1996.[9] So the actual fiscal expenditures are around DM 110bn per year in 1991-2, and no less (i.e. 95bn in 1993, and 150bn in 1998) thereafter. The point to note is that taxes rise with time and that allows the budget deficit to be reduced. But the fiscal expenditures and service payments continue almost unchanged, in real terms, into the next century. That clearly signals a Mezzogiorno problem setting in -

government support has to continue instead of being self-liquidating as things improve. It remains to be seen how far the extra growth and investment can reduce unemployment and raise productivity before that happens (section 6 below).

5.4 The DM and the Current Account

Unification causes the DM to appreciate initially and then fall back later. Since that rise and fall is measured as a nominal effective rate against a virtually constant benchmark, it means (i) that as a result of unification the DM appreciates and then depreciates more than it otherwise would have done, and (ii) that it also appreciates against its pre-unification value but falls below that value later on (a net depreciation, therefore, by 1997-8). These movements are just as predicted in Section 3, and by the theoretical arguments of Begg et al (1990) and Melitz (1991), although the changes are probably smaller than one might have expected given the attention given to this issue. The nominal effective DM rate rises 2% during 1991-93, but falls back ½% during 1995-98. In dollar terms, that is a rise of 5% followed by a fall of ¼%. And the real effective rate rises equally strongly against the non-ERM currencies: about 4½% in 1992 before falling back to the benchmark, and against the ERM currencies the DM rises about 3% in real terms before falling back to 1% up in the latter 1990s.

Small exchange rate movements and slow dynamics are plausible here because, although the model has forward looking financial and expenditure variables, there are also significant lags from wage contracting and sticky prices and because the eastern economy fails to catch up. The

forward looking variables react to that catch up failure (and its financial consequences) and therefore slow the whole adjustment process down by spreading all movements out over time. In fact the catch up is no more than half complete within 15 years.

Section 3's other prediction (also made in Begg et al (1990)) that German foreign assets would not be enough to finance the consumption driven current account deficits also holds true because the DM has to fall from 1996. The fall is not very large because the ERM system holds the effective rate against 4 of the G7 countries. The current account however goes into deficit quite strongly: 3½% of GNP in 1991 (about twice the size of the Begg et al estimate, and about the same size as the US trade deficit in 1985-88), then running at a steady 2¼% of GNP until 1997/8 when it rises again to 3¼% of GNP. Thus the prediction of a short run deficit is born out. But the assumption that this will be put right fairly quickly is not: the current account starts to recover in the mid 90s, but then deteriorates again as the Mezzogiorno problem takes hold in the East and public savings drop.

5.5 The Costs for EC Partner Countries

Finally the effects of all of this on the ERM countries is negative, while they are positive (but small given the small DM appreciation) for Japan, the US and Canada.[10] France and Italy and the UK, for example, suffer growth rates 1%-2% points lower than otherwise up to 1995. That is the result of temporary rises in interest rates and the ERM currencies which more than offset any direct trade stimulus. Such a stimulus is definitely there because those current accounts turn positive. But the transmitted

monetary contractions are not small. In France, Italy and the UK, high nominal interest rates within the ERM plus lower inflation rates produce real interest rate rises of 1.8% on average (and 3% in the crucial 1993-4 period). By contrast, real interest rates increase by an average of only 1% in Germany. On the other hand German competitiveness falls by 15% over the 10 years after unification, whereas the ERM's appreciation plus lower inflation implies no loss of overall competitiveness elsewhere in the EC (although there are some losses in the period up to 1993). Hence the costs to the EC partners are due to inappropriately tight monetary conditions transmitted through the ERM links. Unlike Germany, they enjoy no net additions to aggregate demand. But the US and Japan do not have this problem: a small realignment of their currencies removes any recessionary pressures.

The proportion of the unification bill paid by EC countries is also quite large. A 1% loss per year in their combined GNP is 1½% of German GNP.[11] Germany adds 10½% of GNP to its internal debt plus tax bill, and 17% of GNP to its external debt. If that external debt is all private sector debt, and the interest rate averages 8%, then Germany's direct unification costs are 2.1% of GNP. But if it is all government debt, then the costs are 1.4% of GNP. Suppose now, as Melitz (1991) does, that Germany's new debt is owed to ERM countries in proportion to its trade with the EC (60%), and that the rise in ERM currencies worsens their trade outside Europe more than their trade within Europe improves for demand reasons. We might therefore guess that the ERM countries will benefit by new service payments from half of the 17% increase in German external debt. That reduces the overall cost to Europe to 0.8%-1% of German GNP.

That means the ERM countries are paying about 27-36% of the total unification costs. However the cost of servicing the ERM countries debt will also rise with the rising interest rates, so 27-36% will be (if anything) an underestimate. These calculations are rather approximate, but a fair guide is that the rest of the EC is paying about one-third of Germany's unification bill.

5.6 Productivity and the Speed of Convergence

On balance, the reference scenario suggests that the impact of German unification is not so very large, and that the increased demand does not put unmanageable strains on the (West) German economy. Financing the unification programme is something of a problem however, and it is likely to persist as a problem well into the next century. The international impacts are also a problem in that the ERM mechanism has the effect of bottling up the benefits in Germany or passing them over to the US and Japan. That leaves the EC countries paying a significant part of the unification bill, which may strain the various European union negotiations.

But the main difficulty is the slow rate of catch up by the east. In productivity terms, this scenario moves East German productivity from 30% to around 50% of the West German level in the 15 years from 1990 to 2005. At that rate it will take more than 40 years to achieve complete integration without a Mezzogiorno problem, unless there are policy changes. In that case the official predictions of 5-10 years look hopelessly over-optimistic. Other commentators who assume 10 years will be needed for complete convergence (Siebert 1990, Fitoussi-Phelps 1990)

or to reach 80% of the Western economic performance (McDonald-Thumann 1990) also seem to have underestimated the difficulty of the problem. Begg et al (1990) were correct to say that the crucial issue is speed and extent of convergence and to warn that 10 years may be too optimistic.

The problem here is that investment does not take off as expected. In fact investment is slow to pick up and then runs at only ¾% of GNP above the no unification case. There are several reasons for this. First, there is little incentive to invest since growth is not much faster than normal for most years (½% extra), although when that improves investment picks up too. Second, the appendix shows that investment reacts positively both to current output levels and to expected future output, and negatively to the current and future cost of capital (interest rates). That is an entirely conventional specification. But it implies that low growth, which may be anticipated, and tight money driven by financing costs and inflationary pressures will both depress investment and reinforce the Mezzgiorno effects. That in turn implies producers have no particular incentive to invest in the East, as opposed to satisfying the extra demand from suppliers the West. Moreover, where Eastern investment does take place, it may just displace Western investment. Meanwhile financing the trade and fiscal deficits with a 2% hike in interest rates (a 30% increase in the cost of capital) effectively crowds investment out. This seems realistic enough: the across-the-board investment that people hoped for has not (with some well publicised exceptions) materialised, implying that the catch up will be slower and the restructuring costs higher than expected.

6. SOME ALTERNATIVE POLICIES

Policy makers might perhaps regard an 80% catch up in productivity levels as sufficient to allow fiscal support to be withdrawn without provoking migration from the East. Are there policy changes which will achieve that goal?

6.1 Wages, Taxes and Monetary Targets[12]

One possibility is that the government might intervene to slow down the growth in wages. That would be a logical response given the counter productive way in which the Eastern labour market has worked (or been persuaded to work) since unification. To encourage investment and output growth in the East, unit labour costs have to be reduced relative to the West. We constrained wages in the East to grow 1% slower than in the reference scenario. Table 3 shows that this would produce some improvements:e.g. investment was ¾% of GNP higher to 1993 , and then ¾%-1% higher thereafter. The crowding out effect is clearly smaller. Output and growth are also a little higher (½%-1% extra) and the inflation problem is completely offset (which is a nice result). Those targets are quite sensitive to the growth in wages. Elsewhere, wages have little impact: the appreciation of the DM is smaller, so things are easier for the ERM partners, while the trade and budget deficits are unchanged. So this is quite helpful, but doesn't solve all of the problem: the final productivity catch up is just 62% after 15 years, which still implies nearly 30 years is needed for an 80% catch up and more than 30 for full convergence.

In fact of course the government and unions have followed the opposite strategy, talking wages up on equity and migration grounds. Making eastern and western wage rates equal after 5 years (which is the official policy) pushes the productivity catch up back down to 53% after 15 years (table 4). Output and income would then decline for 4 consecutive years (1993-96) with a trough deep enough to register an actual decline in GNP. This is the policy which produces recession, therefore. Inflation from wage costs would also be higher than in the reference scenario, causing further monetary contractions and further recession. The fiscal deficit is slower to decline too. Current policies are therefore very ill-advised because they exaggerate the costs quite significantly.

We have seen that higher taxes in the West are an important part of financing the unification programme, and the servicing costs will certainly be increased (or last longer) without extra taxation. On the other hand the government has been extremely reluctant to raise new or extra taxes (having promised no extra taxation). The reference scenario, in contrast, calls for quite large increases. So we have included a simulation to show what would happen if the government limited the tax increases, for political reasons, to half their values in the reference scenario (table 5): average rates may rise by no more than 1% to 1995, 2% for 1996-2000, and then 4%. This is inferior to slowing the growth in wages, but not by much: the productivity catch up is 58% after 15 years. The major difference is that the fiscal deficit is not reduced at all: after 10 years it is still 4½% of GNP, implying servicing costs that are 3 to 4 time larger than in the reference scenario. On the other hand, growth, investment and inflation, while more variable, are not much

affected on average. Similarly the DM's appreciation and the other ERM countries are hardly affected. [Conversely raising tax rates would have more impact on the financing costs than on output and investment]. Current tax policies therefore just serve to increase the eventual cost.

6.2 Variations in the Adjustment Period and Fiscal Targets

With large financial changes and shifts in the consumption-investment mix over a long horizon, one would expect the Lucas critique to play a role: agents might want to change their behavioural responses from those recorded in the pre-unification period. There are two issues: would they want to, and would it change our conclusions if they did?

We have reviewed the sensitivity of our results to a range of specific changes - in monetary policy reactions, in inflation responses, savings and investment interest rate elasticities, import price elasticities, or in German wage setting, supply capacity and investment decisions - in the appendix to this paper. Our results seem pretty robust to behavioural changes in those components. But a more general test of whether the Lucas critique would have a significant impact on our results is to shorten the time horizon and/or change the terminal condition for the fiscal debt to GNP ratio. This is because the model implies extensive forward looking behaviour so that suddenly shortening the length of time available to reach the required terminal values would certainly alter the behaviour of the associated variables if the model gave them any scope to do so. In particular, most of the disturbances caused by unification appear in the fiscal deficit and its financing variables. Hence changing the debt to GNP ratio would also show how large an impact the Lucas critique could (but not necessarily would) have.

We tried two sensitivity tests: first bringing the terminal period forward to 2005 (a 40% reduction in the period allowed for bringing the combined German economy to its pre-unification or equilibrium growth path) and second combining that short horizon with a 33% rise in the permitted debt/GNP ratio at the terminal date. The results were almost identical (see table 6, which reports the second case). There are changes compared to the reference scenario, concentrated in 1991-94, but they are very small. So Lucas critique does apply, but its impact is rather small and unconnected with any responses to the build up in fiscal debt. In Germany, a shorter horizon raises output growth perhaps 0.2% points in 1991-2 and from 1997 onwards. It also raises the fiscal deficit and interest rates marginally (0.2% points each) until 1994, and the DM and dollar exchange rates are a little lower over 1991-2. Inflation and investment are unaffected. Finally the EC partners' losses are smoothed but not lowered on average. Our conclusion is that the Lucas critique and variations in the terminal debt limit would therefore have rather little impact on the unification process.

6.3 Investment Incentives vs. Employment Subsidies

Section 3 suggested two main policy approaches to reconstruction: investment subsidies and self-eliminating employment subsidies. We compare those two approaches in tables 7 and 8. It is important to stress that we are comparing two general directions of policy here, not the particular decision rules. The first step is to decide which strategy is most effective. Then we can consider the best way of implementing that strategy.

On the investment side we tried two simulations. In one, the government subsidises 40% of any increases in private sector investment in the East.[13] In the other, the private sector investment equation is exogenised to yield sufficient capital growth to give the same capital-labour ratio as in the West in 2005, and the government picks up 40% of the bill for that. In both cases we get more investment as desired, but also more crowding out because of the extra load on the budget constraint and associated financing costs. In fact investment only starts to take off in 1995-96 when the initial (consumption induced) pressure on the budget begins to ease and interest rates pass their peak values of 1991-94. Investment rises an extra 1% of GNP above the reference scenario (but not before 1995), increasing to 5% extra by 2001 and beyond. But the extra load on the budget means that interest rates, when they ease, remain above their reference levels. So recovery is still a long drawn out process and the budget deficit is somewhat larger (the debt to GNP ratio rises by 11.2% points instead of 10% by 2001). At the same time, extra investment does have its desired effect; income and output levels grow faster than in the reference case - although those effects are only first noticeable in 1999 - and the catch up in productivity (68% by 2005) passes the half way to convergence mark for the first time. On the other hand inflation and the DM's effective appreciation are a little larger throughout, principally in 1993-99 when the investment drive is on; and the current account deficit, which is not much affected in the early stages, shows a sharp deterioration from 1997/8 onwards. So there are obviously costs attached to this strategy, and the financing costs result in tax rates rising more than in previous simulations (½% point in 1993-4, 1% point in 1995-8, and 2% from 1999 onwards). The accent

therefore switches to fiscal contraction as interest rates ease, rather than to allowing faster expansion. Subsidising investment is therefore both a more successful and a more expensive approach.

The alternative, our self-eliminating employment subsidy scheme, has been simulated using the formula suggested by Akerlof et al (1991):

$$b_t = \lambda w_0[(w^*_t - w_t)/(w^*_t - w_0)] \qquad t=1,2,.....$$

where b_t the subsidy per eastern employee at time t, w_t is the eastern wage rate (with initial (1990) value of w_0), and w^*_t is the corresponding western wage rate. The size of the subsidy, and hence the incentive for producers to remain/relocate in the East, is controlled by the government's choice of $\lambda \in [0,1]$. Akerlof et al's argument was that driving a wedge between the wage received and the wage cost would promote employment, investment and growth more rapidly (because the same or higher incentives are being offered at a higher level of aggregate demand) at a low and possibly negative extra cost to the budget (because of the claw backs through taxation and social security payments that would not otherwise be paid). We argue it also permits price (wage) flexibility to re-enter the story.

We searched the interval $0.1<\lambda<0.9$ to find the value ($\lambda=0.63$) which maximised growth, investment and hence the productivity catch up. The result was the best so far: Eastern productivity reaches 71% of the West after 15 years, implying an 80% catch up in 19 years and full convergence in about 30 years. Output and national income certainly benefit, with growth rates around 6% and 5% points above the no unification case or just 3% above the reference scenario. And in contrast to earlier simulations,

output now grows very steadily. Investment too benefits, up ¾% of GNP on the reference scenario. But because this scheme is operating by reducing wage costs, producer prices can be somewhat lower. Inflation is therefore eliminated, with prices falling 4-5% annually against the reference path (i.e. 1% in absolute terms) from the mid 1990s. It is the real income effects of that which provide the impluse for the extra growth observed in this simulation.

The other side of the employment subsidies coin, the financing costs and the fiscal/trade deficits, looks equally promising. The fiscal deficit is actually reduced below the reference scenario from 1993 onwards (as Akerlof et al conjectured might happen) - but the impact is no more than marginal (except for the period between 1996 and 1999). This is obtained at the cost of larger deficits in 1990-92. So what this strategy does is to front load the fiscal spending in order to kick start output growth and to reduce the fiscal cost later.[14] The Mezzogiorno threat is still there however: the fiscal deficit starts increasing again in 2000 when wages catch up and the subsidies come off. But, with faster GNP growth, Germany is actually able to reduce its debt to GNP ratio quite substantially for the first time both because GNP rises and because tax revenues rise faster with GNP (by 1998 the tax rates are actually lower than in all other solutions). Those of course are precisely the revenue from growth effects which the government had planned on, and which make reductions in the financing costs possible. As a result we see lower interest rates and smaller rises in the effective DM rate. (Both now fall below their pre-unification levels from 1996 onwards). That in turn has the effect of halving the recessionary pressure imposed on the rest of the EC. Thus

the advantage of an employment subsidy scheme is that it secures increases in output and employment from both an increase in aggregate demand and from real income effects. It also accelerates the productivity catch up; the subsidies are self-eliminating; and they reduce the financing costs to both the Germans and the EC. That is a first object lesson in how European monetary union could be made to work with imperfect convergence.

The disadvantage of employment subsidies is that producers may not believe the subsidy will continue long enough to make new investment worthwhile. And it does nothing to improve the productivity of existing (as opposed to new) plant so that, as wages rise and subsidies fall, all firms have an incentive to invest in new equipment, products and work practice - nor does it encourage the labour market to work by bidding down wages (to get the subsidy) when labour is released onto the market because firms fail. But capital subsidies are equally vulnerable to this criticism. First, they are already scheduled to be removed in 1992-4. Second, Eastern firms that cannot cover their short run variable costs are not going to be made more able to do so by the introduction of capital subsidies, and they will not be more viable when the subsidies are withdrawn. Nor do capital subsidies give any incentive to make the labour market work better, or for firms to stay in a low productivity zone once the subsidies have been obtained.

The key to this improved performance is three fold:

a) The correct sequencing of events is crucial. In this case output growth is essential right from the start. That has to be obtained by front loading the fiscal programme; and that can only be done by

subsidising some existing activity. It cannot be done by unemployment benefits, social and regional transfers, or investment subsidies since they cannot start to play a serious role until after the local economy has already started its decline - no kick starts therefore, and hence no capacity to reduce financing costs without introducing contractionary tax increases.

b) Driving a wedge between wages received and private unit labour costs preserves wage flexibility, and hence output price flexibility, at a time when bargaining, arbitrage and market integration tend to make wages (prices) move with supply and demand in the aggregate rather than the regional markets. Output prices are determined by a mark-up on short run variable costs, where the mark-up is a function of capacity utilisation and where variable costs depend positively on the wage actually paid and negatively on full capacity output. Therefore the wedge between wages paid and wages received not only increases employment (and hence investment) through marginal productivity and income effects. It also adds to potential output. Both those effects help reduce output prices. That increases the real income effects in investment and consumption, given nominal income levels which are driven by the higher consumption wages. This wedge therefore allows producers to retain price flexibility despite the reluctance of workers to accept flexible (and hence uncertain) wages, and despite the difficulties of persuading them to do so in a world of easy comparisons and overlapping contracts. The extraordinary rise of Eastern wages alongside rapidly increasing unemployment is testimony to the inflexibility of wages in the local labour markets as they operate now. This is a second object lesson for the European monetary union: in order to function properly it will need

some policy (perhaps self-eliminating employment subsidies) to ensure that relative price flexibility actually materialises.

(c) When designing policies to accommodate incomplete convergence, it is very important to focus on the revenue raised in depressed areas as well as the expenditures or transfers to those areas (compare Sala-i-Martin and Sachs (1991)).

6.3 Employment Expansion?

What in fact are the employment consequences of these policy strategies? MULTIMOD does not determine employment levels directly, but we can estimate the employment implications from the productivity changes. If the relative productivity in the East in 1990 was a_0 and in year 1990+N was a_N, then

$$a_N = \frac{a_0(1+g)^N}{(1.02)^N}$$

with productivity growth g defined by $Y_N/L_N=(1+g)Y_0/L_0$, assuming a 2% productivity growth rate in the West. Solving for g, and knowing output growth in each scenario, gives us an employment growth rate $\dot{L}=\dot{Y}-(1+g)$ for all Germany. The results are given for the year 2005 in table 9. It shows that the reference scenario is neutral as far as employment growth is concerned. (Unfortunately we cannot break these figures into Western and Eastern components, but they imply that any unemployment in the east would be matched by extra job creation in, and hence migration to, the West). It also shows that the shift to a market economy, plus wage subsidies produces the kind of sustained "wirshaftswunder" growth rates of 9%-10% often considered necessary to solve the East German economic problem. But, even then, full convergence takes nearly 30 years.

Finally table 9 shows that the employment subsidy approach is the only one which actually provides for a net increase in employment after 15 years. The others, although they encourage faster productivity growth, fail to provide a matching growth in output. Consequently they reduce employment opportunities. So once again it is the flexible producer prices which do the work. But the employment growth is only 1.3% p.a. so continuing fiscal support for the East is likely to be needed for some time. The prospect of a Mezzogiorno problem may have receded a little, but not much.

7. CONCLUSIONS

a) Full convergence without a Mezzogiorno problem, will take 30-40 years. On the basis of current policies the catch up after 15 years will be around 50 to 60%, although 70% is also possible with some policy changes.

b) Fiscal transfers and a fiscal deficit will continue for at least as long as productivity in the East lags that in the West. The net present value of the expected financing costs is therefore a serious constraint.

c) Some more inflation may be expected, but it will be limited by a tightening monetary policy and rising interest rates. Those monetary contractions may reduce growth and investment somewhat, but any tendency for the DM to rise (and the current account to worsen) will be largely prevented by the ERM mechanism. The current account deficit will therefore persist.

d) A significant part of the cost of unification will be borne by the non-German ERM countries, in the form of monetary contractions and possible recession.

e) Reconstruction is being hampered by a conflict between the needs of fiscal coordination and of fiscal discipline.

f) The unification process would be accelerated if Eastern wages were restrained relative to Western wages or taxes were increased. The same effects can be obtained more effectively with a self-eliminating employment subsidy in the East with long-term benefits for the budget and inflation through faster growth in real incomes and greater price flexibility. From the point of view of European policy making, that is the key lesson to learn from German unification. Union with incompletely converged and asymmetric economies cannot reach its employment and output targets without specific policies targeted on price/wage flexibility.

FOOTNOTES

1. Even the statistics are unclear since they are often quoted for Western Germany only, not for the unified Germany. Thus the current Western inflation and unemployment rates of 5% and 6% would translate to roughly 7% and 15% for all Germany

2. In 1991, private Western investment in East Germany was projected to be DM 13.5bn i.e. just 5% of Eastern GDP or 3% of total German investment - and much of that is in distribution facilities. Around one half of this investment is accounted for by 5 large firms: Volkswagon (DM 4.2bn), Siemens and Mercedes (DM 1bn each), IBM (DM 200m), Opel (DM 27m). Even public investment in infrastructure (estimated at DM 35bn-55bn) is not so large. DM 45bn would be 10% of total German investment.

3. Begg et al (1990) argue the wages differential case; but the survey evidence in Akerlof et al (1991) suggests the second possibility is more powerful.

4. This is the estimate for 1990 made by the Institut für Wirtschaft und Gesellschaft in Bonn, not the OECD's figure. It is in line with the IMFs estimate of 30% for 1988, given that productivity has now fallen (McDonald and Thumann, 1990).

5. These figures should be compared to the productivity growth rates which would have to be achieved if the usual forecasts of convergence are to be met. The unions' 1994 time limit requires a

33% productivity growth; a 10 year catch up (the government's and financial market's estimate) requires 17%; the Eschweiler (1991) estimate implies 13% and Burda's (1990) 7½%.

6. e.g. Begg et al (1990), Siebert (1990), Fitoussi and Phelps (1990). These upper and lower bounds are obtained by applying typical OECD capital-output ratios of 4 (for the economy as a whole) and 2.5 (for industry only).

7. Unless there is a significant asset effect in consumption, in which case it will remain a little lower.

8. A terminal date of 2015 is standard IMF practice for solving this model (Masson, Symanski and Meredith, 1990). To calculate these solutions, we used Fisher and Hughes Hallett's (1988) efficient adaptation of the Fair and Taylor (1983) procedure. It implies a stable steady state.

9. These are quite large numbers given that they are average rates where living standards are temporarily falling in a country.

10. These results also agree with the calculations made by Alexander and Gagnon (1990), McKibbin (1990) and Masson and Meredith (1990).

11. Germany contributes about 40% of EC GNP; and France, Italy and the UK lose an average 1.3% of their GNPs per year in these calculations - Holland and Belgium about the same, but the Southern countries rather less. A 1% loss overall therefore seems a good estimate of the average loss.

12. We also tried relaxing the Bundesbank's monetary targets, and 2% or 5% realignments of the DM as policy strategies. neither are reported separately here because they appear to have been ruled out by the policy makers and have dropped out of the policy debate. The monetary target strategy in particular was very ineffective because it clashed with the Bundesbank's money supply reaction function which is tied down by demand pressure and capacity (i.e. inflation). Raising the target therefore has little effect on the outcomes.

13. 40% is the Institut der Deutschen Wirtschaft's estimate of the capital subsidies currently on offer.

14. This explanation is confirmed because, although the results are not very sensitive to λ (the productivity catch up varies from 65% to 71% and back again), increasing λ increases the degree of front loading and also the subsequent savings on the budget deficit. Unfortunately it also raises interest rates and demand (and hence prices) early on, which slows growth and the underlying real income effects.

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TABLE 1. REFERENCE SCENARIO

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
GERMANY												
GNP	1.0	3.2	0.6	-0.3	0.0	0.5	1.1	1.5	1.7	1.7	1.7	1.7
GDP	1.0	3.7	1.4	0.6	1.0	1.6	2.2	2.7	3.0	3.1	3.2	3.2
INFLATION	0.0	0.0	0.2	0.4	0.6	0.7	0.7	0.6	0.5	0.4	0.3	0.3
INTEREST RATE (S-R)	0.0	1.2	1.9	2.0	1.7	1.1	0.5	0.0	-0.2	-0.3	-0.2	0.1
INTEREST RATE (L-R)	1.5	1.7	1.5	1.1	0.6	0.2	-0.1	-0.1	0.0	0.3	0.5	0.7
NOMINAL EFFECTIVE EX/R	1.3	2.1	2.2	1.6	0.8	0.2	-0.2	-0.4	-0.3	0.0	0.4	0.7
CURRENT ACCOUNT/GDP	-1.4	-3.4	-2.6	-2.3	-2.3	-2.3	-2.4	-2.6	-2.8	-3.0	-3.2	-3.3
GOVT.DEFICIT/GDP	2.2	5.6	3.6	2.4	1.9	1.5	1.2	1.1	1.1	1.2	1.3	1.5
INVESTMENT/GDP	0.1	0.0	0.0	0.2	0.4	0.6	0.7	0.7	0.7	0.7	0.6	0.6
US												
GDP	-0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
INFLATION	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	0.0	0.0	0.1	0.1	0.1
INTEREST RATE (S-R)	0.1	0.2	0.3	0.3	0.2	0.1	-0.1	-0.2	-0.2	-0.1	0.0	0.1
NOMINAL EFFECTIVE EX/R	-1.7	-2.5	-2.7	-2.3	-1.7	-1.0	-0.5	-0.2	-0.1	-0.2	-0.4	-0.6
CURRENT ACCOUNT/GDP	-0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
GOVT.DEFICIT/GDP	0.0	0.0	0.1	0.1	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0
INVESTMENT/GDP	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
JAPAN												
GDP	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
INFLATION	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
INTEREST RATE (S-R)	0.0	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	-0.1	0.0	0.0
NOMINAL EFFECTIVE EX/R	-1.5	-2.3	-2.5	-2.1	-1.4	-0.6	0.0	0.3	0.3	0.0	-0.4	-0.8
CURRENT ACCOUNT/GDP	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
GOVT.DEFICIT/GDP	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
INVESTMENT/GDP	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UK												
GDP	-1.3	-1.8	-2.3	-2.3	-1.8	-1.3	-0.7	-0.4	-0.4	-0.7	-0.9	-1.0
INFLATION	-0.2	-0.5	-0.9	-1.2	-1.4	-1.4	-1.2	-1.0	-0.7	-0.5	-0.5	-0.5
INTEREST RATE (S-R)	0.2	1.1	1.6	1.6	1.5	1.1	0.5	0.2	0.1	0.1	0.1	0.2
NOMINAL EFFECTIVE EX/R	1.0	1.5	1.7	1.6	1.3	0.8	0.4	0.2	0.1	0.1	0.2	0.3
CURRENT ACCOUNT/GDP	0.4	0.5	0.3	0.2	0.1	0.1	0.2	0.3	0.4	0.4	0.4	0.4
GOVT.DEFICIT/GDP	0.3	0.3	0.3	0.2	0.0	-0.1	-0.3	-0.5	-0.6	-0.8	-0.9	-0.7
INVESTMENT/GDP	-0.8	-0.8	-0.7	-0.5	-0.2	-0.1	0.0	0.0	-0.1	-0.2	-0.3	-0.4
FRANCE												
GDP	-1.1	-1.6	-2.3	-2.3	-1.9	-1.4	-0.9	-0.5	-0.4	-0.5	-0.7	-1.0
INFLATION	-0.1	-0.4	-0.8	-1.2	-1.5	-1.6	-1.5	-1.3	-0.9	-0.6	-0.3	-0.2
INTEREST RATE (S-R)	0.2	1.1	1.6	1.6	1.5	1.1	0.5	0.1	0.0	0.0	0.0	0.1
NOMINAL EFFECTIVE EX/R	1.0	1.5	1.7	1.5	1.1	0.7	0.3	0.1	0.0	0.1	0.2	0.4
CURRENT ACCOUNT/GDP	0.4	0.6	0.4	0.3	0.2	0.2	0.2	0.3	0.4	0.4	0.5	0.6
GOVT.DEFICIT/GDP	0.2	0.2	0.3	0.2	0.0	-0.2	-0.3	-0.4	-0.5	-0.4	-0.4	-0.4
INVESTMENT/GDP	-0.8	-0.9	-0.8	-0.6	-0.4	-0.2	-0.1	-0.1	-0.1	-0.3	-0.4	-0.5
ITALY												
GDP	-1.1	-1.5	-2.3	-2.4	-2.1	-1.5	-0.8	-0.2	0.1	0.1	-0.2	-0.5
INFLATION	-0.1	-0.4	-0.8	-1.2	-1.6	-1.7	-1.6	-1.4	-0.9	-0.5	-0.1	0.1
INTEREST RATE (S-R)	0.2	1.1	1.6	1.6	1.5	1.1	0.5	0.1	0.0	0.0	0.0	0.1
NOMINAL EFFECTIVE EX/R	1.0	1.4	1.6	1.4	1.1	0.6	0.3	0.1	0.0	0.1	0.2	0.3
CURRENT ACCOUNT/GDP	0.3	0.6	0.4	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.2	0.2
GOVT.DEFICIT/GDP	0.2	0.1	0.4	0.3	-0.2	-0.6	-0.8	-0.9	-0.7	-0.4	-0.1	0.1
INVESTMENT/GDP	-0.7	-0.8	-0.7	-0.5	-0.3	0.0	0.1	0.1	0.0	-0.1	-0.3	-0.4
OTHER OECD COUNTRIES												
GDP	-1.0	-1.4	-2.1	-2.2	-1.8	-1.2	-0.6	-0.2	-0.1	-0.3	-0.5	-0.8
INFLATION	-0.1	-0.3	-0.6	-1.0	-1.3	-1.4	-1.4	-1.2	-0.9	-0.5	-0.3	-0.2
INTEREST RATE (S-R)	0.2	1.1	1.7	1.7	1.6	1.1	0.5	0.1	0.0	0.0	0.0	0.1
NOMINAL EFFECTIVE EX/R	1.4	2.1	2.3	2.1	1.5	0.9	0.4	0.1	0.0	0.1	0.3	0.5
CURRENT ACCOUNT/GDP	0.6	0.9	0.6	0.4	0.4	0.4	0.5	0.6	0.8	1.0	1.0	1.0
GOVT.DEFICIT/GDP	0.1	0.2	0.4	0.3	0.1	-0.2	-0.4	-0.6	-0.7	-1.1	-0.8	-0.6
INVESTMENT/GDP	-0.8	-0.9	-0.8	-0.6	-0.3	-0.1	0.0	0.1	0.0	-0.2	-0.3	-0.4

KEYS AND HINTS FOR ALL TABLES:

GNP, GDP	: real GNP and GDP (% deviation from baseline)
INFLATION	: annual inflation rate (difference from baseline)
INTEREST RATE (S-R)	: nominal short-term interest rate (difference from baseline)
INTEREST RATE (L-R)	: nominal long-term interest rate (difference from baseline)
NOMINAL EFFECTIVE EX/R	: nominal MERM-weighted effective exchange rate, IMF (% deviation from baseline)
CURRENT ACCOUNT/GDP	: current account balance as % of GDP (difference from baseline)
GOVT. DEFICIT/GDP	: general government financial deficits as % of GDP (difference from baseline)
INVESTMENT/GDP	: gross investment as % of GDP (difference from baseline)

TABLE 2. TAX RATE CHANGES IN GERMANY

1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
REFERENCE SCENARIO											
0.0	0.5	2.0	3.3	4.1	4.6	5.0	5.2	5.3	5.5	5.7	5.9
SLOWER WAGES GROWTH											
0.0	0.5	2.0	3.2	4.0	4.4	4.8	4.9	5.1	5.2	5.5	5.7
FASTER WAGES GROWTH											
0.0	0.5	2.1	3.4	4.2	4.8	5.2	5.4	5.5	5.7	5.8	6.0
LOWER TAX RATES											
0.0	0.4	1.0	1.0	1.0	1.0	2.0	2.0	2.0	2.0	2.0	4.0
SHORTER HORIZON/WEAKER DEBT TO GNP TARGET											
0.0	0.4	1.9	3.2	4.0	4.5	4.9	5.0	5.1	5.2	5.4	5.7
INVESTMENT SUBSIDIES (FIXED INVESTMENT TARGETS)											
0.0	0.6	2.3	3.6	4.5	5.2	5.7	6.0	6.3	6.9	7.3	7.7
SELF-LIQUIDATING EMPLOYMENT SUBSIDIES											
0.0	0.7	2.4	3.8	4.5	5.0	5.3	5.3	5.2	5.2	5.2	5.4

TABLE 3. SLOWER WAGES GROWTH SCENARIO

GERMANY	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
GNP	1.3	3.8	1.6	0.9	1.4	1.8	2.4	2.7	2.8	2.8	2.7	2.6
GDP	1.3	4.4	2.4	1.8	2.3	2.9	3.5	3.9	4.1	4.1	4.1	4.1
INFLATION	-0.4	-0.7	-0.9	-1.0	-1.0	-1.1	-1.1	-1.1	-1.2	-1.2	-1.2	-1.1
INTEREST RATE (S-R)	-0.1	0.9	1.5	1.5	1.2	0.7	0.3	0.0	-0.1	-0.1	0.1	0.2
INTEREST RATE (L-R)	1.2	1.4	1.2	0.8	0.4	0.1	0.0	0.0	0.2	0.4	0.6	0.7
NOMINAL EFFECTIVE EX/R	1.2	1.8	1.8	1.3	0.6	0.1	-0.2	-0.3	-0.1	0.2	0.5	0.8
CURRENT ACCOUNT/GDP	-1.4	-3.4	-2.6	-2.3	-2.2	-2.3	-2.4	-2.6	-2.8	-3.0	-3.2	-3.3
GOVT.DEFICIT/GDP	2.1	5.5	3.4	2.2	1.7	1.4	1.1	1.1	1.1	1.2	1.4	1.5
INVESTMENT/GDP	0.2	0.2	0.3	0.4	0.7	0.8	0.9	1.0	0.9	0.9	0.8	0.8

TABLE 4. FASTER WAGES GROWTH SCENARIO

GERMANY	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
GNP	0.9	2.9	0.0	-1.2	-1.1	-0.7	-0.1	0.4	0.7	0.8	1.1	0.8
GDP	0.9	3.4	0.8	-0.3	-0.1	0.4	1.0	1.6	2.0	2.2	2.5	2.4
INFLATION	0.0	0.4	1.0	1.5	2.0	2.2	2.3	2.2	2.1	1.9	1.7	1.6
INTEREST RATE (S-R)	0.0	1.3	2.1	2.4	2.1	1.5	0.8	0.2	-0.2	-0.4	-0.2	0.0
INTEREST RATE (L-R)	1.6	1.9	1.7	1.3	0.8	0.3	0.0	-0.1	0.0	0.1	0.4	0.6
NOMINAL EFFECTIVE EX/R	1.4	2.3	2.4	1.9	1.1	0.4	-0.1	-0.4	-0.4	-0.2	0.2	0.6
CURRENT ACCOUNT/GDP	-1.4	-3.4	-2.6	-2.3	-2.3	-2.4	-2.4	-2.6	-2.8	-3.0	-3.2	-3.4
GOVT.DEFICIT/GDP	2.2	5.7	3.7	2.5	2.1	1.7	1.3	1.1	1.1	1.2	1.3	1.5
INVESTMENT/GDP	0.0	-0.1	-0.2	-0.1	0.1	0.3	0.5	0.5	0.5	0.5	0.5	0.4

TABLE 5. LOWER TAX RATES SCENARIO

GERMANY	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
GNP	1.0	3.0	0.8	0.1	0.5	1.0	1.3	1.7	1.9	2.0	2.1	1.6
GDP	1.0	3.6	1.6	1.0	1.5	2.1	2.5	3.0	3.4	3.5	3.7	3.3
INFLATION	0.0	0.0	0.2	0.4	0.6	0.7	0.7	0.7	0.6	0.5	0.4	0.4
INTEREST RATE (S-R)	0.0	1.2	1.9	2.0	1.8	1.3	0.7	0.2	-0.1	-0.1	0.0	0.1
INTEREST RATE (L-R)	1.5	1.7	1.6	1.2	0.7	0.3	0.1	0.0	0.1	0.3	0.5	0.7
NOMINAL EFFECTIVE EX/R	1.4	2.1	2.2	1.7	1.0	0.4	0.0	-0.2	-0.2	0.1	0.4	0.6
CURRENT ACCOUNT/GDP	-1.4	-3.4	-2.8	-2.6	-2.7	-2.8	-2.8	-2.9	-3.1	-3.4	-3.6	-3.5
GOVT.DEFICIT/GDP	2.2	5.2	4.4	4.4	4.7	5.0	4.3	4.4	4.7	5.0	5.4	4.2
INVESTMENT/GDP	0.1	0.0	0.0	0.2	0.4	0.6	0.7	0.8	0.8	0.7	0.7	0.6

TABLE 6. SHORTER HORIZON/WEAKER DEBT TO GNP TARGET

GERMANY	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
GNP	1.2	3.4	0.7	-0.3	0.0	0.6	1.1	1.7	1.9	2.0	1.9	1.8
GDP	1.2	3.9	1.5	0.6	0.9	1.6	2.3	2.9	3.2	3.3	3.3	3.3
INFLATION	0.0	0.1	0.2	0.4	0.5	0.6	0.6	0.5	0.4	0.3	0.3	0.3
INTEREST RATE (S-R)	0.0	1.3	2.1	2.2	1.8	1.1	0.4	-0.1	-0.3	-0.3	-0.1	0.2
INTEREST RATE (L-R)	1.5	1.7	1.6	1.1	0.6	0.2	-0.1	-0.1	0.1	0.3	0.6	0.8
NOMINAL EFFECTIVE EX/R	1.0	1.8	2.0	1.6	0.8	0.2	-0.2	-0.4	-0.4	0.0	0.3	0.6
CURRENT ACCOUNT/GDP	-1.3	-3.3	-2.6	-2.3	-2.3	-2.4	-2.5	-2.6	-2.8	-3.0	-3.1	-3.3
GOVT.DEFICIT/GDP	2.1	5.6	3.7	2.5	2.0	1.7	1.3	1.2	1.2	1.3	1.5	1.7
INVESTMENT/GDP	0.1	0.0	0.0	0.1	0.3	0.6	0.7	0.8	0.8	0.7	0.6	0.5

TABLE 7. INVESTMENT SUBSIDIES (FIXED INVESTMENT TARGETS)

GERMANY	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
GNP	1.5	3.2	0.8	-0.2	0.1	0.5	1.1	1.6	1.9	2.0	2.1	2.3
GDP	1.5	3.8	1.6	0.8	1.2	1.6	2.3	2.9	3.3	3.4	3.6	3.9
INFLATION	0.0	0.0	0.2	0.4	0.6	0.7	0.7	0.6	0.5	0.3	0.3	0.3
INTEREST RATE (S-R)	0.0	1.2	2.0	2.1	1.7	1.2	0.5	0.0	-0.3	-0.3	-0.2	0.1
INTEREST RATE (L-R)	1.5	1.7	1.5	1.1	0.6	0.2	-0.1	-0.1	0.1	0.3	0.6	0.9
NOMINAL EFFECTIVE EX/R	1.4	2.2	2.2	1.7	0.9	0.2	-0.2	-0.4	-0.2	0.1	0.5	0.9
CURRENT ACCOUNT/GDP	-1.7	-3.5	-2.8	-2.4	-2.4	-2.4	-2.5	-2.7	-3.0	-3.3	-3.5	-3.9
GOVT.DEFICIT/GDP	2.5	5.9	3.9	2.7	2.3	2.1	1.8	1.7	2.4	2.1	1.9	1.8
INVESTMENT/GDP	0.8	0.2	0.4	0.6	0.8	0.8	1.1	1.3	1.4	1.6	1.9	2.3

TABLE 8. SELF-LIQUIDATING EMPLOYMENT SUBSIDIES

GERMANY	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
GNP	2.9	6.0	4.4	4.2	4.8	5.1	5.3	5.0	5.2	5.2	5.1	5.0
GDP	2.9	6.6	5.2	5.1	5.9	6.2	6.5	6.3	6.5	6.6	6.6	6.5
INFLATION	-1.0	-2.2	-3.3	-4.1	-4.6	-5.0	-5.2	-5.3	-5.3	-5.2	-5.1	-4.9
INTEREST RATE (S-R)	-0.3	0.5	0.8	0.7	0.4	0.1	-0.2	-0.4	-0.4	-0.2	0.0	0.2
INTEREST RATE (L-R)	0.6	0.7	0.6	0.3	0.1	-0.1	-0.1	-0.1	0.1	0.3	0.5	0.6
NOMINAL EFFECTIVE EX/R	1.4	1.7	1.3	0.7	0.1	-0.2	-0.3	-0.2	0.2	0.5	0.8	1.0
CURRENT ACCOUNT/GDP	-2.0	-3.9	-3.0	-2.5	-2.5	-2.4	-2.4	-2.4	-2.6	-2.9	-3.1	-3.3
GOVT.DEFICIT/GDP	3.1	6.1	3.7	2.2	1.7	1.0	0.6	0.1	0.4	0.7	0.9	1.2
INVESTMENT/GDP	0.5	0.8	0.9	1.1	1.3	1.4	1.5	1.5	1.5	1.5	1.4	1.4

TABLE 9. THE EMPLOYMENT CONSEQUENCES OF DIFFERENT UNIFICATION POLICIES IN GERMANY [$\dot{L}=\dot{Y}-(1+g)$]

UNIFICATION POLICIES	$1+g$	$\dot{Y}$	CATCH-UP AFTER 15 YEARS
REFERENCE SCENARIO	1.055	1.054	50%
SLOWER WAGES GROWTH	1.071	1.064	62%
FASTER WAGES GROWTH	1.060	1.043	53%
LOWER TAX RATES	1.066	1.058	58%
HIGHER MONETARY TARGETS	1.063	1.052	58%
INVESTMENT SUBSIDIES (FIXED INVESTMENT TARGETS)	1.075	1.065	68%
SELF-LIQUIDATING EMPLOYMENT SUBSIDIES	1.080	1.093	71%

TABLE A1. THE MULTIMOD BASELINE (1988 PRICES)

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
GERMANY (BIL. D-MARK)													
GNP	1928.75	1983.70	2038.12	2089.60	2142.33	2196.61	2252.15	2316.75	2383.27	2451.76	2522.26	2594.87	2669.64
GDP	1928.83	1983.78	2038.21	2089.68	2142.41	2196.69	2252.24	2316.84	2383.36	2451.85	2522.36	2594.97	2669.73
of which:													
WESTERN GERMANY (BIL. D-MARK)													
GDP	1756.42	1803.78	1850.29	1893.49	1937.59	1982.86	2029.00	2083.78	2140.04	2197.82	2257.16	2318.10	2380.68
EASTERN GERMANY (BIL. D-MARK)													
GDP	172.41	180.00	187.92	196.19	204.82	213.83	223.24	233.06	243.32	254.03	265.20	276.87	289.05
PRICE INDEX	1.28	1.31	1.34	1.37	1.40	1.44	1.47	1.53	1.59	1.65	1.72	1.79	1.86
INTEREST RATE (S-R)	6.65	6.80	6.80	6.80	6.80	6.80	6.80	6.80	6.80	6.80	6.81	6.81	6.81
INTEREST RATE (L-R)	6.95	7.00	6.71	6.55	6.41	6.27	6.13	6.26	6.39	6.53	6.67	6.81	6.81
NOMINAL EFFECTIVE EX/R	1.14	1.15	1.16	1.18	1.19	1.20	1.22	1.22	1.22	1.22	1.22	1.22	1.22
CURRENT ACCOUNT	165.92	183.82	199.51	216.58	234.32	252.83	272.48	274.94	274.36	271.81	267.06	259.87	249.96
GOVT.DEFICIT	6.75	23.50	22.32	20.77	21.75	19.92	20.85	54.85	58.36	62.35	66.91	71.84	77.16
INVESTMENT	343.32	352.27	369.09	377.70	386.50	395.53	404.74	415.66	426.89	438.41	450.25	462.40	474.89
US (BIL. $)													
GDP	3725.83	3812.64	3915.58	4021.29	4129.86	4241.36	4355.87	4473.48	4594.26	4718.30	4845.69	4976.52	5110.88
PRICE INDEX	1.48	1.55	1.62	1.69	1.76	1.83	1.90	1.98	2.06	2.14	2.22	2.31	2.40
INTEREST RATE (S-R)	8.40	8.00	8.00	8.00	8.00	8.00	8.00	7.75	7.50	7.26	7.03	6.81	6.81
NOMINAL EFFECTIVE EX/R	1.07	1.08	1.07	1.05	1.04	1.03	1.01	1.01	1.01	1.01	1.01	1.01	1.01
CURRENT ACCOUNT	-135.00	-151.95	-174.30	-189.60	-206.70	-223.00	-238.70	-254.95	-272.31	-290.84	-310.64	-331.79	-354.38
GOVT.DEFICIT	102.40	95.30	83.96	70.60	54.89	36.64	15.65	185.48	195.29	205.22	215.26	225.45	235.77
INVESTMENT	634.43	650.25	737.08	774.90	809.62	850.38	887.89	911.86	936.48	961.77	987.74	1014.40	1041.79
JAPAN (000' BIL. YEN)													
GDP	347.39	363.17	378.30	394.18	410.74	427.99	445.97	458.01	470.37	483.07	496.11	509.51	523.27
PRICE INDEX	1.13	1.14	1.16	1.17	1.18	1.19	1.20	1.25	1.30	1.35	1.41	1.46	1.52
INTEREST RATE (S-R)	5.00	5.30	5.30	5.30	5.30	5.30	5.30	5.57	5.86	6.16	6.48	6.81	6.81
NOMINAL EFFECTIVE EX/R	1.92	1.94	1.99	2.04	2.09	2.15	2.20	2.20	2.20	2.20	2.20	2.20	2.20
CURRENT ACCOUNT	15.93	19.72	20.32	20.87	21.27	21.55	21.74	22.45	22.91	23.26	23.48	23.57	23.50
GOVT.DEFICIT	-6.70	-8.58	-9.18	-9.66	-10.17	-10.70	-11.26	3.57	3.81	4.06	4.31	4.58	4.86
INVESTMENT	108.91	114.27	119.48	124.97	130.71	136.71	142.98	146.84	150.80	154.87	159.05	163.35	167.76
UK (BIL. POUND)													
GDP	286.97	295.56	303.54	311.73	320.15	328.80	337.67	346.79	356.15	365.77	375.64	385.79	396.20
PRICE INDEX	1.73	1.83	1.92	1.99	2.06	2.12	2.19	2.28	2.37	2.46	2.56	2.66	2.77
INTEREST RATE (S-R)	14.00	10.70	9.00	8.50	8.00	7.50	7.50	7.36	7.22	7.08	6.94	6.81	6.81
NOMINAL EFFECTIVE EX/R	0.80	0.77	0.76	0.76	0.75	0.75	0.74	0.74	0.74	0.74	0.74	0.74	0.74
CURRENT ACCOUNT	-24.89	-20.96	-16.65	-16.49	-15.65	-14.09	-12.11	-12.92	-13.61	-14.21	-14.73	-15.14	-15.42
GOVT.DEFICIT	-12.10	-16.03	-14.54	-12.42	-9.90	-6.98	-7.39	0.53	0.59	0.64	0.70	0.76	0.83
INVESTMENT	57.33	57.13	59.69	60.95	62.59	64.28	66.02	67.80	69.63	71.51	73.44	75.43	77.46
FRANCE (BIL. FFr.)													
GDP	3380.88	3482.74	3587.94	3699.83	3814.50	3932.78	4058.32	4187.89	4280.42	4395.98	4514.67	4636.56	4761.75
PRICE INDEX	1.79	1.84	1.88	1.93	1.98	2.03	2.08	2.16	2.25	2.34	2.43	2.53	2.63
INTEREST RATE (S-R)	8.50	8.20	8.20	8.20	8.20	8.20	8.20	7.90	7.61	7.33	7.07	6.81	6.81
NOMINAL EFFECTIVE EX/R	0.74	0.74	0.75	0.75	0.76	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77
CURRENT ACCOUNT	41.33	30.62	36.95	44.95	54.58	70.41	83.52	80.44	76.58	71.72	65.72	58.46	49.81
GOVT.DEFICIT	94.50	94.00	76.05	69.32	64.69	60.97	59.88	168.68	178.68	187.59	195.01	202.26	209.34
INVESTMENT	575.09	597.54	620.27	643.92	668.52	692.07	716.48	735.83	755.69	776.09	797.05	818.57	840.67
ITALY (000' BIL. Lire)													
GDP	475.59	489.55	504.21	519.48	535.24	551.46	568.25	583.60	599.35	615.53	632.15	649.22	666.75
PRICE INDEX	2.59	2.62	2.74	2.85	2.96	3.07	3.18	3.31	3.44	3.58	3.72	3.87	4.02
INTEREST RATE (S-R)	12.40	11.60	11.00	10.60	10.30	10.20	10.20	9.41	8.68	8.00	7.38	6.81	6.81
NOMINAL EFFECTIVE EX/R	0.68	0.67	0.67	0.66	0.65	0.65	0.64	0.64	0.64	0.64	0.64	0.64	0.64
CURRENT ACCOUNT	-15.96	-21.07	-27.74	-31.52	-36.01	-40.06	-43.65	-43.99	-43.84	-43.37	-42.54	-41.32	-39.66
GOVT.DEFICIT	127.98	134.96	140.83	146.43	150.27	153.82	157.12	225.57	235.20	241.13	242.65	242.67	241.36
INVESTMENT	97.33	99.04	100.86	105.92	107.07	110.32	113.68	116.75	119.90	123.13	126.46	129.87	133.38
OTHER OECD COUNTRIES (BIL. $)													
GDP	1506.33	1541.21	1584.92	1630.10	1676.73	1724.88	1774.60	1822.51	1871.72	1922.25	1974.15	2027.45	2082.19
PRICE INDEX	1.82	1.91	1.98	2.06	2.14	2.23	2.32	2.41	2.51	2.61	2.71	2.82	2.93
INTEREST RATE (S-R)	9.34	7.86	8.04	7.96	7.97	7.98	6.80	6.80	6.80	6.80	6.81	6.81	6.81
NOMINAL EFFECTIVE EX/R	0.78	0.77	0.77	0.76	0.76	0.75	0.74	0.74	0.74	0.74	0.74	0.74	0.74
CURRENT ACCOUNT	28.16	16.04	10.89	6.92	-1.38	-9.52	-19.28	-25.51	-31.49	-37.58	-43.77	-50.08	-56.53
GOVT.DEFICIT	5.79	20.05	19.08	17.84	18.76	17.26	18.15	76.06	80.00	85.06	91.48	98.45	106.03
INVESTMENT	306.43	314.48	319.46	324.54	328.52	332.56	336.65	345.74	355.07	364.66	374.50	384.61	395.00

Appendix A

The Original MULTIMOD Specification

MULTIMOD is an annual multicountry econometric model, used to construct the medium term scenarios which are published in the IMF's annual review World Economic Outlook. The models' specification explains the main expenditure categories and production flows in each country, from which employment, investment, prices, interest rates and exchange rates are determined. Financial markets, trade flows, and capital movements (including loans and interest payments) are included.

Trade itself is divided into three markets; oil, primary commodities and manufactured goods. The oil market contains an exogenous real price, demand driven by activity levels in each country, and supplies that clear the market. Perfectly flexible prices clear the commodity markets, where demands are driven by activity levels and supplies by prices and a predetermined capacity. Manufactured goods are produced and traded everywhere.

Aggregate demand is then built up from consumption, investment, import and export expenditures, plus government expenditures, and it determines output in the short run. Long run or potential output is determined by a production function, so capacity utilisation (the ratio of actual to potential output) can vary. Domestic output prices are subject to a Phillips curve, such that the higher the capacity utilisation the greater the inflation pressure. So there is no absolute output constraint, and prices change by an amount depending on the remaining spare capacity and the state of the labour market.

Finally governments are modelled with explanations of their fiscal expenditures and receipts, and of their monetary instruments and monetary targets. Taxes are endogenous, being driven by a government budget constraint and the cost of financing any deficits through domestic or foreign asset sales. Much of the behaviour is forward looking (with respect to the financial variables, inflation, interest and exchange rates, also certain expenditure categories) in the sense that expectations of future events influence current decisions and are themselves solved jointly with current forecasts of prices, output, investment, debt servicing capacity, interest rates, consumption etc.

The East German Components

Various modifications have to be made to the German model within MULTIMOD to incorporate East Germany. The first is to sum the two populations. The two labour forces are treated as separate, but homogenous in quality, before full productivity convergence is achieved. No specific account is taken of migration therefore: labour supply is (costlessly) elastic in both parts of Germany. We also assume that, after unification, both economies produce a single homogeneous product - although at a very low level of productivity in the East. Thus we maintain two separate production functions to describe potential output: the Western function is unchanged, and the Eastern function implies access to the same technology but a very small capital stock. To get an estimate of the initial capital stock in the east, we start with the 1989 labour force (i.e. immediately before unification when there was still 100% employment) and a productivity level estimate at 30% of the West to give the Eastern

output capacity at unification. We then compute the capital stock which, when applied to the Western production technology, would give that same Eastern output capacity. That aligns the East German starting point with its Western production function equivalent. It also avoids having to measure capital or output from incompatible and unreliable East German data, or from arbitrary assumptions such as taking the capital stock to be worthless (which would have falsified the evidence by implying zero production in the East). After that all new investment is West German in quality and can be added to the revalued initial stock. We likewise assume that East Germany will install the same production technology as the west after unification. That allows us to add new production potential to our re-evaluation of the old. But only when Eastern productivity catches up the Western level can we merge the two production functions into a single explanation of German productive potential. That is shown as follows:

The original MULTIMOD had a West German Cobb-Douglas production function:
$Y_w = \alpha L^{1-\beta}_w K^{\beta}_w$ where Y_W is capacity output
L_W is labour force
K_W is real net capital stock

Our calculations assume that East Germany will operate according to the same type of production function after re-unification: $Y_E = \alpha L^{1-\beta}_E K^{\beta}_E$. If all new investment comes from West Germany and the eastern labour force is homogenous to the west, then aggregate production is $Y = Y_w + Y_E$. But only if the capital-labour ratios and productivity levels are equalised, [i.e. $K_w/L_w = K_E/L_E = K/L$, since productivity is given by $Y_w/L_w = \alpha(K_w/L_w)^{\beta}$ and $Y_E/L_E = \alpha(K_E/L_E)^{\beta}$], do we get:

$$\begin{aligned} Y &= \alpha L_w (K_w/L_w)^{\beta} + \alpha L_E (K_E/L_E)^{\beta} \\ &= \alpha(L_w+L_E)(K/L)^{\beta} \\ &= \alpha(L_w+L_E)^{1-\beta}(K_w+K_E)^{\beta} \end{aligned}$$

The demand side of the model is simpler to deal with. East and West Germany are assumed to have identical tastes and face similar prices. That is an approximation given differences in some markets such as housing; but all the subsidies on food, transport, energy etc have now been eliminated, so it is not a bad approximation. Likewise interest rates, taxes, social security payments etc are common to both parts. Hence all West German demand and expenditure functions may be used as if they applied to all Germany, once Eastern and Western incomes and expenditures have been lumped together. The only exception to that is East German wages during the transition. The discussion in sections 2 and 3 made it clear that East German wage movements have in fact moved counter to market forces. The usual wage determination equation therefore had to be suspended for East German wages. Instead they are linked to the West German wage level by a "mark-down" factor which can be set to control the speed of convergence. From their pronouncements, this is clearly what the West German policy makers and unions intended should happen (Akerlof et al, 1991).

Finally Government expenditures have to be increased after unification. The IMF estimates that the total cost to the year 2001 will be DM 1700bn (McDonald and Thumann, 1990). We suppose that half of that will be paid for by central and local government, spread as a declining balance over 15

years to cover fiscal transfers, social security, infrastructure and private investment support. Accordingly we add DM 850bn to the exogenous government spending, as the fiscal shock of unification, spread as DM 56bn, 160bn, 120bn, 70bn in 1990, 1991, 1992 and 1993 respectively, and then DM 37bn each year until 2005. That corresponds to a fiscal shock of 7.9% of GDP at its peak, but of 1.5% or less after 1994. These figures are fairly close to current expenditures, estimated to be running at DM100bn-140bn per year at present, and match those in the IMF's own investigation if the private sector picks up the remainder of the bill. These figures, plus our model changes, and an unchanged information set for the rest of the world, define the reference scenario: it is unification with no other policy changes.

Model Sensitives (in MULTIMOD)

In their simulations of the macroeconomic consequences of German unification, Masson and Meredith (1990) tested the sensitivity of their results to 4 further changes to MULTIMOD: changes in money demand upon unification, sharper inflation reactions to increasing capacity utilisation, lower savings/investment rate elasticities, and higher relative price elasticities for traded goods in Europe. Like Masson and Meredith, we assume that the Bundesbank will continue to conduct monetary policy using the same decision rules, but applied to the post-unification monetary aggregates. So far experience bears that assumption out. In practice the Bundesbank uses short-term interest rates to hold a target range for M3, rather than cash (Mo) as in the model. But Masson and Meredith find that the model's Mo targetting rules generate results which are very close to the Bundesbank's actual M3 targetting rule. So that distinction can safely be ignored here.

Secondly Masson and Meredith question the model's linear response of inflation to demand pressure (as measured by capacity utilisation). They try a cubic response, which implies inflation accelerates as capacity utilisation approaches 100%, but that price responses are flatter (stickier) for a range of capacity utilisation below that (before falling fast at low activity levels). That seems reasonable: as output approaches its limit we might expect an increasingly sharp price response instead of a constant one. However the changes to the reference unification scenario were minor when these nonlinear responses were introduced: small (less than a ¼% point) changes appear in inflation, the real effective DM rate, and the interest rate figures for 1990-91. But thereafter, and in other variables, no changes appeared. This refinement too has been ignored therefore.

Masson and Meredith also point out that macroeconomic theory contains a major unresolved debate on the responsiveness of savings (consumption) and investment to interest rate changes. The size of those interest rate elasticities are, in principle, fundamental to a macromodels specification, and in section 3 we noted that they play a crucial rule in the savings-investment relationship which underlies the whole unification process. MULTIMOD has fairly large interest rate elasticities for consumption and investment, so it is important to check that the projected outcomes of unification are not much affected if the elasticities were smaller. In a sensitivity test which halves the consumption elasticities, and reduces the investment elasticities by 20%, the changes to the

reference scenario were found to be very small: less than 0.3% points for GDP and the real DM rate in 1990-1992, 0.8% on the interest rate itself, but zero everywhere else. This amendment was also ignored in our simulations.

The final change was to increase the price elasticities in the trade equations for the European countries, to reflect the increasing market integration after 1992. This might well damage unified German economy's capacity to expand if competitiveness is reduced by inflation and excess demand. This does in fact happen when the price elasticities are doubled, but the numerical effects are negligible as far as Germany is concerned (less than 0.1% points off output growth and on the current account to GDP ratio while growth in the other DM countries improves by 0.1-0.2% points). This refinement can also be ignored.

Sensitivity to the East German Model Specification:
It is also possible that the results obtained here are sensitive to the specification of the East German equations which have been added to the model. The specification of those equations is necessarily tentative since we necessarily have very little firm evidence of East German economic reactions. There are three elements: investment, output and the evolution of wages. A stronger response in any of those might reduce Germany's unification costs and shorten the catch up period.

(a) The last of these, Eastern wages, has already been investigated. Tables 3 and 4 showed that our results were somewhat sensitive to slower or faster wages growth, but not by enough to disturb the overall conclusions in any way. Output growth moves from 5½% p.a. to 6½% p.a., and the full catch up period from 40 years to about 37 years. Our conclusions do not change therefore, although we recognise a Lucas-type critique might appear here in that East German wage bargaining behaviour might change over the 1990s in response to the new government policies and market arrangements which they are now experiencing. Our simulations show that that is true, but the East German sector is too small a component of Germany to make a large difference. Moreover wage bargaining has moved counter to market forces, implying that behaviour has actually changed in a way which would slow up convergence. The Lucas critique therefore suggests that, if anything, our figures underestimate the convergence problem.

(b) Output growth in East Germany is restricted by the assumption that new productive capacity should obey the same Cobb-Douglas production function as in the west. That seems reasonable given the higher Western productivity levels and that much of the Eastern investment will be made by Western firms or subsidiaries of Western firms. It is perhaps hard to imagine that new investment would provide capacity that was significantly more productive than that existing in West Germany. It might happen, but even then it is not clear how much impact that could have overall since (after full convergence) Eastern output will still only be about 20% of the total. A massive change in the production function would therefore be necessary to disturb the conclusions reached in the main text. As it is, we find a near-doubling of output growth rate (5.4% to 9.3% p.a.) only reduced the convergence period from 40 years to 30 years (tables 1,6 and

9). We have therefore ignored this sensitivity as unimportant in our story, although it could be tested further.

(c) Investment responses are fairly weak in all the unification scenarios, even those with investment subsidies. It is important to check whether this is due to the particular investment function used or to the forward looking behaviour which anticipates weak growth and a slow productivity catch up. If it is the former the results may be sensitive to plausible model changes. But if it is the latter our results will not be sensitive to the particular investment function. And, having said that, one must remember that this investment will remain a small proportion of the combined German economy and almost all of it is now being undertaken by Western firms or according to Western criteria. It would therefore take a massive change in Western investment behaviour to produce a very different investment function.

In fact investment is determined by Tobin's model of the gap between the market values of existing capital and its replacement cost. That market value is a discounted sum of expected future earnings of capital, each component of which is the real after-tax income generated by the then existing capital stock (i.e. the value of its marginal product times that capital stock at that point). Since the marginal product is a function of the output-capital ratio, the market value of existing capital is a forward looking function of expected future output levels discounted by the cost of capital: schematically

$$I_t = \alpha_0+\alpha_1 (V_t-K_{t-1})$$

where $V_t=(\beta P_t Y_t-tax)/CPI_t+V_{t+1}/(1+r_t+risk+D)$ is the current market value of capital, risk=risk premium, Δ=depreciation (Masson, Symanski and Meredith, 1990). Consequently low output growth anticipated at any point in the future, especially following the initial surge in demand, will depress investment now; and hence lower the growth rates to be expected in the future yet further. Similarly, high interest rates now or in the future, driven by the need to finance a large and continuing fiscal deficit and/or by the Bundesbank's anti-inflation policy reactions, will not only crowd investment out in the usual way, but also depress the market's evaluation of any given income stream in the future. (And, by appreciating the DM, high interest rates would in fact reduce that income stream even further). Hence rising interest rates also reduce the incentive to invest. In other words to get rid of the weak investment responses we would have to take out the marginal productivity (income dependence) terms, and the cost of capital terms and the forward looking behaviour from investment decision making, rather than go to an alternative functional specification and new parameters. From a theoretical perspective, that is not a plausible change.