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**One Money for Europe?
Lessons from the US Currency Union**

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exchange-rate uncertainty can the full benefits of economic integration be obtained. Merely freeing trade in commodities and permitting international movement of labour and capital will not deliver the benefits of integration. Capital controls increase the bureaucratic complexity of foreign investment. Exchange risk discourages firms from contemplating it. Unfortunately, the European Monetary System traditionally has relied on capital controls and periodic exchange-rate realignments to reconcile national policy autonomy with intervals of exchange-rate stability.^{2/} Thus, to obtain the benefits of the single market, the argument runs, either exchange-rate stability within Europe must be sacrificed, perhaps through the adoption of crawling pegs (Dornbusch 1988), or else national policies must be more tightly harmonized, presumably through the medium of a single central bank.

Insofar as capital controls have had these effects in the past, it is argued, the removal of other barriers to integration will soon undermine their effectiveness (Servais, 1988). No longer will it be possible to segment national markets for short-term financial assets since there will exist so many opportunities for evasion. The implication is that the single market and the EMS of the 1980s are fundamentally incompatible, and that if exchange rate stability is to be maintained, national policies within Europe will have to be more closely harmonized. But even if policies are harmonized closely, there will remain the danger of speculative crises. Adverse expectations may create self-fulfilling convertibility crises even in countries where economic fundamentals are strong. Hence the argument for a European central bank to eliminate all prospect of exchange-rate changes and all danger of adverse speculation.

To an American observer, a European central bank and a common currency are radical ideas. But imagine 50 US states with 50 different currencies, responds the European to the skeptical American. A common currency, like permanently fixed exchange rates, encourages flows of commodities, capital and labour between states by eliminating exchange-rate

uncertainty and reducing transactions costs. By encouraging factor mobility, a common currency and an integrated market enhance the capacity of member states to accommodate balance of payments disturbances. More controversial is the assertion that these gains are obtained at a cost that is dwarfed by the benefits. A permanently fixed exchange rate requires those who join the currency union to sacrifice autonomy of monetary policy and possibly fiscal autonomy as well. No longer can exchange rate changes be used to resolve conflicts between internal and external balance.

Here the skeptical European responds that the 50 US states evince no desire for independent macroeconomic policies. Neither does one hear talk of balance-of-payments "problems" among the states, or of regional problems severe enough to induce them to secede from the Federal Reserve System.

This paper analyzes these issues from two complementary perspectives. Part I explores the conceptual issues and assesses their empirical importance by examining recent European experience. I start with the question of whether capital controls are inimical to economic integration. The answer turns out to hinge on issues of technology, transport costs, market structure, and international labour mobility. I then analyze the extent to which integration in general and the removal of capital controls in particular require monetary and fiscal harmonization. Both theory and evidence suggest that considerable harmonization of monetary policies already has occurred. There appears to have been considerably less pressure for fiscal harmonization. It does not appear to be possible, however, on the basis of abstract reasoning alone to determine how much additional harmonization will be required in the future.

For evidence on these questions, the second part of the paper examines US experience with customs and monetary union. I take seriously the analogy between the United States of America and the "United States of Europe." I first consider the institutional mechanisms

designed to resolve regional conflicts over economic policies within the United States. I then assess the notion that the single US market differs fundamentally from its more balkanized EC counterpart in its capacity to accommodate disturbances and in the constraints it imposes on member states.

It is a common observation that balance of payments problems do not arise within the United States. I use some unusual data to analyze exactly how interregional payments balance is maintained. This enables us to ask whether or not the conditions for replicating the American situation are present in Europe.

To assess the notion that creation of a European exchange-rate union will require not only the harmonization of national monetary policies but close coordination of fiscal policies as well, I analyze state budget balances within the US. A related assertion is that following the elimination of controls on short-term capital and long-term foreign investment it will not be possible to sustain corporate tax rates that differ significantly across states. Hence the imperative of fiscal harmonization will equalize not only the level of deficit spending but the level of government expenditure throughout Europe. I assess this proposition by analyzing variations in tax rates and levels of public expenditure within the United States. A final assertion is that interregional movements of capital and labour largely eliminate the problems of depressed regions that would otherwise arise in the US currency/customs union. I examine data on regional unemployment in the United States as a way of gauging the likely European response.

Heroic assumptions are required to export the lessons of US experience to Europe. The concluding section therefore speculates about the extent to which US experience is an export good.

2. Conceptual Issues in Light of Recent European Experience

"It appears that Europe has reached a halfway house, a point at which it cannot stand still. Creation of a common market for agricultural and manufactured products and integration of money and capital markets have already gone so far that, with fixed exchange rates, nations can no longer pursue divergent monetary policies....Exchange controls can have some influence on capital flows, but not enough to alter the outcome. Either exchange rates will be forced to change or extensive restrictions on trade and payments must be introduced, subverting economic integration."

Ingram, "The Case for European Monetary Integration," pp. 3-4.

In this quotation, James Ingram boldly states the *raison d'être* for a European central bank. Exchange rate stability requires close international monetary policy coordination. Exchange controls once provided European policymakers room for manoeuvre, but continued integration of commodity, labour and capital markets has undermined their effectiveness. Either the member nations of the EC must reject fixed exchange rates, which is regarded as antithetical to integration, or they must more closely coordinate their macroeconomic policies, perhaps through the agency of a European central bank.^{3/}

The problem with Ingram's passage is that it was written nearly 20 years ago! Since then, European economic integration has proceeded apace. It is not obvious that the maintenance of capital controls has hindered integration. Nor is it obvious that integration has destroyed the effectiveness of controls. And if exchange controls and progress toward integration have coexisted for decades, why cannot they continue to coexist?

Whether capital controls are inimical to completion of the internal market therefore boils down to whether international capital mobility is necessary to obtain the benefits of integration.^{5/} There is no general answer to this question. The answer depends on technology, industry structure, transport costs, and the mobility of other factors of production. Appendix A sketches the precise conditions under which different answers obtain.

If all goods are tradable (transport costs are negligible), nondifferentiated and produced using constant-returns-to-scale technologies, and if industry structure is perfectly competitive, then free trade in goods alone or at most free trade plus mobility of a subset of productive factors suffices to deliver the full benefits of integration. If factor endowments are similar across countries, factor prices will be equalized by trade alone (as in the factor-price equalization theorem of the Heckscher-Ohlin Model), and free trade is Pareto optimal. If factor proportions differ by too much to prevent specialization in production, then mobility of one factor of production (say, labour) will suffice to insure factor price equalization and the first-best allocation of resources. There is no need for mobility of other factors (say, capital).

Admitting the existence of nontraded goods does not overturn this conclusion. It narrows the range of factor proportions for which commodity trade alone delivers the full benefits of integration, and hence heightens the need for international factor mobility. But it does not change the conclusion that mobility of one factor, or of a subset of factors, suffices to obtain the full benefits of integration. Imagine that nontraded goods (say, services) are produced using labour alone. Then the first-best allocation of resources merely requires labour to migrate between countries to insure that the supply of services in each member of the customs union just equals the demand.^{6/}

What may overturn this conclusion is the existence of external economies. If there exist increasing returns to scale that are external to the firm but internal to other firms in the same industry in the same country, then it is efficient to concentrate that industry in a single country so that all potential external economies can be reaped. An agglomeration of producers may facilitate the development of a skilled labour force that the entire industry can employ. Learning by doing may spill over among firms in close proximity. Silicon Valley in California and Silicon Glen in Scotland arguably owe their existence of such externalities. The appropriate degree of concentration will obtain by definition in an integrated world. But in a world of many countries, it is feasible only if one country possesses all the factors of production utilized by the relevant industry, or if all the necessary factors are free to migrate. If the increasing-returns industry is capital intensive, labour mobility alone may not suffice to concentrate production of the increasing-returns good in one country. It may be necessary to permit international capital mobility as well.

Significantly, it is economies of scale, not differentiated products, the other element of models of international trade with imperfect competition, that may necessitate the mobility of more than a subset of factors of production. If, for example, there exist no external economies but firms produce differentiated products subject to declining average costs and free entry (the assumptions of Chamberlinian competition), there will be no productive efficiency grounds for concentrating the differentiated products industry (or any other industry) in one country, and hence mobility of a subset of factors of production will suffice.

The same conclusions follow in the presence of intermediate inputs. If intermediates are homogeneous goods produced under constant returns and perfect competition, either free trade in goods (both final and intermediate) or at most free movements of goods and a subset of productive factors is sufficient to deliver the full benefits of economic integration. But if intermediates are nontraded, differentiated products and if productive efficiency rises

with the range of differentiated inputs the intermediate-using industry can employ (in effect, a positive externality spilling over from the intermediates industry to manufacturing), it will be efficient to concentrate the entire industrial complex (intermediate-input-producing firms and intermediate-input-using firms) in one country. If that complex is sufficiently capital intensive, then trade in goods plus mobility of labour alone may be inadequate to deliver the full benefits of integration.

Thus, whether capital controls are inconsistent with the benefits of full integration hinges on the importance in Europe of external economies in capital-intensive sectors. If external economies are negligible, free trade in goods and international labour mobility deliver the full benefits of integration. This is true whether one views European manufactured goods as relatively homogenous and produced by constant-returns-to-scale technologies (in other words, whether one believes that the standard Heckscher-Ohlin model is an adequate characterization of European industry) or as differentiated and produced subject to increasing returns and free entry (one believes that a model of Chamberlinian competition better characterizes European manufacturing). Only if external economies exist at the level of national industries may international capital mobility also be required.

Caballero and Lyons (1989) have attempted to estimate the extent of external economies in Germany, France, the U.K. and Belgium. They find significant external economies in all four countries, although their economic importance appears to be greater in France and Belgium than in Germany and the U.K. If these estimates are correct, then the retention of controls on capital movements well may be incompatible with the full benefits of the single market.

Even if external economies are negligible, substituting labour mobility for capital mobility may be inadequate if the costs of labour mobility are high. Policies which permit migration but prevent foreign investment may fail to deliver the full benefits of integration if

nonnegligible costs of labour mobility limit the labour movements that take place. Molle and Mourik (1988) have recently studied the responsiveness of labour flows to changes in economic conditions within the EC. They find that migration is responsive to wage differentials between sending and receiving countries. But they also find that cultural differences between sending and receiving countries serve as significant impediments to migration. These cultural differences are precisely the kind of costs that might prevent the elimination of barriers to migration within the EC from delivering the full benefits of the single market.

Acknowledging costs of labour mobility reinforces the conclusion that capital controls will be a drag on economic integration. If so, controls must be eliminated to deliver the full benefits of the internal market. And since the elimination of controls destroys the scope for periodic realignments within the EMS, the EC has no alternative to irrevocably fixed exchange rates. Fixed exchange rates are only credible when governments invest in new institutions that render exchange-rate changes costly. Hence the case for a common currency and a European central bank.

In fact, there are at least two other options. One is a gliding peg system of exchange rates that are adjusted in preannounced, predictable directions, as advocated by Dornbusch (1988). Countries which rely heavily on seigniorage or reap other benefits from devaluing their currencies can do so in a predictable way. A second option is a Tobin tax, applied to purchases of foreign securities or to deposits in foreign bank accounts, as advocated by Wyplosz (1989). Each time an investor moves wealth across a national border, she would be required to pay a one (or two, or five) per cent transactions tax on the principal. The tax on a round trip would be double this amount. Such a tax should deter an individual tempted by short-term speculative transactions more than a long-term investor able to defray the cost of the tax over a period of years.

TABLE 3

RATES OF GROWTH OF MONETARY AGGREGATES, 1974-1988

	<u>% Change in Narrow Money</u> (M1)			<u>% Change in Broad Money</u> (M1 + Quasi Money)		
	<u>Average</u> 1974-78	<u>Average</u> 1979-84	<u>Average</u> 1985-88	<u>Average</u> 1974-78	<u>Average</u> 1979-84	<u>Average</u> 1985-88
Belgium	8.6	2.9	5.3	10.5	6.0	7.5
Denmark	12.7	14.5	15.5*	12.3	14.6	10.6*
France	11.5	11.0	4.4	14.5	10.6	8.8
Germany	10.9	4.4	8.5	9.4	5.3	6.6
Ireland	19.0	8.6	6.0	19.6	11.1	9.1
Italy	17.8	14.7	9.6*	21.2	13.9	8.4*
Netherlands	11.4	5.5	7.0	14.1	7.1	5.4
Arith. Avg.	13.1	8.8	8.1	14.5	9.8	8.0
Stand. Dev.	3.6	4.4	3.8	4.1	3.5	1.7
High-Low Dif.	10.5	11.8	11.1	11.9	9.4	5.3
Coef. of Var.	0.27	0.50	0.47	0.28	0.36	0.22
Australia	9.6	10.0	12.8	11.6	11.8	15.4
Austria	7.5	4.2	2.68	14.2	8.9	7.0
Canada	7.7	8.7	15.2	13.9	13.0	8.1
Finland	13.5	13.8	9.8	15.1	15.2	15.3
Greece	19.5	18.5	16.6*	23.0	23.7	21.7*
Iceland	35.0	61.7	5.69	36.4	60.2	35.6
Japan	11.3	3.8	6.7	12.7	7.9	9.8
New Zealand	9.0	7.9	21.9*	14.7	14.1	25.0*
Norway	9.3	12.6	24.0	13.3	13.4	10.3
Portugal	14.5	16.1	22.7	16.9	24.7	16.7
Spain	18.7	9.5	16.4	19.3	14.5	13.2
Sweden	11.6	NA	6.1*	10.5	11.0	7.9*
Switzerland	7.0	1.4	3.3	4.2	9.0	5.7
UK	15.5	11.4	19.1	11.1	15.8	18.5
US	6.4	7.4	9.1	10.0	8.6	7.1
Arith. Avg.	13.1	12.5	17.8	15.1	16.8	14.5
Stand. Dev.	7.1	14.2	12.9	7.0	12.6	8.2
High-Low Dif.	28	60.3	53.6	32.2	51.6	29.9
Coef. of Var.	0.54	1.14	0.73	0.47	0.75	0.57

Note: * Missing observation for 1987/88

Source: 1974-78 and 1979-84: Ungerer et al. (1986), pp. 61-62.
1985-88: International Financial Statistics (various issues).

does it imply that they also must harmonize levels of taxation, which, together with the first proposition, implies harmonization of levels of public expenditure?

2.3.1. Deficit Spending

Table 4 summarizes Europe's experience with fiscal harmonization. It shows two measures of fiscal stance since 1982: structural budget balances as a per cent of potential GNP, and net government borrowing as a per cent of GDP. In contrast with monetary policy, there is no evidence of significant fiscal convergence. As of 1987, structural budget balances still ranged from -10 per cent of GNP for Italy to +5 per cent for Denmark. Insofar as the fiscal constraint exists, there is little evidence that it has begun to bind.

The basis of the fiscal convergence argument is straightforward. Consider a country which runs a deficit in excess of that run by the other countries against which it fixes its exchange rate. If the government attempts to monetize its deficit, it cannot print more money than the public will hold at the interest rates prevailing in the union. To prevent the exchange rate from depreciating, the central bank will have to absorb the excess money in return for domestic or foreign assets. It cannot run down reserves indefinitely without undermining its ability to peg the exchange rate. Nor can it issue domestic debt indefinitely without similarly courting a run on its reserves and a convertibility crisis. Current budget deficits (in excess of those permitted by the constraint of union membership) therefore will have to be offset by surpluses in the future. This is the characterization of the fiscal implications of monetary union in Cohen and Wyplosz (1989), for example.

The point is not simply that members of an exchange-rate union face a government budget constraint. Governments with discretion over their exchange rates face the same budget constraint. So does the mythical closed economy. The point, rather, is that members of an exchange-rate union also face a second constraint, namely the exchange-rate constraint.

TABLE 4
MEASURES OF FISCAL STANCE

STRUCTURAL BUDGET BALANCE AS PERCENT OF POTENTIAL GNP
(in percentage points)

<u>Country</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>
Belgium	-10.52	-11.25	-11.00	-8.89	-9.52	NA
Denmark	-8.58	-13.01	-5.27	-1.93	3.77	4.92
France	-2.31	-1.97	-2.21	-2.46	-2.75	-2.39
Germany	-0.66	-1.48	-2.23	-0.66	-0.60	-0.87
Greece	-6.64	-8.88	-9.89	-13.69	-9.78	-10.14
Ireland	-15.46	-11.37	-11.97	-11.93	-10.67	-9.44
Italy	-10.03	-10.68	-11.25	-12.94	-10.81	-10.61
Netherlands	-4.99	-5.73	-6.70	-4.56	-4.53	-5.85
Spain	-4.64	-4.64	-4.94	-6.36	-5.26	NA
UK	-2.00	-4.13	-2.83	-3.15	-1.98	NA
Mean	-6.58	-7.32	-6.83	-6.66	-5.21	-4.91
Std. dev.	4.36	4.00	3.70	4.63	4.68	5.35

NET LENDING (+) OR NET BORROWING (-) OF GENERAL GOVERNMENT
AS A PERCENT OF GDP AT CURRENT MARKET PRICES

	<u>1982/83</u>	<u>1983/84</u>	<u>1984/85</u>	<u>1985/86</u>	<u>1986/87</u>	<u>1987/88</u>
Belgium	-11.2	-9.3	-8.3	-8.9	-7.2	-7.1
Denmark	-7.2	-4.1	-2.0	+3.1	+2.1	+0.9
France	-3.2	-2.8	-2.8	-2.9	-2.5	-1.9
Germany	-2.5	-1.9	-1.1	-1.3	-1.8	-2.3
Greece	-8.3	-10.0	-13.6	-10.8	-9.5	-12.1
Ireland	-11.6	-9.6	-11.1	-11.0	-9.1	-6.5
Italy	-10.6	-11.5	-12.5	-11.4	-10.5	-10.0
Luxembourg	+1.6	+2.9	+5.8	+6.0	+5.2	+5.3
Netherlands	-6.3	-6.2	-4.7	-6.0	-6.3	-5.2
Portugal	-9.1	-12.0	-10.1	-7.8	-8.4	-8.1
Spain	-4.8	-5.5	-7.0	-5.7	-3.6	-3.0
UK	-3.3	-3.9	-2.7	-2.4	-1.4	-0.3
Mean	-6.375	-6.16	-5.842	-4.925	-4.42	-4.19
Std. dev.	3.882	4.28	5.41	5.37	4.72	4.72

Source: For structural budget balances, Muller and Price (1984), and author's calculations based on data from OECD Main Economic Indicators.

For net lending or borrowing, European Economy Annual Economic Report 1988-89, No. 38, November, 1988, p. 177.

Money-financed deficit spending consistent with the government budget constraint may lead to the depletion of reserves, which is feasible for a country with discretion over its exchange rate but not for a member of an exchange-rate union. Debt-financed deficit spending can have precisely the same effects, unless taxes are raised sufficiently to pay the service on the additional debt.

One can be more precise about the amount of fiscal autonomy that governments with a commitment to irrevocably fixed exchange rates possess. Appendix B derives the fiscal implications of monetary union in the context of a specific model. It is shown that commitment to a fixed exchange rate requires the government to eliminate the primary deficit by a specific date. If the government monetizes its budget deficit, the deadline for fiscal correction is advanced with increases in the initial stock of domestic credit, the initial stock of government debt, the initial primary deficit, and the interest rate, all of which raise the rate of growth of the government's debt-servicing burden. The deadline recedes into the future with a faster rate of economic growth at home than abroad, since the demand for money rises with income, permitting the government to monetize more of its deficit without losing reserves.

If the government borrows instead of monetizing its deficit, this may or may not delay the deadline for fiscal correction, depending on the timing of the borrowing. If the borrowing takes place soon before the fixed exchange rate would otherwise collapse, by replenishing reserves it may increase the length of time during which fiscal independence can be maintained. But if borrowing starts at an earlier date, it may cause the burden of the public debt and the government's debt-servicing burden to rise so quickly as to bring forward the date by which fiscal correction is required (reducing the scope for independent fiscal policy).

The less substitutable domestic and foreign debt instruments, due for example to the incomplete credibility of the fixed domestic exchange rate or the possibility of future capital controls or capital levy, the greater the tendency for borrowing to drive up domestic interest rates. This increases the cost of debt service and reduces the domestic demand for money. Both effects accelerate the depletion of reserves, hastening the need for fiscal correction to avoid exchange rate collapse.

Do capital controls enhance fiscal autonomy? If controls are thought of as a wedge between domestic and foreign interest rates, then they reduce domestic interest rates and domestic debt servicing costs. This reduces the rate at which reserves are depleted, *ceteris paribus*, lengthening the period before fiscal correction must ensue. Thus, capital controls enhance not just monetary autonomy but fiscal autonomy as well.

An alternative to capital controls as a means of relaxing the fiscal constraint is transfers of reserves within the exchange-rate union. If a member of the union can costlessly replenish its reserves courtesy of other members, then the fiscal day of reckoning can be delayed. If reserves can be replenished indefinitely, then the day of reckoning can be delayed indefinitely. If, in contrast, loans of reserves must be repaid, taxes still must be raised at a rate at which their present value is sufficient to finance current spending, service debt, and repay borrowed reserves, as Obstfeld (1985) shows. Thus, the degree to which fiscal policies must be harmonized within an exchange-rate union depends critically on the freedom with which reserve swaps are provided and on the terms on which they must be repaid.

2.3.2. Tax Harmonization

If in the absence of capital controls a fixed exchange rate requires not just monetary harmonization but also fiscal harmonization, then governments cannot maintain independent

levels of deficit spending indefinitely. Can they nonetheless maintain independent levels of public expenditure?

If capital and/or labour are highly mobile across jurisdictions, then this limits the capacity of governments to levy different tax rates and thereby maintain independent levels of public expenditure will be severely limited. If resources flee high tax jurisdictions, then no single jurisdiction will be able to levy taxes at rates exceeding those prevailing elsewhere in the union. Since participation in the currency union precludes deficit spending (in excess of the union average) for sustained periods, levels of public expenditure will be governed by tax receipts. And if factors of production are footloose, tax rates will be governed by the rates prevailing abroad. National authorities will be forced to harmonize not only levels of deficit spending but levels of total public spending as well.

The EC Commission has worried about these pressures for some time. Its proposals for corporate tax harmonization date from 1975. The elimination of capital controls makes the issue all the more urgent. As Emerson *et al.* (1988, p. 64) write, "the harmonization of capital taxation will become much more important, since the elasticity of capital movements in relation to differences in taxation will increase very significantly as those movements are liberalized."

Table 5 shows what they are worried about. The first column shows direct taxes raised by the central government. These range from 5 per cent in Germany to as much as 17 per cent in Belgium, Denmark and Luxembourg. It would be facile to suggest that integration would require equalization of these rates, for countries differ in the mix of direct and indirect tax instruments utilized. Indirect taxation may also affect location decisions. The second column shows total central government taxes (excluding social security), which range from 12 per cent in Germany to as much as 35 per cent in Denmark. Adding indirect taxes reduces the coefficient of variation from 0.40 to 0.27. The problem here is that countries

TABLE 5

EFFECTIVE TAX RATES

Country	Direct Central Govt Taxes (Excluding Social Security) as % of GDP	Central Govt Taxes (Excluding Social Security) as % of GDP	Consolidated Taxes (Excluding Social Security) as % of GDP	Consolidated Taxes (Including Social Security as % of GDP
Netherlands	13.4	23.9	25.4	44.7
UK	15.0	27.2	31.2	38.2
Belgium	16.6	27.4	29.6	44.0
Denmark	16.3	34.8	48.5	50.0
France	7.8	20.0	24.2	43.0
Ireland	14.8	31.6	32.8	40.6
Italy	12.3	20.9	22.0	34.4
Spain	5.8	13.4	19.5	31.3
Luxembourg	16.7	28.6	34.1	46.6
Greece	5.6	20.3	22.2	34.0
Portugal	7.0	21.2	21.9	31.1
Germany	5.1	12.4	25.0	41.1
Mean	11.4	23.5	28.0	39.9
Standard Deviation	4.5	6.3	7.6	5.9

Notes: Column 2 is the sum of direct and indirect taxes. Columns 3 and 4 are the sum of direct and indirect taxes for central, state or provincial, plus local governments.

Source: OECD National Accounts (various issues). Figures are most recent available: 1986, except for Portugal (1981), Luxembourg and Ireland (1984).

differ greatly in the extent to which they allocate revenue (and expenditure) decisions to the central government rather than local authorities. Germany relies on states and municipalities for the vast majority of revenue raising, while Ireland relies primarily on the central government. When the consolidated public sector is considered, variations in the tax share of GDP are smaller. (The coefficient of variation declines from 0.27 for the central government to 0.15 for the consolidated public sector including social security.) But variations in the tax share of GDP, which range from as little as 31 per cent in Spain and Portugal to 50 per cent in Denmark, remain considerable. Again, integration raises the specter that Northern European levels of taxation will have to be reduced to Iberian levels to prevent the flight of footloose factors.

There are two important reservations to this conclusion. First, costs of factor mobility may provide some scope for tax differentials between jurisdictions. Second, governments may be able to sustain high levels of taxation without eroding the tax base if those who bear the tax burden benefit from public expenditure. Firms may be willing to shoulder a heavier tax burden if the receipts are spent on social and economic infrastructure (educating the labour force, improving the transport network) in ways that increase productivity and augment the profitability of local production. Again, the extent to which these considerations provide scope for fiscal autonomy is a question that can only be answered empirically. It is for this reason that I turn to the experience of the United States.

3. Lessons from the US Currency Union

The remainder of this paper analyzes the operation of the US currency/customs union as a way of gaining perspective on the operation of a European currency/customs union. US experience cannot be applied mechanically to Europe. The United States of America and a "United States of Europe" would differ in both economic and political structure. Table 6

displays some economic similarities and differences. Per capita income in 1987 remained more than 50 per cent higher in the US whether market exchange rates or purchasing power parity conversions are used. The degree of openness of the two economies was comparable (only slightly higher in the EC) once intra-EC trade is netted out. Not only was average unemployment higher in Europe in 1986, so was its variability across locations whether measured by the standard deviation or coefficient of variation. The share of labour in agriculture in Europe remains considerably higher than in the US, and due not only to the importance of agriculture in countries like Greece, Portugal and Ireland. The share of labour in services is higher in Europe than in the US, even when a generous measure of US service sector employment is applied.

3.1. Policy Formulation

This section discusses how divergent regional preferences over monetary and fiscal policies are reconciled in the United States.

3.1.1. The Institutional Framework for Monetary Policymaking

Monetary policy preferences are reconciled by placing on the Board of Governors of the Federal Reserve System representatives of Federal Reserve Districts organized along geographic lines. The Federal Open Market Committee is comprised of the seven members of the Board of Governors (appointed by the President and confirmed by the Senate), plus five Reserve Bank presidents (one of whom is president of the Federal Reserve Bank of New York, the others of whom rotate). This geographic form was adopted to allay fears of Westerners that the newly created central bank would adopt an overly deflationary policy, and fears of Easterners that the Fed would be overly inflationary. (Europeans reading this passage may be tempted to replace "Westerners" and "Easterners" with and "Southerners" and "Northerners.")

TABLE 6

THE UNITED STATES AND THE EC12
(data for most recent year available)

<u>Item</u>	<u>United States</u>	<u>EC12</u>
Population (1,000s)	241,600 ¹	322,668 ¹
Area (thsnd sq. km.)	9,363 ¹	2,259 ²
GDP per capita, US\$, current exchange rates	16,936 ³	10,752 ³
Standard Deviation of GDP per capita (above)	3,674	4,073
GDP per capita using EC purchasing power parity adjustment	18,338 ⁴	11,729 ⁴
External trade (X+M)/GDP (excluding trade within EC12)	14.7 ⁵	18.4% ⁵
Unemployment Rate	6.95% ⁶	10.9% ⁷
Standard Deviation of Unemployment Rate	2.23	4.934
Share of labor force in agriculture	4.146 ⁸	9.1% ⁹ 7.4% ¹⁰
Stan. dev. of share of labor force in agric.	2.864	9.17 3.78
Share of labor force in service sector	13.94 ¹¹ 44.22	56.2% ¹² 57.4% ¹³
Stan. dev. of share of labor force in services	2.14 2.86	10.22 7.27

TABLE 6 (Cont.)

Sources:

- (1) World Development Report 1988. Data are for mid-year 1986.
- (2) World Development Report 1988, except for Luxembourg which is from Eurostat 1987.
- (3) US figure is from the Advisory Committee on Intergovernmental Relations, Significant Features of Fiscal Federalism, 1988. The figure shown differs slightly from the US GDP per capita for 1986 from the source used for Europe (\$17,349). The ACIR figure was used in order to obtain individual state figures. The European figure is from OECD Main Economic Indicators for 1986 at current prices and exchange rates in billions of US dollars. Population figures for Europe are from World Development Report.
- (4) OECD National Accounts, Volume 1, 1960-87. GDP per capita uses current prices and current PPP in US dollars for 1987.
- (5) External trade = exports plus imports. OECD Monthly Trade Statistics, 1987. Data in US dollars. OECD Main Economic Indicators for 1987 GDP in US dollars.
- (6) Statistical Abstract of the United States. Data are for 1986.
- (7) Eurostat Yearbook 1987. Data are for April/1986.
- (8) Geographic Profile of Employment and Unemployment. United States Department of Labor, Bureau of Labor Statistics, 1987. Table 15, p. 64.
- (9) Eurostat 1987, data are for 1983. For Greece, Ireland, and Portugal, source is World Development Report, data for 1980.
- (10) Same as (9) except Greece, Portugal, and Ireland are excluded.
- (11) I report two figures for "Services." The first figure and corresponding standard deviation pertain to what the BLS officially calls "services." This number is far out of line with the European figures, however. It seems that the BLS definition of services is very restrictive. I also include an expanded definition of "Services" which includes, besides the original services heading, technicians and related support, sales, and administrative support, including clerical.
- (12) Same as sources in note 9.
- (13) Same as sources in note 9 except Greece, Portugal, and Ireland are excluded. The data represent the sum of "market" and "non-market" services.

Considerable autonomy to regulate local banks and allocate discounts across potential borrowers was delegated to the district reserve banks. The Federal Reserve Act empowered them "to establish from time to time, subject to review and determination of the Federal Reserve Board, rates of discount...for each class of paper." From the beginning, the Federal Reserve Board exercised "considerable influence on the district banks in the direction of equalizing rates" (Myers 1970, p. 275).

In its early years this arrangement did not succeed in alleviating regional conflicts completely. That a reasonable degree of cooperation quickly developed among the regional reserve banks is attributed to the fact that the nation was engaged in a war which rendered "apparent to all the necessity of subordinating considerations purely of sectional advantage" (Reed 1922, p. 9). But as soon as the war ended, representatives of the East and West found themselves at loggerheads over Fed policy. In the postwar agricultural depression (starting in the summer of 1920), western and southern periodicals published scathing attacks on the Federal Reserve System for pursuing a tight-money policy that favored metropolitan financial interests. It was widely argued that the Federal Reserve Bank of New York, set in the international financial centre of the United States, exercised disproportionate influence over the formulation and implementation of financial and monetary policies.

Decentralization gave rise to uncertainties about the locus of power that undermined the capacity of the newly established central bank to maintain monetary stability. According to Friedman and Schwartz (1963), the power struggle between the New York Fed and the Washington, D.C.-based Board of Governors, where the western reserve banks exercised more influence, immobilized the Fed when the money supply collapsed in the early stages of the Great Depression. According to Wigmore (1988), the run on the dollar in 1933 forced the US to abandon the gold standard because of the unwillingness of interior Reserve Banks,

concerned about their own balance sheets, to rediscount on behalf of the Federal Reserve Bank of New York.

How divergent regional preferences over monetary policy will be reconciled by a European central bank remains to be seen. Proposals for a European central bank closely resemble the Federal Reserve System in structure. They stress the need to ensure the independence of the governing body from national political bodies as well as from other EC institutions. German officials, used to functioning under a decentralized Bundesbank system with 11 Land Central Banks and a Board of Governors in Frankfurt, propose organizing the European central bank along federal lines (Poehl, 1988). US experience in the early years of the Federal Reserve System suggests that this guarantees neither effective cooperation among members of the monetary union nor the alleviation of regional conflicts over monetary policy.

3.1.2. The Institutional Framework for Fiscal Policymaking

Federal fiscal policy in the United States is formulated by a convoluted process involving Congress, the Executive Branch and the electorate. The President, with the help of OMB, submits a budget to Congress in January of each year. This budget is scrutinized by House and Senate Committees. Concurrent resolutions lead to the passage of a reconciliation bill. The President can influence the process only by pressuring Congress and threatening to veto appropriation bills. This is in contrast with parliamentary systems, where the legislature simply accepts the government's budget or the government falls. In the US the President's budget is merely a recommendation to Congress.

Regional conflicts continue to feature prominently in US fiscal debate. Representatives of agricultural regions lobby for farm programs, those from regions with insolvent banks for bank bailout schemes. Regional interests make difficult reductions in spending on existing

programs. An illustration of the point is military base closings. Every regional representative has a strong interest in opposing base closings in her district, and a diffuse interest in supporting specific base closings elsewhere. Hence the budgetary process in the US has found it next to impossible to succeed in closing redundant bases. (The European analogy might be spending on the CAP.) Clearly, centralizing the budgetary process and allowing it to be determined by proportional representation has not sufficed to alleviate regional conflicts.

The EC budget is determined in a broadly similar fashion, but with one important difference. In contrast to the US, where the President can veto Congress's budget, in Europe the EC Parliament can veto the Council of Ministers' budget. Expenditures are divided into so-called compulsory expenditures, which have traditionally comprised about two-thirds of total spending and are determined by the Council of Ministers, and so-called noncompulsory spending, voted directly by Parliament. Compulsory spending is that resulting from the Treaty and associated Acts and includes such items as expenditures on the purchase of agricultural surpluses, grants to improve farm structures, interest rebates on EMS loans, and aid to developing countries. Since this portion of the budget is decided by the Council of Ministers, comprised of representatives of national governments (in this case, finance ministers), the process is broadly similar to that portion of the American budget over which the Executive branch has control or influence. The CAP accounts for the largest share. Noncompulsory spending includes outlays on energy, research, transport, administrative costs, and salaries and pensions of EC employees. Since MEPs are directly elected, this component of spending is subject to the same kind of pressures as in the United States. If the Parliament finds components of the budget -- presumably compulsory expenditures -- unsatisfactory, it can reject it if a majority of voting members and two-thirds of all MEPs so

decide. This occurred in 1980. Until the dispute is resolved, the EC proceeds on the basis of the previous year's budget.

In the US, the 50 states retain fiscal independence. They decide their own levels of spending, taxation and borrowing. The EC, in contrast, foresees a situation in which the Community will exercise increasing influence over the fiscal policies of member states. A number of critics (e.g. Padoa-Schioppa *et al.*, 1987) have questioned the viability of the EC's model and have suggested emulating the US example.

3.1.3. Fiscal Federalism

A central feature of the American budgetary process is fiscal federalism. Tax revenues are raised by local, state and national governments, with the states redistributing a portion of the receipts to localities, just as the national government redistributes a portion of the revenues to the states. One rationale for this arrangement is that some effects of government spending spill over state and local borders. Standard examples are spending on education, environmental quality, health and public welfare. Because local governments have no reason to internalize these externalities, spending will remain at suboptimal levels. Only federal authorities are in a position to internalize these externalities. They can do so through transfers to state and local jurisdictions, generally in the form of matching grants. If the external benefits of additional provision of these items are especially high when undertaken by jurisdictions in which incomes are especially low, then there may be a case for a continuous net transfer of resources from high- to low-income jurisdictions.

A second rationale for fiscal federalism views intergovernmental transfers as insurance. If economic conditions are imperfectly correlated across member states, then all can benefit from a program of fiscal self-insurance through which resources are transferred from jurisdictions in which income is temporarily high to those in which income is temporarily

low. This rationale is especially relevant to monetary union. Normally, a decline in the demand for a region's exports requires a decline in spending (to reduce the demand for imports from other regions) and a fall in real product wages (to help restore the competitiveness of exports to other regions). In a country with its own currency, devaluing the exchange rate can accomplish both ends. In a country that belongs to a monetary union and cannot devalue, the entire vector of own-currency wages and prices upon which production and spending decisions depend must change to bring about adjustment. Inward transfers to the depressed region reduce the need for these difficult forms of adjustment to restore external balance.

Both arguments have been applied to the EC. Padoa-Schioppa *et al.* (1987, p. 162) argue for Community support for general education in low-income states, citing the benefits to the entire Community from a more educated labour force, and the special problems facing countries like Portugal and Ireland due to emigration of their workers to higher income states. Sachs and Sala-i-Martin (1989) suggest that without simultaneously creating a fiscal union responsible for the insurance function, viable monetary union in Europe may not be possible.

In the US, the dominant form of intergovernmental transfers is federal grants-in-aid. An increasing number of federal grant programs have incorporated explicit equalizing formulas, which allocate a higher proportion of the available funds to low-income states or increase the federal share of total program costs in states with low per capital incomes.^{8/} Public assistance programs account for the largest segment of the equalization group.

Intergovernmental grants comprise a high and rising share of state and local government spending (Table 7). Federal intergovernmental spending approached 2 per cent of GNP in the 1960s. Receipts from the Federal government accounted for nearly a quarter of state spending in the 1960s and 1970, and for nearly 40 per cent of local spending. In

TABLE 7

**U.S. INTER-GOVERNMENTAL REVENUE AS
PERCENTAGE OF RECIPIENTS' EXPENDITURES**

<u>Year</u>	<u>State Receipts from Federal Government as Percentage of State Expenditures</u>	<u>Local Receipts from Federal and State Governments as Percentage of Local Expenditures</u>
1902	1.6	5.8
1922	7.4	7.1
1932	8.0	12.8
1942	16.6	25.4
1958	18.3	24.9
1964	21.2	27.0
1967	23.2	30.3
1972	24.5	33.5
1974	23.9	39.0
1976	23.2	38.4
1978	24.6	39.8
1980	24.0	39.3
1982	21.3	37.2
1984	21.7	35.3
1986	21.8	34.4
1987	20.9	33.7

Source: Break (1967), p. 5, for 1902 - 1964.
Advisory Committee on Intergovernmental Relations,
Significant Features of Fiscal Federalism 1989, vol. 1,
for 1967-1987.

the 1980s, with the rise of the deficit problem, these ratios have begun to decline, though both remain substantial.

Sachs and Sala-i-Martin (1989) have attempted to quantify the extent to which transfers function as insurance. They estimate that a one dollar decline in income in the average US region leads to a rise in federal transfers of 6 to 10 cents. (Transfers include social security and other retirement plans, income maintenance payments, veterans' benefits and payments to nonprofit institutions.)

The more important source of regional insurance is on the tax side. Sachs and Sala-i-Martin estimate that a one dollar decline in income in the average US region leads to a decline in Federal tax payments on the order of 30 cents. Thus, the magnitude of insurance on the tax side is 3 to 5 times as important as that on the expenditure side. Together, tax and transfer adjustments eliminate as much as 40 per cent of the decline in regional incomes.

Does there exist scope in Europe for replicating US arrangements? This really is two questions: first, whether there exist institutions with the relevant structure; second, whether they operate on the relevant scale.

On the transfer side, the EC has created a series of structural funds to discharge redistributive functions and deal with regional problems. A Social Fund was introduced to deal with the labour market adjustment problems brought about by economic integration. A Regional Fund was created to address their uneven geographical incidence. The Integrated Mediterranean Programs were created to deal with the special problems of the southern members of the Community. Yet the scope for distribution on the American scale will remain limited so long as the Community budget barely exceeds one per cent of EC GNP. (Estimates of the national incidence of the Community budget appear in Table 8.) Important redistributive vehicles such as the regional fund receive less than 10 per cent of the

TABLE 8
NATIONAL CONTRIBUTIONS AND RECEIPTS FROM EC BUDGET
(minus sign indicates contributions > receipts)

	<u>1982-84 average^a</u>		<u>1985-87 average^b</u>	
	<u>% GDP</u>	<u>ECUs per capita</u>	<u>% GDP</u>	<u>ECUs per capita</u>
Germany	-0.41	-45	-0.44	-59
France	-0.09	-9	-0.05	-5
Italy	0.27	17	0.04	3
Netherlands	0.18	17	0.20	23
Benelux**	-0.52	-45	-0.38	-37
UK	-0.23	-19	-0.35	-29
Ireland	3.77	206	4.75	260
Denmark	0.52	60	0.41	53
Greece	2.12	81	3.31	70
EC10	-0.07	-6	-0.13	-13
Spain*	na	na	0.08	3
Portugal*	na	na	1.01	12
EC12	na	na	-0.14	-10

Notes: * All magnitudes are in 1982 prices. Data for Spain and Portugal are 1986 and 1987 only. Consequently EC12 average for 1985-87 is actually for 10 countries and 1986-87 for Portugal and Spain.

** Benelux = Belgium and Luxembourg

Sources: ^a Ardy (1988) for 1982-84, and author's calculations, following Ardy, for 1985-87. Author's calculations are based on the sources listed below.

^b Contributions/Receipts: E.C. Court of Auditors Annual Report 1988.

Population: OECD Main Economic Indicators.

ECU/local currency rates: IMF International Financial Statistics.

Deflators: OECD National Accounts 1960-87.

GDP: OECD National Accounts.

Community budget. Since a nonnegligible share of the fund's expenditures are allocated to projects in high income states (Croxford et al., 1987), its redistributive impact is smaller still. In 1987 the Commission began to propose increasing expenditure on these structural programs, but even at projected levels intergovernmental transfers would remain minute by US standards.

As to scale, recall Sachs and Sala-i-Martin's estimate that the elasticity of regional transfer receipts with respect to regional income may be as high as 0.1. Imagine a severe recession, defined as a decline in income of 10%, affecting half of the EC. To emulate US adjustment, it must be possible to raise EC transfers to the depressed regions in the amount of 1/2 of one per cent of EC GNP. Spending on EC programs is currently in the range of one per cent of EC GNP. Thus, raising EC spending by 1/2 of one per cent of EC GNP, under the favorable assumption that the entire increase goes to the depressed regions, implies at least a 50 per cent increase in spending. It is hard to imagine that existing programs have a transfer elasticity significantly in excess of 0.5. Thus, replicating the US situation would require a significant increase in the scale of the EC budget.

The EC derives most of its revenue from VAT, customs duties and agricultural levies. VAT contributions are roughly proportional to GDP, all member states contributing between 0.4 and 0.6 per cent of GDP to the Community (Ardy 1988, Table 2). If VAT is levied at a constant *ad valorem* rate, a \$1 decline in income in an EC member state would lead to a 0.4-0.6¢ decline in VAT payments. The actual situation is more complicated, since VAT is remitted on exports and investment and government expenditure are VAT exempt. (Other spending is taxed at 1.4% per cent, although 10 per cent of revenue collected is remitted to member states to defray collection costs.) Since investment and exports are more cyclically volatile than other components of national income, a fall in national income of \$1 is likely

to reduce that portion of GDP subject to VAT by less than \$1 and therefore to reduce VAT payments by even less than 0.4-0.6¢.

Customs duties are about half as important on the revenue side as VAT, and their elasticity with respect to national income is likely to be unity or, by the logic of the preceding paragraph, somewhat less. At most, a \$1 fall in national income would lead to a 0.2-0.3¢ fall in this tax.

The cyclical volatility of the agricultural and sugar levies is by far the most difficult to estimate. Insofar as the production and consumption of foodstuffs is relatively price and income inelastic, their elasticity with respect to national income is likely to be less than unity. At most, that elasticity is unity. Given this assumption, and since receipts from these levies are only 1/3 as important as receipts from customs duties, a \$1 fall in national income would reduce levy receipts by 0.07-0.1¢.

Combining estimates for the three principal categories of receipts, a \$1 fall in national income would reduce tax payments to the EC by no more than 1¢. This is in contrast to Sachs and Sala-i-Martin's estimate that federal tax payments by US states would fall by on the order of 30¢.

Steps are underway to augment the budgetary resources of the EC. In February 1988 a "fourth resource" was added in principle to agricultural import levies, customs duties and VAT, namely contributions based on each country's GNP. But emulating the stabilizing regional impact of the US fiscal system would require very substantial changes in the scale and elasticity of this fourth resource.

Some observers argue that the case for fiscal federalism will be rendered redundant by the elimination of capital controls. Europeans will be able to protect themselves against the impact on their incomes of region-specific shocks by holding diversified portfolios of financial claims on firms in other regions. The welfare rationale for fiscal transfers into

Portugal in response to shocks affecting only the Portuguese economy will be considerably weakened if Portuguese citizens are permitted to hold financial claims on producers in other countries, thereby insulating their incomes from region-specific disturbances. However, US experience suggests that freedom to invest in other regions weakens at most slightly this rationale for fiscal federalism. The majority of Americans hold most of their wealth in human capital, the returns on which (labour income) depend on region-specific factors, and in real estate (their homes). The incomes and net asset positions of Texans decline significantly when the Texas economy falls on hard times even while the rest of the American economy remains prosperous, despite the fact that Texans are free to diversify away this risk by accumulating financial claims on other states and countries.

3.2. Operation of the US Currency Union

3.2.1. Balance of Payments Adjustment

According to its proponents, establishment of a currency/customs union transforms the balance-of-payments adjustment process. The mechanisms are the same as those which operate between any countries with fixed exchange rates, but they operate more smoothly and powerfully, facilitating adjustment.

The first such mechanism is international capital flows. Imagine that a country suffers a decline in competitiveness leading to a deterioration in its balance of payments. The cause might be an exogenous fall in the demand for its exports, leading to a trade balance deficit. Capital should flow in to minimize the domestic authorities' loss of reserves. If the domestic central bank (or in the US case, the regional reserve bank) raises its discount rate, any incipient rise in local market interest rates will be arbitrated away by capital inflows. According to proponents of monetary union, stabilizing capital flows will operate more powerfully in the presence of a common currency or immutably fixed exchange rates. There

is no danger that balance-of-payments problems will lead to devaluation and capital losses for foreign investors. The incipient rise in interest rates therefore provides an irresistible incentive to investors. Stabilizing capital flows will be even more important than under fixed but adjustable exchange rates.

If the shock is permanent, eventually domestic wages and absorption will have to fall to restore competitiveness. Exports have to be raised and/or imports reduced to make it profitable for domestic firms to employ the labour supplied and in order to generate the earnings needed to service the additional external debt. If wages and costs fail to decline, unemployment results. According to proponents of union, labour market adjustment is smoother when factor markets are integrated. Rather than being forced to accept lower earnings or higher unemployment, some residents of the region whose competitiveness has declined can migrate to other regions experiencing an increase in the demand for their goods and enjoying higher living standards. This raises the capital/labour ratio at home, minimizing the fall in real wages required of workers who remain. Thus, labour mobility like capital mobility facilitates balance-of-payments adjustment.

The United States provides a clear example of a credible customs/currency union. Adequate balance of payments statistics are not gathered on a state or Federal Reserve District level, however. There exist state data on exports to other countries, but no official statistics on state of origin of those goods or on interstate trade. Interstate trade in commodities can be inferred only on the basis of restrictive assumptions about within-state consumption. The Interdistrict Settlement Fund of the Federal Reserve System provides summary data on flows of funds between Federal Reserve Districts but omits check clearings that go directly through correspondent banks and important interdistrict currency flows. Moreover, it is impossible to break down the gross flows into components.

Fortunately, the requisite data are gathered for Puerto Rico, a fact exploited by Ingram (1962) nearly three decades ago. Puerto Rico's status as a semi-autonomous Commonwealth associated with the United States has motivated the gathering of statistics on balance-of-payments transactions between the Commonwealth and the mainland. That Puerto Rico is an island makes it possible for the authorities to estimate the value of these transactions with accuracy that would be impossible for most states. Puerto Rico is a full-fledged member of the US customs/currency union. The American dollar is the sole local currency. There are no barriers to trade or factor mobility between Puerto Rico and the mainland.^{9/}

In this section, I follow Ingram by analyzing balance-of-payments adjustment between Puerto Rico and the rest of the United States. But where Ingram had data on Puerto Rico's external transactions only for the first post-World War II decade, we now possess time series for the entire period 1948-83.

Puerto Rico is a special region of the United States. The dominant language differs from the mainland's. The economy is relatively underdeveloped. But the presence of a distinct language and a distinct regional culture makes Puerto Rico's experience all the more apposite for Europe. The income differential suggests that lessons of Puerto Rican experience may be relevant to Spain or Portugal.

Table 9 compares Puerto Rico and Portugal with the United States and the EC, respectively. Per capita income and crude birth rate ratios of Puerto Rico versus the US and Portugal versus the EC are quite similar. Puerto Rico and Portugal are more open, more rural and more agricultural than the US and the EC. On the other hand, external trade is considerably more important to Puerto Rico than to Portugal. Puerto Rico is more urban.

Table 10 summarizes the balance of payments experience of Puerto Rico. Clearly, foreign investment and remittances are extremely important. Transfers from the Federal

TABLE 9
A COMPARISON OF FOUR ECONOMIES

<u>Item</u>	<u>Puerto Rico</u>	<u>US Average</u>	<u>Portugal</u>	<u>EC Average</u>
Income Per Capita(\$)	4,519 ¹	17,417 ¹	2,886 ²	10,752 ²
Birthrate	19.4 ³	16.0 ⁴	14.2 ⁵	11.9 ⁵
% Urban	66.8 ⁶	74.0 ⁶	31.0 ⁶	78.0 ⁶
Imports/GDP	67.4 ⁷ 26.0 ⁸	9.1 ⁹	36.6 ¹⁰ 13.4 ¹¹	22.2 ¹⁰ 9.3 ¹¹
Share of Labor Force in Agric.	5.4 ¹²	2.7 ¹³	26.0 ¹⁴	9.1 ¹⁵
Unemployment	21.0 ¹⁶	7.0 ¹⁶	8.7 ¹⁷	10.9 ¹⁷

Notes: Sources are as follows:

- (1) Statistical Abstract of the United States, 1985.
- (2) OECD Main Economic Indicators for GDP in 1986, US\$, current exchange rates. Population figures from World Development Report.
- (3) Informe de Recursos Humanos, Junta de Planificacion de Puerto Rico, June, 1986.
- (4) World Development Report. Year is 1986.
- (5) Eurostat 1987. Year is 1986.
- (6) World Development Report 1988. Data are for 1985. EC average not including Luxembourg is constructed using population weights from World Development Report. Data for Puerto Rico are from Statistical Abstract of the United States, 1988, p. 18. Year is 1980.
- (7) Statistical Abstract of the United States 1988. Data are for 1985 and include trade with the rest of the U.S.
- (8) Same source as (7). Excludes trade with the rest of the U.S.
- (9) Trade data from OECD Monthly Statistics of Foreign Trade. Data are for 1987. GDP from OECD Main Economic Indicators, also for 1987.
- (10) Same source as (9). Figures include trade within the EEC.
- (11) Same source as (9). Figures net out trade within the EEC.
- (12) Informe de Recursos Humanos. Figures are for 1984.
- (13) Statistical Abstract of the United States. Figures are for 1985.
- (14) World Development Report 1988. Figure is for 1980.
- (15) World Development Report 1988 for Greece, Portugal and Ireland. Figures are for 1980. Eurostat 1987 for the rest. Figures are for 1983. Average is obtained by weighting by population as per World Development Report.
- (16) Statistical Abstract of the United States. Figures are for 1986.
- (17) Eurostat 1987. Rates are for 1986.

TABLE 10

BALANCE OF PAYMENTS FOR PUERTO RICO: 1960 - 1983
(annual averages in millions of 1947 dollars)

<u>Item</u>	<u>1960-1969</u>	<u>1970-1979</u>	<u>1980-1983</u>
Merchandise Exports	733.8	1,474.4	2,315.5
Merchandise Imports	-1,010.5	-2,024.4	-2,406.4
Transport (net)	-78.1	-138.6	-102.3
Travel (net)	30.4	57.5	75.1
Income on Investments	13.9	65.3	193.0
Outlays on Investment (including net interest of Commonwealth & muni- cipal governments) ¹	-190.0	-696.6	-1,346.1
Miscellaneous Services, net (including outlays of federal agencies)	76.3	59.6	49.3
Remittances, net (including transfers from non-residents)	33.1	30.0	60.8
Transfers from Federal Government	119.8	534.2	871.1
TOTAL CURRENT ACCOUNT	-271.3	-638.6	-290.0
Long-term External Investments			
In Puerto Rico	295.1	662.6	585.5
Obligations of Government Sector ²	91.8	208.6	152.6
Direct Investments	146.1	418.8	406.0
Other ³	57.1	35.3	26.9
Long-term External Investments of Puerto Ricans	-30.0	-30.8	-34.8
Short-term Capital Movements (net)	2.5	5.6	-254.0
TOTAL CAPITAL ACCOUNT	267.6	637.4	296.7
ERRORS AND OMISSIONS	3.7	1.0	-6.6

TABLE 10 (Cont.)

Notes:

- (1) Data on net interest of the Commonwealth and municipal governments not available until 1971.
- (2) Includes Federal Agencies mortgages and loans.
- (3) Includes Home Mortgages and loans and investments in local corporations.
- (4) Note that Balanzo de Pagos shows 12.6 for errors and omissions for 1980-83. However, there are several errors in the summations of various capital sub-categories. I have assumed that the individual line items are correct and have used "errors and omissions" to adjust so that the accounts balance.

Source: Balanzo de Pagos, 1983. Junta de Planificacion de Puerto Rico, San Juan. Data are converted to constant prices using Statistical Yearbook of Puerto Rico (various issues) and Informe Economica al Gobernador (various issues).

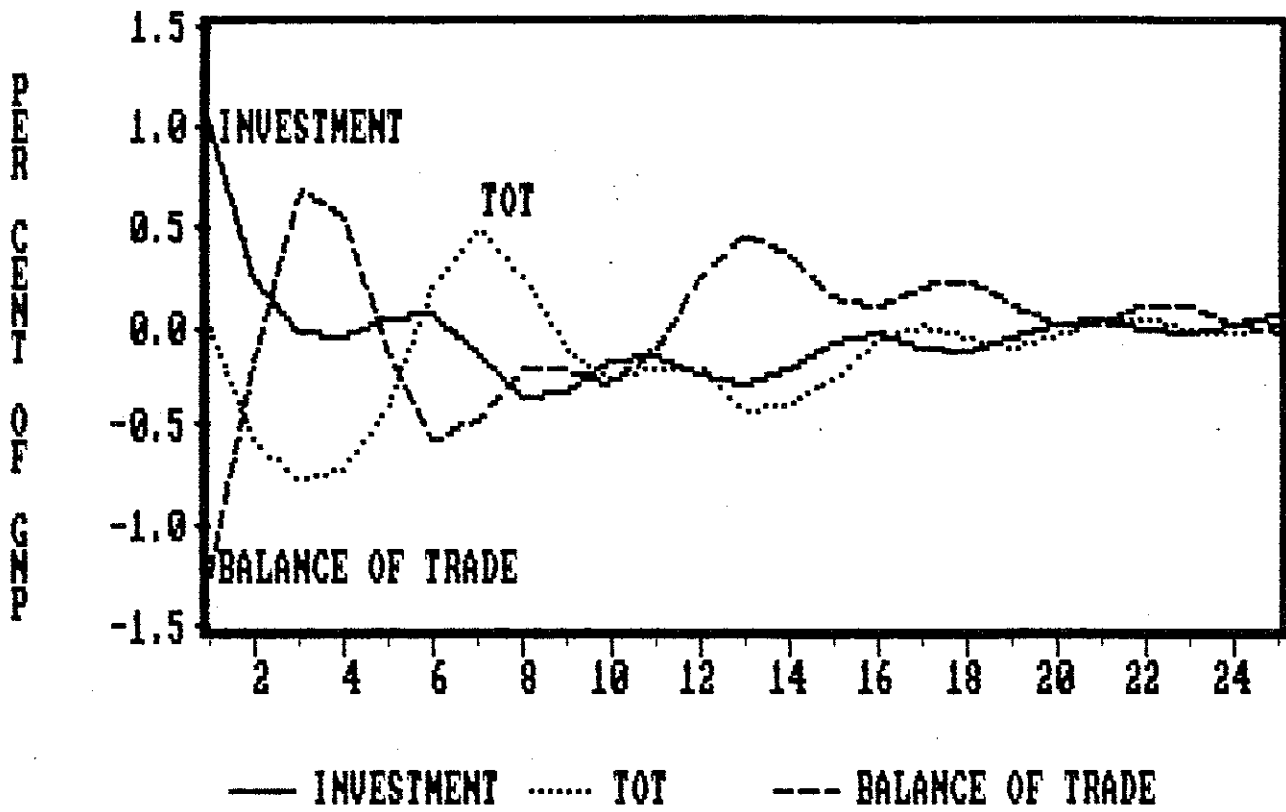
government (and miscellaneous transfers from other state governments) represent a particularly important element of the current account.

To analyze Puerto Rican balance-of-payments adjustment, I assembled annual data on gross fixed domestic investment, the terms of trade (Puerto Rico's CPI relative to the US CPI), the balance of trade, the value of remittances, and net international capital flows. All variables but the terms of trade were expressed as ratios to GDP. I estimated a vector autoregression by regressing each of these variables on three lags of itself, three lags of the other variables, a time trend and a constant. The data ran from 1947 to 1984. Allowing for lags, the estimation period was 1950-84.

I then simulated the response of the estimated equations to a one standard deviation shock to investment. Simulation requires orthogonalizing the estimated equations, attributing common variance among the residuals in the various equations to one of the variables. Since I am interested in the response of the system to a shock to investment, I chose investment as the "most exogenous variable" by attributing common variance to it. Movements in investment are effectively assumed to precede movements in other variables. The ordering of the remaining variables is the same as the order in which they are listed in the preceding paragraph. (I also experimented with different orderings. This made some difference for the precise effects, but had no impact on the direction or in general on the relative sizes of the responses.)

Figure 1 shows the response to a shock to investment. (The horizontal axis denotes years, since the data are annual.) Investment rises in the first year by about one per cent of GDP. The behavior of the trade balance and terms of trade document Puerto Rico's dependence on imported capital goods. The balance of trade turns negative in the wake of the investment boom. Puerto Rico's terms of trade weaken, suggesting a shift of expenditure from domestic to imported goods.

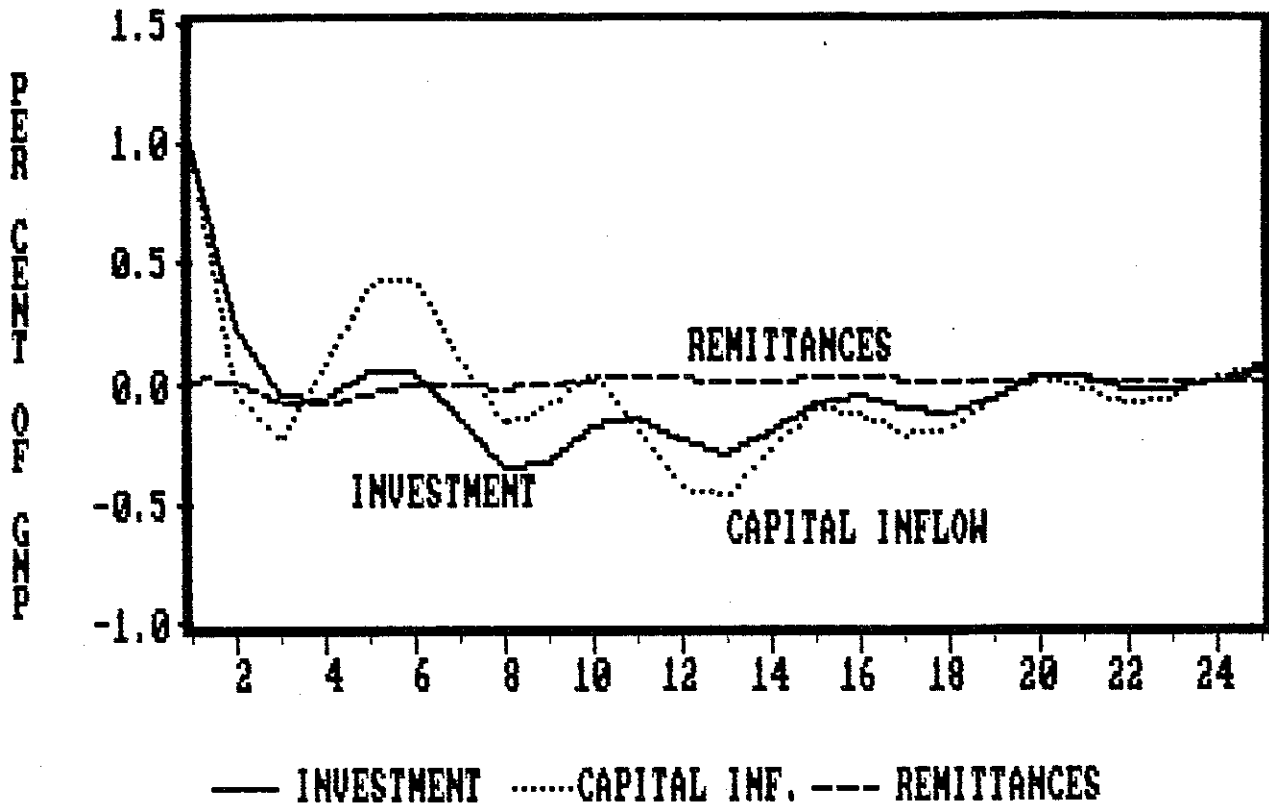
CHART 1. RESPONSE TO INVESTMENT SHOCK



Since savings minus investment equals the current account of the balance of payments, a positive shock to investment should bring about an incipient balance-of-payments deficit that must be financed or eliminated. It is financed. In the short run, the rise in investment is financed almost entirely by overseas capital as opposed to domestic saving. Note that this is not due to the response of "foreign aid" (transfers from the Federal government), since this item is not included in capital flows. In the second year, the capital inflow falls to zero, indicating presumably that the induced rise in GDP augments saving by a sufficient amount to finance the additional investment. (Alternative regressions and simulations, in which all variables were expressed in levels rather than relative to GDP, GDP was included as an additional element of the vector, and a time squared term was added to pick up growth, suggested that the investment boom had precisely this effect on GDP.) Overall, these results are consistent with the important role of capital flows in bringing about balance-of-payments adjustment within the United States hypothesized by previous authors (e.g. Hartland, 1949).

Labour mobility seems to play a less important role in current account financing and domestic adjustment. Remittances take a year before beginning to adjust, consistent with the view that there are lags in labour migration. They then decline, suggesting some repatriation of Puerto Ricans working abroad in response to the boom. The net change in remittances is small, however, relative to capital flows, suggesting that changes in remittances are relatively unimportant as a source of external finance. (In response to an increase in investment of slightly more than one per cent of GDP, capital inflows rise by slightly less than one per cent of GDP, while remittances fall by 1/100 of one per cent of GDP after a year.) The small magnitude of the change in remittances suggests that the amount of return migration induced by the investment surge is too small to play much role in adjustment to the shock. The same argument applies to a negative investment shock. Outmigration in the wake of a domestic investment slump does not appear to be an important part of the domestic

CHART 2. RESPONSE TO INVESTMENT SHOCK



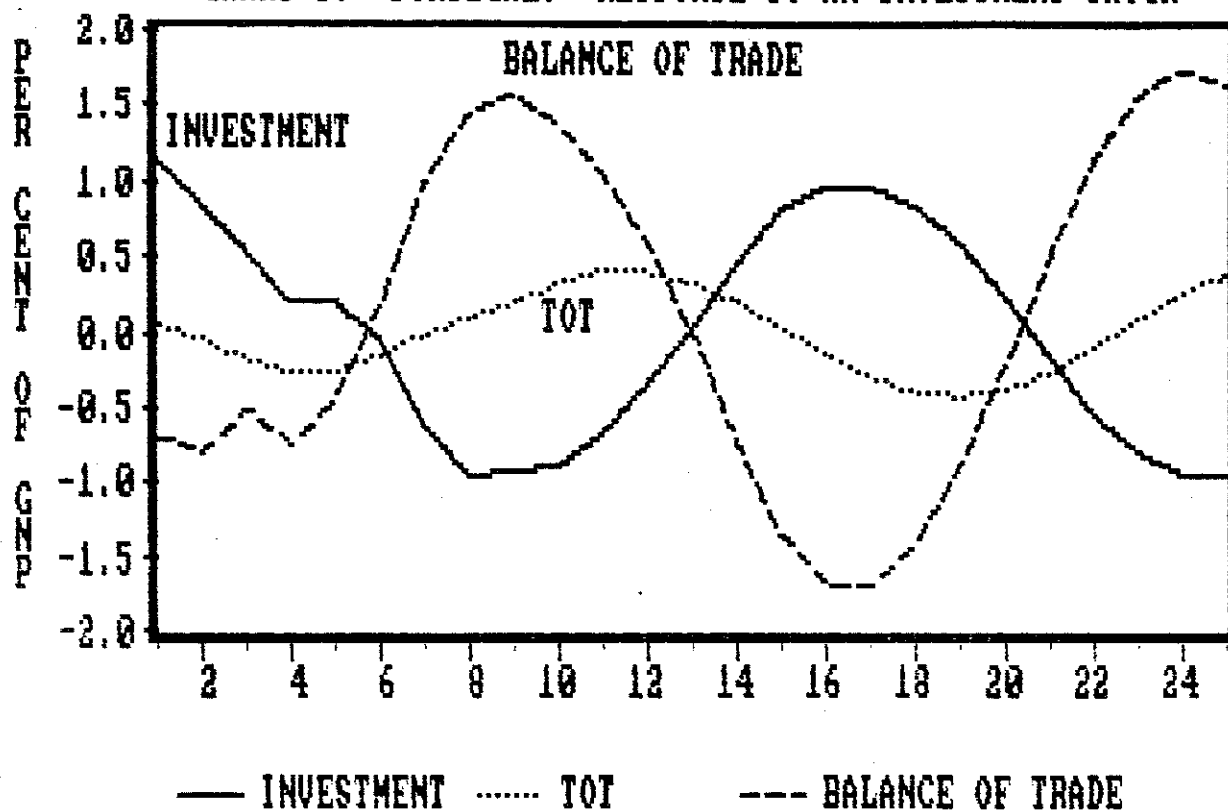
adjustment process in the short run. Despite the absence of barriers to labour mobility between Puerto Rico and the mainland, and the inducement to mobility provided by a common currency and the absence of exchange risk, adjustment to a domestic slump appears to require a fall in domestic costs rather than simply an increase in outmigration. Moreover, high capital mobility between Puerto Rico and the mainland implies that a domestic slump is not moderated by a fall in domestic interest rates. Capital flows out in amounts almost exactly matching the fall in domestic investment.

How much difference does Puerto Rico's membership in the US customs/currency union make? One approach to answering this question is to compare Puerto Rico's response to that of a country which does not belong to such a union. I therefore gathered annual data on the same variables for Portugal for the period 1953-86, estimated the same regressions, and ran the same simulations. Portugal is not an EC member for much of the period. Since the extent of its economic integration therefore differs so markedly from Puerto Rico's, if integration matters for balance of payments adjustment, this should be clearly evident in the Puerto Rico-Portugal comparison.

Results are depicted in Figures 3-4. They are broadly consistent with those for Puerto Rico. As in Puerto Rico, an investment boom leads to a deterioration in the trade balance and weakening of the terms of trade (Figure 3).^{10/} The investment boom is partly financed by a capital inflow (Figure 4). As in Puerto Rico, there is little short-run movement of remittances; but as in Puerto Rico, after a delay of a few years, remittances fall, suggesting some repatriation of guest workers abroad in response to the investment surge.

While the patterns are broadly similar, the magnitudes and timing are strikingly different. Whereas in Puerto Rico the first year of the investment boom is completely financed by overseas capital, in Portugal more time is required for the capital inflow to get underway. Only a tenth of the short-run rise in investment is financed out of foreign

CHART 3. PORTUGAL. RESPONSE TO AN INVESTMENT SHOCK

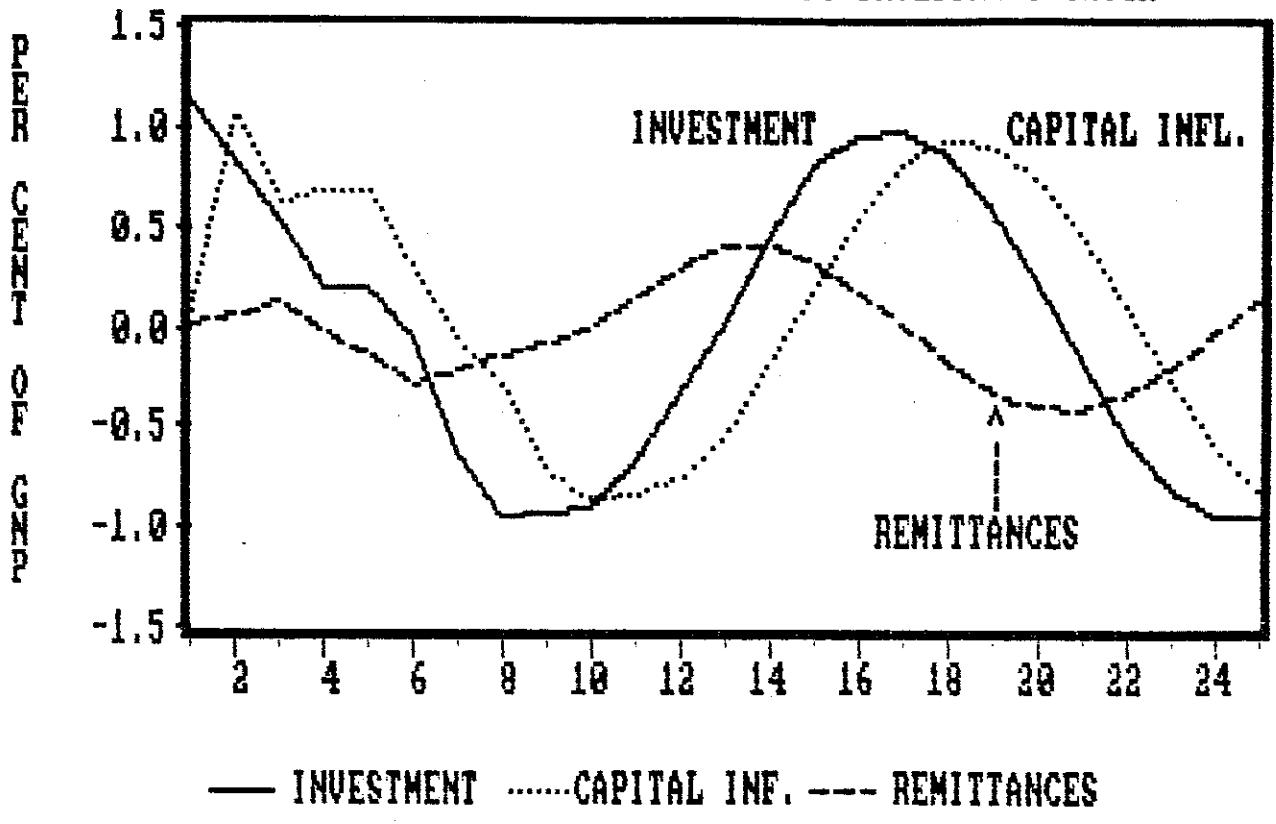


sources. This is reflected in Figure 3, where the short-run deterioration in the trade balance is relatively small compared to that in Puerto Rico. Since less capital flows in initially, the demand for traded goods has to be reduced to finance the surge in investment, attenuating the deterioration in the trade balance. The mechanism works through interest rates. In Puerto Rico, which enjoys an elastic supply of overseas capital, the investment boom has little effect on interest rates. But in Portugal, where the supply of external capital is less elastic, the investment surge puts upward pressure on interest rates. Some investment is crowded out. The rise in the rate of return stimulates saving. Since the current account (and, roughly speaking, the trade balance) equals investment minus saving, and since investment rises by less in Portugal than in Puerto Rico while saving rises by more, the Portuguese trade deficit is smaller. A further consequence is that the short-run deterioration in the terms of trade is smaller than in Puerto Rico, because the rise in the demand for traded goods is limited by the limited capital inflow.

The contrast with Puerto Rico suggests that membership in a currency union does in fact enhance the facility with which capital mobility accommodates domestic investment fluctuations in the short run. After a lag of a year or so, however, capital does begin to flow toward Portugal. In contrast to Puerto Rico, where investment and capital inflows are roughly in phase, in Portugal capital movements lag investment fluctuations by a year or two. This appears to contribute to the longer periodicity of investment cycles in Portugal. The tendency of investment shocks to die out rapidly is attenuated because capital flows in with a lag in response to an investment surge, reducing domestic interest rates and encouraging the investment boom to persist, and conversely in an investment slump.

As in Puerto Rico, remittances and, by implication, labour mobility play a relatively minor role in adjustment. Curiously, remittances seem to be more responsive in Portugal than in Puerto Rico. In part this may reflect differences in data: the series for Portugal

CHART 4. PORTUGAL: RESPONSE TO INVESTMENT SHOCK



include also other unrequited transfers. In part it may reflect the greater tendency of Puerto Rican workers to migrate together with their families and hence their lower tendency to remit earnings.

3.2.2. The Extent of Fiscal Autonomy

Does membership in a currency area provide US states with any leeway to run independent fiscal policies? State budget deficits as a share of expenditure typically are small. Surpluses are more common than deficits: states attempt to accumulate a general fund ending balance of five per cent of total expenditures "to provide cash flow during the year, to accommodate the cyclical nature of revenue collections and disbursements, and most particularly, to provide sufficient revenues at the change of a fiscal year without disruption in service" (Howard, 1989). Yet occasionally individual states have run quite substantial budget deficits. Louisiana's state deficit amounted to nearly 5 per cent of expenditures in 1986, nearly 12 per cent in 1987, and more than 18 per cent in 1988, for example.

Behind the preponderance of surpluses in Table 11 is the fact that, but for Vermont, all 50 states possess either statutory or constitutional balanced budget requirements. Not all these restrictions are binding, however. In fully 25 states the governor only has to submit a balanced budget, the legislature only has to pass a balanced budget, and/or the state may carry over a deficit but is formally obliged to correct it in the next fiscal year (Table 12). In all these states, there is scope for at least temporary budget deficits.

Those deficits are financed by issuing debt, as shown in Table 13. The critical question is whether states seeking to finance deficits face a perfectly elastic supply of external funds, or whether interest rates rise if they attempt to increase their borrowing. If higher interest rates heighten the perceived probability of subsequent financial difficulties, the supply of external funds, plotted in quantity of borrowing/interest rate space may be backward bending,

TABLE 11
STATE BUDGET BALANCES BY REGION

<u>Region</u>	<u>Dollar Amount (millions)</u>			<u>As a % of Expenditures</u>		
	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>
US overall	5,398	6,586	7,066	4.21	3.755	4.549
New England	430	291	266	3.18	5.73	5.01
Middle Atlantic	887	1239	838	3.00	4.07	2.59
East North Central	1,175	725	939	3.28	2.30	2.95
West North Central	658	465	931	6.33	4.41	9.14
South Atlantic	1,126	1,151	1,331	5.03	5.06	5.10
East South Central	414	353	349	4.28	4.03	3.55
West South Central	-433	-1430	-1301	-1.88	-5.42	-4.55
Mountain	322	260	306	7.00	3.64	4.64
Pacific	819	672	805	3.18	6.97	7.38
Standard Deviation	494	777	761	2.55	3.57	3.82

Source: National Governors' Association, 1988.

TABLE 12 STATE BALANCED BUDGET REQUIREMENTS
 (Is requirement for balanced budget statutory(S) or constitutional(C)?
 What is the nature of requirement?)

States	(1)		(2)	(4)	(6)	(8)	Degree of Stringency Scale (high=10; low=1)	
	(points)	(1)	(2)	(4)	(6)	(8)		
	Statutory	Constitutional	Governor Only has to Submit a Balanced Budget	Legisla-ture Only has to Pass a Balanced Budget	May Carry Over a Deficit but Must be Corrected in Next Fiscal Year	State Cannot Carry Over a Deficit Into Next Biennium	State Cannot Carry Over a Deficit Into Next Fiscal Year	
New England								
Connecticut	X		S*	S	S		5	
Maine	X					S	9	
Massachusetts		X	C				3	
New Hampshire	X		S				2	
Rhode Island		X				C	10	
Vermont			No Requirement*					0
Midwest								
Delaware		X				C*	10	
Maryland		X	C	C	C		6	
New Jersey		X				C	10	
New York		X	C				3	
Pennsylvania	X	X	S,C	S	S,C		6	
Great Lakes								
Illinois		X	C	C			4	
Indiana		X				C*	10	
Michigan		X			C		6	
Ohio	X	X				S,C	10	
Wisconsin		X			C*		6	
Plains								
Iowa		X				C	10	
Kansas		X				C	10	
Minnesota	X	X				S,C	8	
Missouri		X				C	10	
Nebraska		X				C	10	
North Dakota		X				C	8	
South Dakota	X	X				S,C	10	
Southeast								
Alabama		X				C	10	
Arkansas	X					S	9	
Florida	X	X				S,C	10	
Georgia		X				C	10	
Kentucky	X	X				C*	10	
Louisiana		X		C			4	
Mississippi	X					S	9	
North Carolina	X	X			S,C	S,C	10	
South Carolina	X	X			C	C	10	
Tennessee		X			C	C	10	
Virginia	X	X				S,C	8	
West Virginia		X				C*	10	
Southwest								
Arizona		X				C	10	
New Mexico		X				C	10	
Oklahoma		X				C	10	
Texas		X		C		C	8	
Rocky Mountain								
Colorado		X				C	10	
Idaho		X				C	10	
Montana		X		C		C	10	
Utah	X	X				S,C	10	
Wyoming		X				C	8	
Far West								
California		X	C		C*		6	
Nevada	X	X	S	C			4	
Oregon	X	X	S			C	8	
Washington	X	X				S,C	8	
Alaska	X	X	S		C		6	
Hawaii	X	X	S,C			C	10	

Source: ACIR staff compilation based on 1984 surveys of executive and legislative fiscal directors, and Limitations on State Deficits, Council of State Governments, Lexington, Kentucky, May 1976.

*See notes on next page.

TABLE 12 STATE BALANCED BUDGET REQUIREMENTS
(Continued)

NOTE: The following states have a balanced budget relating to constitutional debt limitations (debt limit in parenthesis): Alaska (\$350,000), Arizona (\$350,000), Colorado (\$100,000), Iowa (\$250,000), Kansas (\$1,000,000), Kentucky (\$500,000), Missouri (\$100,000), Nebraska (\$100,000), New Jersey (1% of appropriations), New Mexico (\$200,000), Ohio (\$150,000), Oklahoma (\$500,000), Rhode Island (\$50,000), South Dakota (\$100,000), Texas (\$200,000), and Utah (1.5% of taxable property value).

CALIFORNIA: Article XVI, Sec. 1, requires that the legislature shall not, in any manner, create a debt in excess of \$300,000 without a vote of the people. This section has been interpreted to allow a carry-over deficit, as long as the deficit is repaid within "a short period of time."

CONNECTICUT: If revenues are deficient by 5% due to lower than projected revenue collections after the budget has been passed, the General Assembly must approve expenditure cuts. (Statute 4-85; Subsection C)

DELAWARE: "No appropriation, supplemental appropriation or budget act shall cause the aggregate State General Fund appropriations enacted for any given fiscal year to exceed 98 percent of the estimated State General Fund revenue for such fiscal year from all sources, including estimated unencumbered funds remaining at the end of the previous fiscal year..." (Const. Art. VIII, Sec. 6) The state provides for this 2 Percent Fund and a 5 percent Budget Reserve Account to be used for an unanticipated deficit. There are no provisions in the Constitution that call for specific action if a projected deficit exceeds 7 percent of general fund revenues.

INDIANA: "No law shall authorize any debt to be contracted, on behalf of the state, except in the following cases: To meet casual deficits in the revenue..." (Const. Art. 10, Sec. 5)

KENTUCKY: Agencies must set aside 2-1/2% of their budget each year in the event of a revenue shortfall (KRS 48.120).

VERMONT: Governor is statutorily required to submit recommendation to alleviate deficits from previous years in his or her budget request. There is no requirement that the governor must submit a balanced budget.

WEST VIRGINIA: "No debt shall be contracted by this state except to meet casual deficits in the revenue..." (Const. Art. X, Sec.4)

WISCONSIN: Section S20.004 of Wisconsin statutes requires that no bill may be passed if the bill will cause the General Fund balances at the end of the biennium to be less than one percent of total General Fund appropriation.

TABLE 13

STATE DEBT BY REGION

	# of States	Total State Debt (millions of current dollars)			Ratios of State Debt/State Product Means (standard deviations)		
		1984/85	1985/86	1986/87	1984/85	1985/86	1986/87
US Overall	50	210,285	248,337	265,705	.0731 (.0542)	.0822 (.0610)	.0811 (.0578)
New England	6	23,394	27,036	28,536	.1280 (.0472)	.1337 (.0410)	.1232 (.0313)
Mid-Atlantic	3	53,010	61,071	66,936	.0833 (.0335)	.0907 (.0398)	.0910 (.0372)
East North Cent.	5	28,499	35,490	37,330	.0451 (.0152)	.0518 (.0145)	.0517 (.0120)
West North Cent.	7	11,165	12,817	13,853	.0506 (.0344)	.0582 (.0406)	.0622 (.0464)
South Atlantic	8	24,600	28,384	31,448	.0671 (.0518)	.0780 (.0710)	.0776 (.0696)
East South Cent.	4	9,792	11,200	11,980	.0510 (.0220)	.0557 (.0241)	.0571 (.0256)
West South Cent.	4	17,692	20,828	21,948	.0552 (.0391)	.0652 (.0503)	.0736 (.0567)
Mountain	8	8,048	10,880	11,216	.0506 (.0186)	.0629 (.0260)	.0601 (.0194)
Pacific	5	34,085	40,625	42,445	.1389 (.0999)	.1517 (.1170)	.1458 (.1116)
S.D. Among Regions		13,422	15,514	16,925	.03345	.03404	.03003

Sources: For Gross State Product: ACIR, Significant Features of Fiscal Federalism (various issues). For Debt: Moody's Governments Manual (various issues).

and beyond some point state governments may be unable to borrow.

I am unaware of previous studies that have asked this question. The closest approximation is provided by studies which seek to explain the Moody's credit rating of US cities. These credit ratings have a decided influence on the interest rates cities are required to pay when floating bonds. Most studies are unable to replicate Moody's ratings using readily observable economic and social characteristics of cities.

Since previous studies employ discriminant analysis, it is difficult to isolate the marginal contribution and statistical significance of a particular variable. I therefore use regression analysis in an attempt to explain the required yields upon issue on state bonds. The initial sample was composed of the most recent general obligation issue for each state. (Data were obtained from Securities Data Company of Newark, New Jersey.) I eliminated issues that were three or more years old and exceptional issues like those for the District of Columbia and Guam. This left 33 observations, all for states that issued general obligation bonds in 1989. I regressed the yield to maturity on the yield on a representative portfolio of 20 bonds (in the week of issue, as computed by Securities Data Company), the ratio of state debt to state product or, alternatively, state debt per capita (in levels and squared), and the US Advisory Commission on Intergovernmental Relations' index of fiscal stringency (which ranges from zero for states with no statutory or constitutional balanced budget requirements to 10 for states with strict constitutional requirements).

Table 14 reports the results. There is weak evidence that higher debt burdens increase the cost of borrowing. The debt/state product ratio in the first two equations enters positively. This remains true when dummy variables for time of issue or years to maturity are added. The squared term is consistently negative, which is inconsistent with the view that high-debt states get rationed out of the market. Interest rates continue to rise until the debt ratio reaches 20-25%. This suggests that most states face rising costs of borrowing.

TABLE 14

STATE DEBT AND THE COST OF BORROWING

(dependent variable is yield on most recent general obligation bond)

<u>Explanatory Variable</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>
Constant	-3.03 (2.70)	-3.12 (2.73)	-2.78 (2.72)	-3.14 (2.74)
Yield on Composite Portfolio	1.19 (0.35)	1.17 (0.35)	1.18 (0.35)	1.15 (0.36)
Debt/State Product	12.51 (9.35)	13.43 (9.51)	-	-
Debt/State Product Squared	-28.65 (24.39)	-31.77 (24.98)	-	-
Debt Per Capita	-	-	0.65 (0.63)	0.89 (0.67)
Debt Per Capita Squared	-	-	-0.10 (0.11)	-0.14 (0.12)
Measure of Financial Stringency	-	0.03 (0.04)	-	0.04 (0.04)
R ²	.31	.32	.30	.32
number of observations	33	33	33	33

Notes: Standard errors in parentheses.
Source: See text.

The third and fourth columns measure debt on a per capita basis rather than relative to state GNP, producing no discernible change in the results.

Specialists in state and local public finance view the differences in bond yields that I interpret as evidence of an upward sloping supply curve for external funds as evidence of differences across states in tax treatment of state bonds. Generally, state bonds are tax exempt only for state residents. (Some states also extend this treatment to residents who hold bonds of certain other states.) A high yield is taken to reflect a high state marginal tax rate. These considerations may have grown less important since the tax reforms of the second half of the 1980s. Nonetheless, to explore the hypothesis, I added to all the regressions in Table 14 the ACIR's estimate of the highest marginal tax rate for each state. Its coefficient is uniformly insignificant and does not alter the coefficients on other variables. It appears that borrowing risk rather than merely tax treatment is a major determinant of the cost of external funds.

It is tempting to infer from Table 14 is that since, even in the absence of exchange risk, state governments in the US face upward sloping supply curves of debt finance, European governments which can still change their minds about never devaluing and therefore cannot totally eliminate exchange risk, consequently face even more steeply rise supply curves of debt finance. A possible caveat is that in the US, where many states function under statutory balanced-budget requirements, a deficit is taken as a signal of serious fiscal difficulties. Such states may face even more steeply sloped supply curves of debt finance than their European counterparts. The argument presumably applies only to states with stringent balanced-budget requirements. I therefore interacted the measure of fiscal stringency with the debt/income ratio and the debt/income ratio squared. The two interaction terms were uniformly insignificant, had extremely small coefficients, and had little impact on the results, suggesting that the signalling argument has little force.

Are US states forced to levy identical tax rates to prevent footloose capital from fleeing to low tax jurisdictions? In fact, there is considerable geographical dispersion of tax rates. Table 15 shows average effective personal income and corporation tax rates by census region. Total state tax revenue (essentially the sum of individual and corporation tax revenues) relative to state personal income has a mean of 7.1% and a standard deviation of 1.0%. The coefficient of variation of 0.141 is 52 per cent of the comparable measure in Table 5 for Europe (total taxes exclusive of social security contributions), suggesting that mobility within the US may have imposed more tax harmonization on the American states.^{11/}

A variety of studies have attempted to estimate directly the impact of interstate tax differentials on firms' location decisions. McGuire (1986) has surveyed these studies, concluding that tax differentials do affect locations decisions, although the magnitude of the effect is not large. Bartik (1985), for example, finds that corporate income tax differentials have a significant impact on location decisions for new branch plants, but with a small elasticity. Papke and Papke (1986) similarly report that a measure of sales, property and corporate income taxes is a significant determinant of capital investment per worker. Yet none of the elasticities seem to be sufficiently large to force states to closely harmonize their taxes.

A popular approach to estimating the degree of tax autonomy US states possess is to examine revenue spillovers. The question is the extent to which changes in tax rates in one state affect the tax revenues of another. The overall effect is ambiguous in sign. Higher tax rates in one state can increase revenues of its neighbors through the substitution effect, as residents cross the border to purchase or produce goods in the lower tax jurisdiction. Conversely, higher tax rates in one state can reduce the revenues of its neighbors insofar as lower disposable incomes reduce spending on both sides of the border. If the substitution effect dominates, states setting tax rates non-cooperatively will tend to set them at lower

levels than they would cooperatively, because they neglect the tendency of their lower rates to reduce the revenues of their neighbors. Insofar as tax revenues determine levels of spending on public goods, tax competition arising from revenue spillovers will produce a suboptimal level of public spending. If the income effect dominates, states setting tax rates non-cooperatively will tend to set them at higher levels than they would under cooperation, because they neglect the tendency of their higher tax rates to reduce the revenues of their neighbors. Public spending will be too high.

Hewett and Stephenson (1983) studied state tax revenues under competition in the case of Iowa and the surrounding region (defined to include Illinois, Kansas, Minnesota, Missouri, Nebraska, South Dakota and Wisconsin) in the years 1950-79. They found that the income effect dominated for most taxes: higher sales tax and income tax rates in the surrounding region significantly reduced Iowa's tax revenues. Only in the case of gasoline taxes did higher rates in the surrounding region significantly increase Iowa's revenues.

The sign and magnitude of spillovers may depend on the size of the regions considered. Fox (1986) in a study of moderately-sized metropolitan regions on state borders found in two of three cases that changes in state and local sales tax rates tended to reduce the level of retail activity on that side of the border. He found state income taxes to have little impact on the location of retail activity. Stephenson and Hewett (1985) analyzed changes in not only own tax rates and tax rates in the surrounding region, but also tax rates in individual neighboring states. (They considered the impact of changes in Iowa's taxes on Missouri and vice versa, as well as analyzing separately income, sales and gasoline tax receipts.) One would expect that when the impact on Iowa of Missouri alone rather than of the group of seven neighboring states is considered, both income and substitution effects would be weaker, but that the sign of the spillover remains ambiguous. Most of the results are consistent with this prior. Higher gasoline tax rates in either state raise gasoline tax

receipts in its neighbour. Higher sales tax rates in either state reduce sales tax revenue in its neighbour. Higher income tax rates in Iowa reduce income tax revenues in Missouri, although paradoxically higher income tax rates in Missouri seem to raise income tax revenues in Iowa.

The only consistent conclusion to emerge from these studies is that the sign and magnitude of spillover effects depends on the size of the region and the tax instrument studied. For groups of US states like those studied by Hewett and Stephenson that approximate the size of EC member states, they suggest that the dominant forms of taxation in the EC, income and sales taxes, exhibit negative spillovers due to the predominance of income effects. Absent cooperation, continued integration may leave EC members with tax rates above optimal levels.

3.2.3. Does Factor Mobility Prevent Depressed Regions?

The prospect of a European customs/currency union creates two kinds of worries about the emergence of depressed regions or countries (Servais, 1988). A customs union which permits increased competition among producers located in different European nations will push the least efficient competitors out of business, forcing European nations to specialize in those industries and product lines in which they have a comparative advantage. In every Community member, resources will have to be shifted out of industries previously protected by import barriers and into other sectors. Workers in traditionally sheltered industries may suffer transitional unemployment, where the length of the transition -- according to pessimists -- may be substantial. If expanding industries pay lower wages than contracting ones, workers may be forced to accept wage cuts in order to gain employment. The strains of unemployment and reductions in living standards may fuel political opposition to the customs union. Alternatively, the removal of barriers to the migration of capital and labour

TABLE 15

**MEASURES OF STATE TAX BURDENS
(TAXES AS A SHARE OF PERSONAL INCOME)**

<u>Region</u>	<u>Effective Indiv. Income Tax Rate (per cent)</u>	<u>Effective Corporation Tax Rate (per cent)</u>	<u>Sum of Effective Indiv. and Corp. Rates</u>	<u>Total Tax Revenue as a Share of Personal Income</u>
New England	0.022	0.009	0.030	0.067
Middle Atlantic	0.027	0.006	0.033	0.065
East North Central	0.020	0.006	0.026	0.065
West North Central	0.020	0.004	0.024	0.063
South Atlantic	0.018	0.004	0.022	0.070
East South Central	0.011	0.004	0.016	0.069
West South Central	0.005	0.001	0.006	0.068
Mountain	0.015	0.003	0.018	0.076
Pacific	0.022	0.007	0.030	0.098
Mean	0.018	0.005	0.023	0.071
Stand. Dev.	0.006	0.002	0.008	0.010
Coef. of Var.	0.345	0.427	0.346	0.141

Source: ACIR, Significant Features of Fiscal Federalism (various issues).
Statistical Abstract of the United States (various issues).

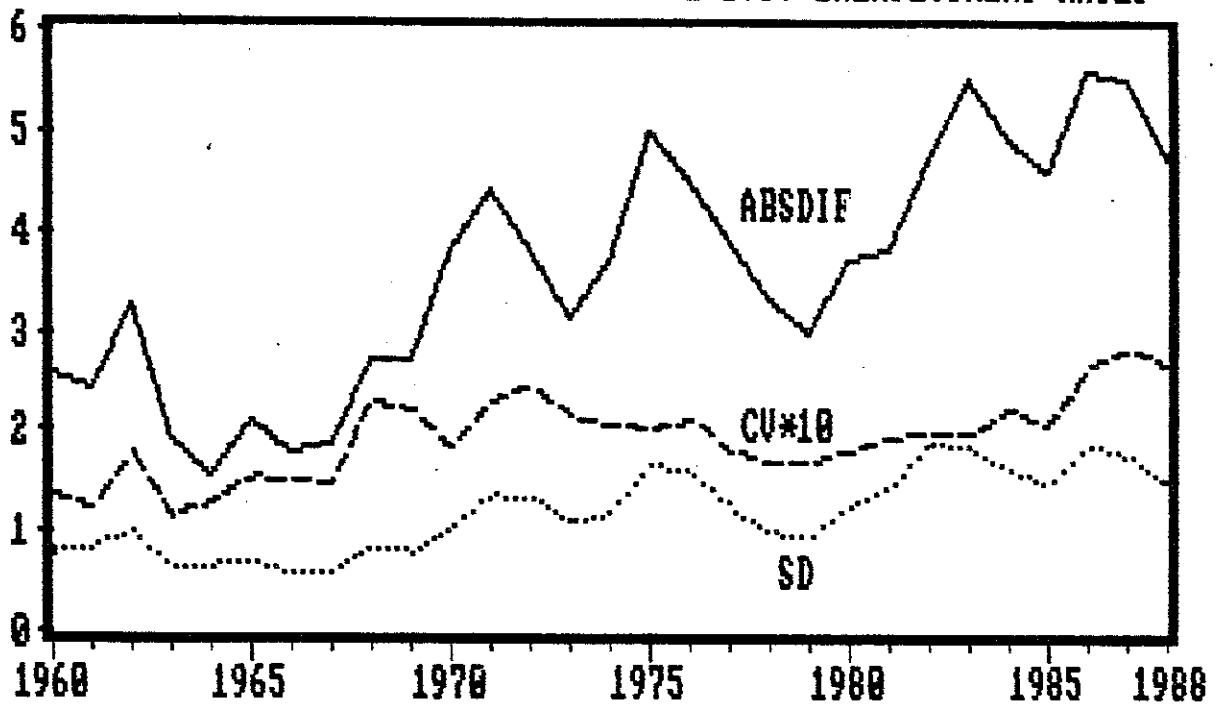
may permit resources to be redeployed rapidly from regions and nations where their marginal productivity and the demand for their services are low to other regions and nations where productivity and factor demands are high.

The second worry is that currency union will require nations that have traditionally relied on the inflation tax for government revenues to reduce public spending. The decline in public spending will raise their unemployment rates relative to those in the rest of Europe. Alternatively, the free mobility of capital and labour across national borders within Europe may conceivably prevent sustained differentials in unemployment rates from emerging. The elimination of exchange risk will enhance international capital mobility within the union, so that any potentially depressed area will immediately receive an injection of investible funds.

The dispersion of state unemployment rates within the US provides a benchmark for these arguments. Europeans and Americans can debate which Continent is more homogeneous culturally, socially and economically, and therefore whether US unemployment differentials are likely to over- or underestimate European unemployment differentials following the completion of the internal market and establishment of a European central bank. Distances are shorter in Europe, but a common language, a common national media and a footloose tradition all suggest that mobility in the US exceeds the degree of labour mobility that is likely to obtain in Europe in the 1990s.

Table 6 above summarized raw unemployment differentials within the EC and US. Both the standard deviation and the coefficient of variation of unemployment rates is higher in the EC than the US. This is consistent with the view that the existence of a US currency/customs union facilitates capital and labour flows which minimize regional problems. But it may be that the EC has recently suffered region-specific shocks larger than those experienced by the United States. A snapshot of unemployment differentials in 1986

CHART 5. DISPERSION OF REGIONAL U.S. UNEMPLOYMENT RATES



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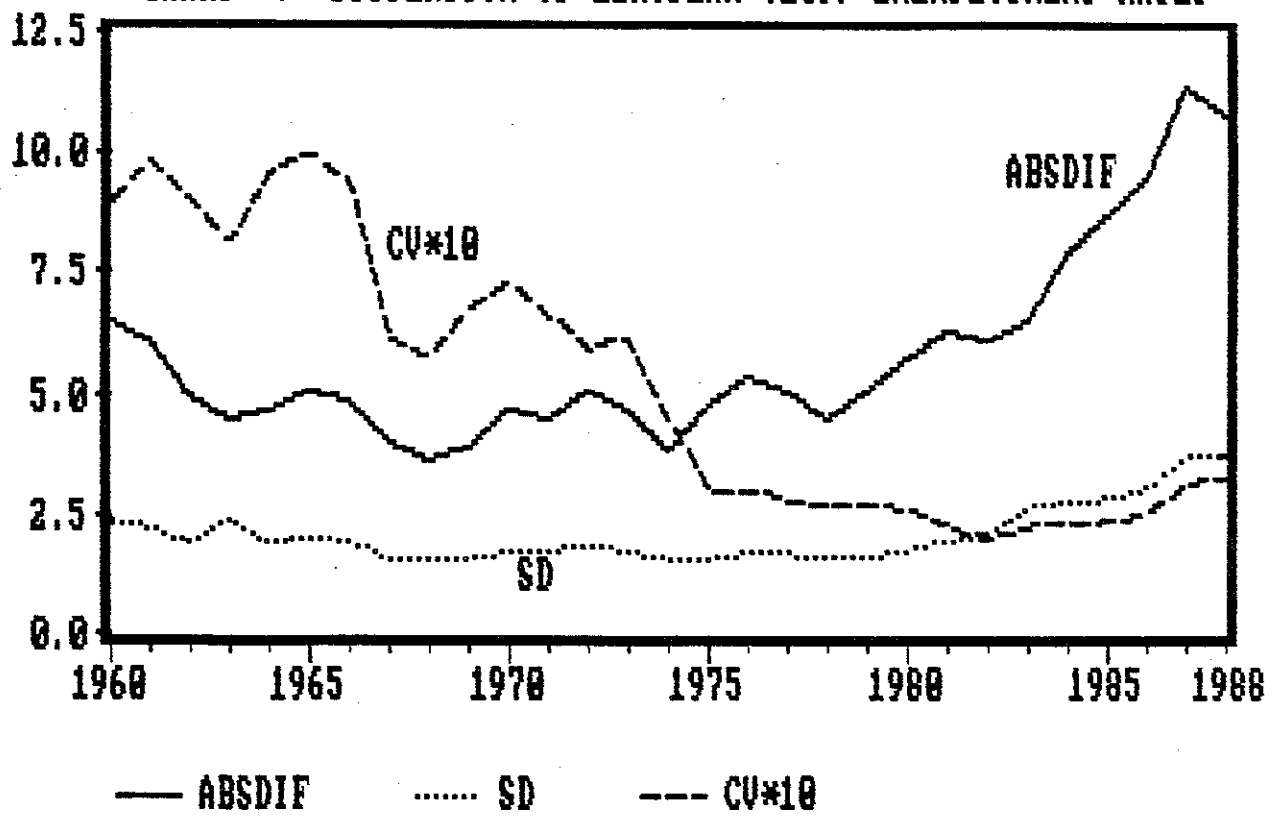
may say little about how quickly local labour markets within the two unions respond to region-specific shocks.

Figures 5 and 6 therefore display alternative time-series measures of the dispersion of unemployment rates in the nine US regions and the EC9. Unemployment rates for European countries and the EC9 average are drawn from Annual Economic Reports of the European Commission. These data are available for the period 1958-88. For the US, I constructed regional unemployment rates by aggregating state unemployment rates, available since 1960.

All of the measures of US unemployment dispersion rise over time. The trend is most pronounced in the absolute difference in unemployment rates between each year's highest unemployment region and lowest unemployment region, least pronounced in the standard deviation of regional unemployment rates. The alternative measures for Europe paint a less consistent picture. When measured by the absolute differential between highest and lowest unemployment rate countries, there has been for Europe, as for the US, a tendency for unemployment dispersion to rise over time. In contrast, the trend in the standard deviation is less pronounced, rising only slightly in the 1980s, while the coefficient of variation falls steadily until 1982-83, suggesting that, at least until recent years, any rise in the cross-country standard deviation of European unemployment rates has been dwarfed by the rise in the average level of European unemployment.

The most dramatic difference between Figures 5 and 6 is the average level of all the dispersion measures. Where the absolute difference in US regional unemployment rates rises from less than 2 per cent in the early 1960s to more than 5 per cent in the 1980s, that for Europe rises from 4 per cent to 10 per cent. Where the US standard deviation rises from less than one per cent in the 1960s to less than 2 per cent in the 1980s, the standard deviation for Europe is consistently between 2 and 3 per cent. The alternative measures

CHART 6. DISPERSION OF EUROPEAN (EC9) UNEMPLOYMENT RATES



suggest that the dispersion of regional unemployment rates is 50 to 100 per cent higher in Europe than in the US.

A possible implication is that local labour markets are slower to adjust to regional disturbances in Europe than in the US. This could reflect greater labour mobility within the US than the EC. It also could reflect the greater integration of commodity and capital markets in the US, the first of which minimizes region-specific demand-side shocks, the second of which evens out the effects of those shocks which occur. Alternatively, it is possible instead that European labour markets respond as quickly as their American counterparts but have been consistently subjected to larger region-specific shocks.

To begin to distinguish between these alternatives, I computed the Spearman rank correlation coefficient between US census region unemployment rates in the current year and in the following year for every year starting in 1960. I did the same for Europe for every year starting in 1958. The correlations are consistently higher for Europe. (The unweighted average is 0.88 for the US and 0.91 for Europe.) The difference grows more pronounced when the ranking of unemployment rates in the current year is compared with the ranking five years later and ten years later. The longer the interval, the greater the disparity between the US and Europe. (Unweighted averages for five year intervals are 0.49 for the US and 0.72 for Europe. For ten year intervals they are 0.17 for the US and 0.66 for Europe.) The implication is that the location of "depressed regions" in the US tends to vary over time, but the same European countries tend to suffer high unemployment and enjoy low unemployment persistently. For the incidence of shocks rather than faster labour market adjustment in the US to explain the difference, one would have to argue that shocks in Europe were not only larger but more serially correlated, which does not seem particularly plausible.

Convincingly distinguishing between these alternatives requires estimation of a model of the labour market's adjustment to disturbances. The central assumption in any such model is the long-run equilibrium relationship among regional labour markets. A strong assumption would be that labour migrates from high to low unemployment regions until regional unemployment differentials are eliminated. There is a large literature for the US, however, starting with Hall (1972), suggesting that significant local unemployment differentials persist in equilibrium. There is little agreement on the reasons for these differentials. Murphy and Hofler (1984), for example, suggest that regional unemployment differentials reflect differences in the sectoral composition of employment (as between construction, agriculture and manufacturing) and differences in the education of the work force. Topel (1983) focuses on the role of experience, suggesting that more experienced workers have more invested in region-specific skills and are therefore less likely to migrate, so that regions in which experienced workers dominate are likely to experience relatively persistent unemployment differentials.

Given this evidence on the persistence of regional unemployment differentials, it is inappropriate to assume that unemployment rates simply converge to the same level. Instead, I made the more general assumption that there is some stable long-run relationship between unemployment in each US region and the overall US unemployment rates (between unemployment in each EC member and the overall EC unemployment rate). In technical terms, I assumed that regional and overall unemployment rates are cointegrated and estimated the cointegrating regression.^{12/} Intuitively, cointegration means that in the long run regional and overall unemployment rates do not have a tendency to wander off in divergent directions.

I then asked how quickly these long-run relationships responded to disturbances. In technical terms, I estimated the error correction model associated with the cointegrating regression.

The analysis was conducted using the annual data summarized in Figures 5 and 6. Results are summarized in Table 16. (The complete set of estimates is reported in Appendix D.) The columns labelled CRDW reports the Durbin Watson statistic testing for cointegration. The critical 5 per cent value for 100 observations is 0.386. The statistic for the basic regressions (in the column labelled "Durbin Watson Test for Cointegration") exceeds the critical value for only four of nine European countries. Two of these are small, highly open economies (Luxembourg and Denmark) whose labour market outcomes might be expected to be particularly closely tied to those in the EC as a whole. But two are relatively large economies (Germany and the UK), to which this argument does not apply. Thus, there appears to have been only a weak tendency for some long-run equilibrium relationship between national and EC9 unemployment rates to hold over the last three decades.

Strikingly, however, the same is true for the United States. Again, the CRDW exceeds the critical value in only four of nine cases. It is commonly suggested that completion of the internal market will attenuate problems of regional unemployment as labor market integration in Europe achieves US levels. Despite the fact that regional unemployment rates are less disperse in the US than in Europe, the remarkable fact is that regional unemployment rates in the US appear to be only weakly related to one another.

It is not possible to estimate the response to a shock to regional unemployment rates if there is no stable relationship among them. A solution to this problem is to add to the cointegrating equation other variables which capture shifts and render the relationship stable. If changes in domestic institutions and/or international competitive conditions in the 1980s

permanently raised unemployment in some regions relative to others, for example, one could add to the equation a dummy variable for the 1980s. A more general version of this approach is to add a time trend which allows unemployment in some regions to rise steadily relative to the average and unemployment in other regions to fall. With this amendment all of the equations pass the test of cointegration. (This is shown in the second column of Table 16. The Engle-Yoo t-test for the three variable case is used). This does not change the conclusion that regional unemployment rates seem only weakly related to the overall rate, but it permits estimation of the error correction model.

The speed of adjustment to shocks to the relationship between regional and overall unemployment rates is shown in the third column of Table 16. Overall, the speed of adjustment is nearly 25 per cent higher in the US than in the EC. The individual country estimates for Europe are plausible, given the literature on labor market institutions and labor market adjustment. Speed of adjustment is lowest for Ireland, Italy and Belgium. It is highest for France, the Netherlands and the UK.

These results confirm at least some of the intuition of proponents of labour market integration. Regional unemployment differentials are smaller in the US than in the EC. The speed of adjustment to regional-specific labour market shocks is faster in the US than in the EC. The decline of statutory barriers and cultural impediments to labour mobility within the EC therefore should go some way toward attenuating the regional problems that might otherwise arise in the course of increasing monetary and fiscal harmonization. At the same time, many of the conditions for labour market integration in the US will be difficult to replicate in Europe. In the absence of fiscal federalism on the scale of the US system, region-specific shocks are likely to remain larger in Europe than in the US. In the absence of the same degree of cultural and linguistic homogeneity as in the US, adjustment through intra-EC-member labour flows is likely to remain slower than comparable adjustment within

TABLE 16
SPEED OF LABOR MARKET ADJUSTMENT IN EC9 AND NINE U.S. REGIONS

	Engle-Granger Durbin Watson Test for Cointegration	Engle-Yoo t-Test for Cointegration, Trend-Augmented Regression	Error Correction Parameter
Denmark	0.54	2.49	-0.42 (0.16)
Germany	0.71	2.73	-0.36 (0.15)
France	0.32	2.78	-0.45 (0.16)
Ireland	0.34	0.91	-0.11 (0.16)
Italy	0.17	0.39	-0.27 (0.25)
Netherlands	0.32	0.99	-0.43 (0.20)
Belgium	0.29	0.80	-0.13 (0.13)
Luxembourg	0.61	3.00	-0.39 (0.13)
UK	0.51	1.26	-0.48 (0.20)
EC9 Average	-	-	-0.34
Middle Atlantic	0.30	1.90	-0.40 (0.12)
New England	0.21	2.12	-0.47 (0.15)
East North Central	0.44	2.86	-0.34 (0.15)
West North Central	0.71	2.86	-0.64 (0.19)
South Atlantic	0.52	1.54	-0.43 (0.17)
East South Central	0.25	1.56	-0.22 (0.14)
West South Central	0.23	1.46	-0.50 (0.21)
Mountain	0.74	3.65	-0.48 (0.18)
Pacific	0.27	1.49	-0.28 (0.16)
US Average	-	-	-0.42

Notes: Standard errors in parentheses. Critical value of Durbin-Watson test for cointegration is 0.386 (for 100 observations). Critical value of Engle-Yoo t-test for the three variable case is 4.11 (5% significance level for 50 observations).

Source: See text and Appendix D.

the US. Thus, US experience provides an upper bound on the extent to which labour-market integration can ameliorate Europe's regional problems. Moreover, US experience suggests that the links between regional unemployment rates even in a highly integrated continental labour market are weak at best. Significant and persistent regional unemployment differentials have consistently characterized US experience over the last three decades. In the US, regional pressures have not led to effective pressure to "devalue the West South Central dollar" or to impose tariffs on goods entering the West South Central region. In part this reflects the federal system of taxes and transfers, which has led to a significant transfer of resources toward high unemployment regions. In part it reflects the broader political context in which US economic policy is formulated. Neither of these forces operates as powerfully in Europe. Even if the EC manages to replicate the degree of economic integration enjoyed in the United States, significant regional imbalances will continue to arise.

4. Lessons for Europe

What lessons emerge from viewing the operation of the US currency/customs union in light of recent European experience? The comparison suggests that the creation in Europe of a customs/currency union along American lines will fundamentally alter policy formulation and market outcomes. The elimination of capital controls dictates increasingly close monetary harmonization. There will remain some scope for independent fiscal policies; both theory and US experience suggest that member states will be able to pursue divergent fiscal policies for limited periods. EC members with high debt-to-GNP ratios and low levels of reserves will have particularly little fiscal autonomy. Moreover, since EC members, like US states, will retain sufficient sovereignty to at least contemplate the option of default on their debts, they should face an upward sloping supply curve of external

finance, which will further limit the length of time for which fiscal independence and monetary union are compatible.

US experience confirms that the elimination of restrictions on the mobility of capital, labour and commodities will create pressure for the harmonization of tax rates across EC member states. It is unlikely to require tax equalization at the lowest prevailing levels, however. While US factors of production are footloose, they are not sufficiently footloose to flee local jurisdictions in response to small tax differentials. Still, some pressure exists: the variability of state tax rates in the US is about 40 per cent less than in EC member states. US evidence suggests that high taxes at home will depress economic activity across the border, a negative externality that needs to be internalized through the international coordination of revenue policies. If they set domestic taxes non-cooperatively, failing to take into account the effect of domestic taxes on their neighbors, EC member states will tend to set tax rates too high.

Establishing permanently fixed exchange rates, perhaps by creating a European central bank and a common currency, will fundamentally alter the balance-of-payments adjustment process. US evidence suggests that, in the absence of devaluation risk and exchange controls, capital should flow more freely among member states to finance payments imbalances. A temporary rise in investment or fall in saving should be almost completely financed by accommodating capital inflows. US evidence also implies, however, that labour mobility among member states will be a less important element of the adjustment process than sometimes posited in discussions of integration. Moreover, the increased scope for capital mobility within a currency union is a two-edged sword. Just as capital inflows can finance a temporary surge in investment, the capital outflows induced by a fall in investment can prevent the excess of domestic savings over domestic investment from reducing local interest rates and thereby moderating the investment slump. The enhanced capital mobility

likely to characterize monetary union may ease external adjustment at the cost of greater domestic instability.

Critics might object that this analysis, based on the experience of Puerto Rico, a distinctive part of the United States, understates the scope for labour mobility within a customs/currency union to eliminate depressed local conditions. Evidence on regional unemployment differentials within the US confirms this intuition, but at the same time suggests that the capacity of labour mobility to eliminate regional unemployment differentials should not be exaggerated. Historically, the dispersion of unemployment rates within the US is only half that within the EC9. The adjustment to regional labour market shocks is about 20 per cent faster in the US than in the EC9. But a striking feature of US experience is the extent to which regional unemployment differentials persist. The tendency for US regional labour market conditions to converge is surprisingly weak. Given the extent of social, cultural, and linguistic diversity in Europe, the tendency of labour mobility to produce convergent labour market outcomes is likely to remain weaker than in the US even if the internal market is completed and a common currency is established.

What do these findings imply for the role of monetary union in the completion of the internal market? There is no reason to doubt that significant regional problems will continue to arise after the elimination of statutory barriers to labour and commodity movements across national borders. Reflationary initiatives by the depressed regions will be limited by the external constraint. Even in a currency union, member states will face sharply rising costs of debt finance. Governments which nevertheless run budget deficits will deplete their reserves and run up against the external constraint. This constraint can be relaxed only by institutionalizing the systematic extension of large-scale reserve swaps among EC members. There exist swap facilities within the EMS, but they would have to be very considerably expanded before they could be reliably utilized to these ends.

Regional problems could be attenuated by fiscal federalism. In the US the political pressures to which divergent regional labor market outcomes give rise are ameliorated by a system of interregional fiscal transfers which limits regional unemployment differentials by offsetting a portion in the decline in regional income and helping to relax the external constraint. Fiscal federalism thereby cements the political consensus for integration. There exists a system of fiscal transfers within the EC, but it too would have to be very considerably expanded before it could have a noticeable impact. Since regional problems are likely to be significantly greater in the "USE" than in the USA, the extent of fiscal transfers in Europe would have to significantly exceed their extent in the US.

The only other way of dealing with the problem of a depressed region is to devalue its currency. Devaluation can transform part of the decline in output into a deterioration in the terms of trade that may offset the loss of regional income or at least spread its domestic incidence more evenly than if it takes the form of unemployment. Unless swap facilities and fiscal federalism are drastically expanded, European governments would be reckless to forswear this option. A Tobin tax would be the least-cost method of maintaining scope for exchange rate changes while at the same time minimizing the damage to the internal market. A further advantage of the Tobin tax is that, as a form of short-term capital control, it can enhance the degree of fiscal autonomy that the depressed region possesses. Lacking adequate reserve swap facilities and meaningful fiscal federalism, there is the danger that the headlong rush for monetary integration will give rise to regional imbalances and political tensions that will disrupt efforts to complete the internal market.

Appendix A. The Simple Analytics of Economic Integration

Section 1 raised the question of whether free trade in commodities, free international mobility of labour, and freedom of international capital movements all are necessary to reap the benefits of economic integration. Three positions on the issue can be distinguished. First is the Heckscher-Ohlin presumption, that free trade in commodities is sufficient to deliver these benefits, rendering factor mobility redundant. In this view, the benefits of a single market and the retention of capital controls are entirely consistent. Second is the standard neoclassical presumption, namely, that even if the Heckscher-Ohlin results fail to obtain, due to large differences in factor proportions across countries, the mobility of one factor of production -- say labour -- suffices to deliver the benefits of integration. Assuming that labour mobility will be relatively high in the European economy of the 1990s, capital mobility is superfluous. The benefits of a single market are therefore entirely consistent with the retention of capital controls. Third is the imperfect competition presumption: that in a world featuring imperfectly competitive markets, free trade in commodities and free mobility of both capital and labour will be needed to deliver the benefits of integration.

The conditions under which these various possibilities obtain can be most readily analyzed using the "Melvin diagram" (Melvin, 1968) employed by Helpman and Krugman (1985). The various assumptions about technology and market structure I consider are those analyzed by Helpman and Krugman. (Other assumptions are possible, but these are the ones that have received the most attention in the recent literature.) Here I rely entirely on diagrammatic analysis; Helpman and Krugman provide mathematical derivations. My addition is international factor mobility.

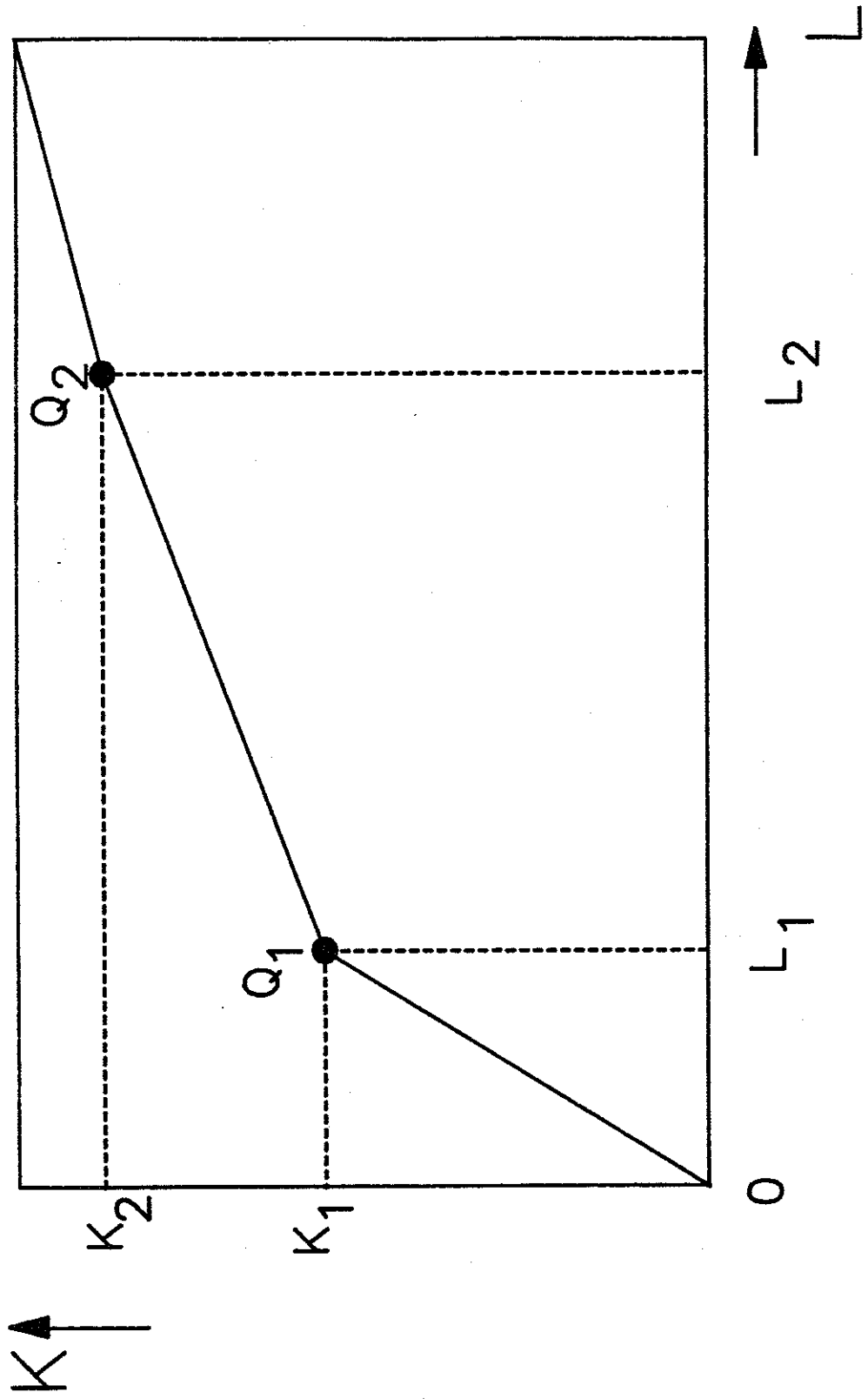


Figure 7

Consider a world with two factors of production (capital and labour) and three goods (indexed 1, 2, 3, in descending order of capital intensity, with no factor intensity reversals). Production functions are quasi-concave and feature constant returns to scale. There is perfect competition. All goods are produced in equilibrium. The economy is fully integrated in that all factors of production are freely mobile among sectors and industry outputs are freely tradable. These are the standard Heckscher-Ohlin assumptions in the two factor, three good case.

Figure 7 shows the equilibrium allocation of resources in an integrated world (think of Europe with a single market but no external trade). The dimensions of the Edgeworth box denote the economy's endowments of labour and capital. Given equilibrium product and factor prices, rays OQ_1 , Q_1Q_2 and Q_2Q_3 denote the employment of factors of production in industries 1, 2 and 3, respectively. The employment of capital in industry 1 is OK_1 , that in industry 2 is K_1K_2 , and that in industry 3 is K_2K . The same applies for labour.

Now assume that this world is divided into two countries and, initially, that there are no international factor movements. The tastes of consumers in the two countries are identical and homothetic. The factor endowment of the home country is measured from the lower, left-hand side origin, as before, while the factor endowment of the foreign country is measured from the upper, right-hand side origin (Figure 8). Q_3 in Figure 7 has been relabelled O^* in Figure 8 to denote the foreign origin. The question is under what circumstances free trade alone will reproduce the integrated equilibrium. Reproducing the benefits of the integrated equilibrium means that product prices are the same, levels of production (and consumption) of each product are the same, factor prices are the same, and (hence) factor proportions in each industry are the same. We therefore draw in the same factor proportions rays starting from the origin for the foreign country. For any set of factor endowments in the shaded region (for example, E , where OK_1 and OL_1 are capital and

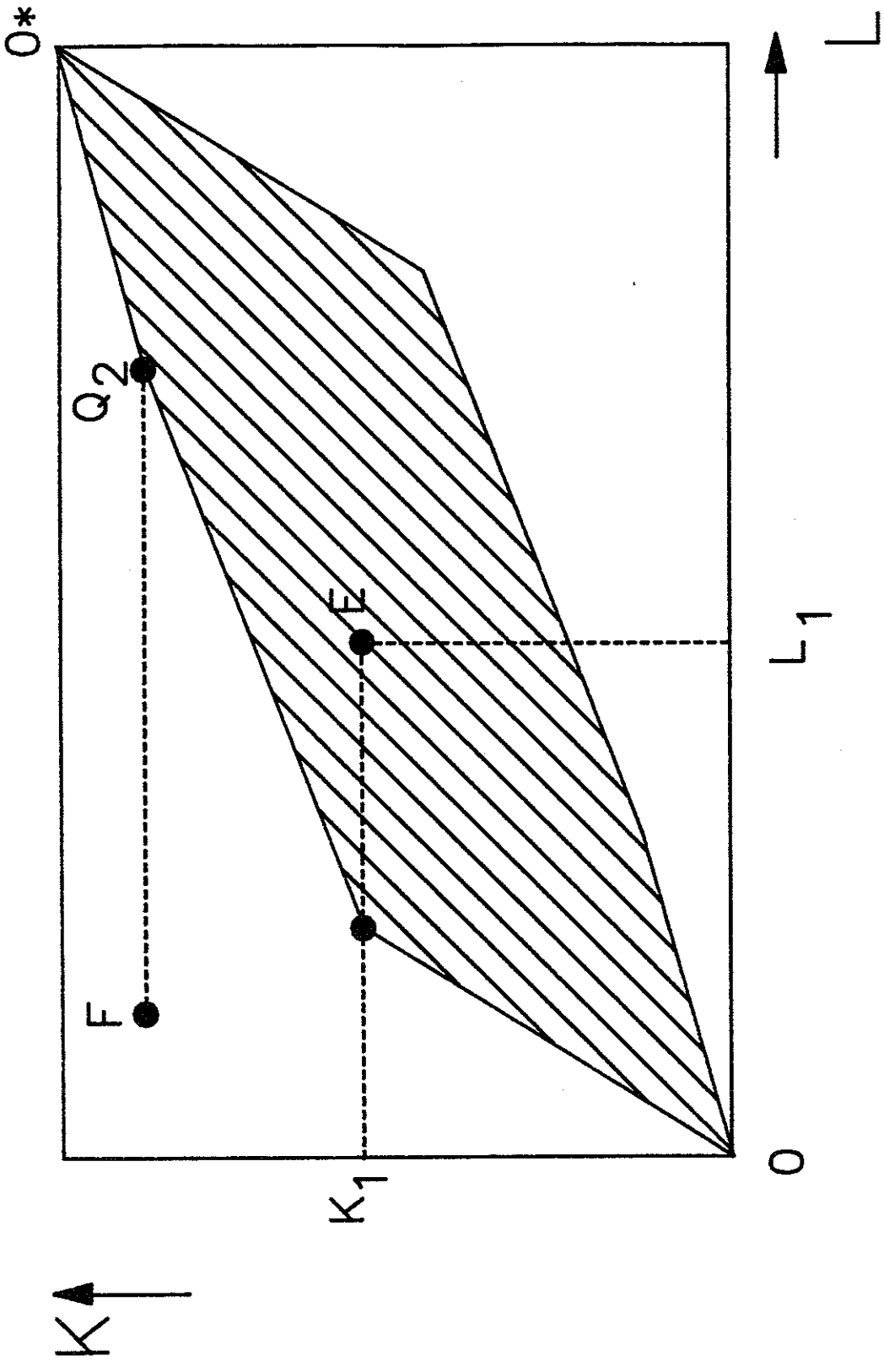


Figure 8

labour of the home country, while K_1K and L_1L are capital and labour of the foreign country), free trade is sufficient to deliver the full benefits of integration.

If factor proportions differ greatly, however, free trade in commodities by itself may be insufficient to deliver the benefits of full integration. If the home country (Germany) is highly capital-abundant relative to the foreign country (Portugal), as at point F in Figure 2, one of the countries will specialize in the production of some subset of commodities. (For example, Portugal will specialize in the production of 3, the most labour-intensive good, or 2 and 3, the two relatively labour-intensive goods). Factor prices may not be equalized internationally, and the benefits of full integration will not obtain.

In this case, mobility of one factor production will suffice to deliver those benefits. Let the mobile factor be labour. If the labour-scarce home country imports labour in the amount FQ , it can return to the shaded area where factor price equalization obtains. Since the shaded area extends from the bottom to the top of the box, mobility of one factor is guaranteed to deliver the benefits of integration.

Adding nontraded goods does not change this result but heightens the importance of factor mobility. Assume that good 3, the labour-intensive good, is nontraded. The relative levels of GNP of the two countries are given by point C on the diagonal of Figure 9. Given C , OP of the nontraded goods is consumed at home, O^*P^* abroad. If we draw vertical lines to the horizontal line down from P and up from P^* and eliminate the corresponding amounts of labour as unavailable to the two traded goods industries, we can draw in the employment rays for those two industries, as in Figure 9. The interior parallelogram is therefore the combinations of factor endowments under which trade alone delivers the benefits of integration. Repeating the procedure from other values of C along the diagonal yields the parallelogram in Figure 10. Thus, the presence of nontraded goods

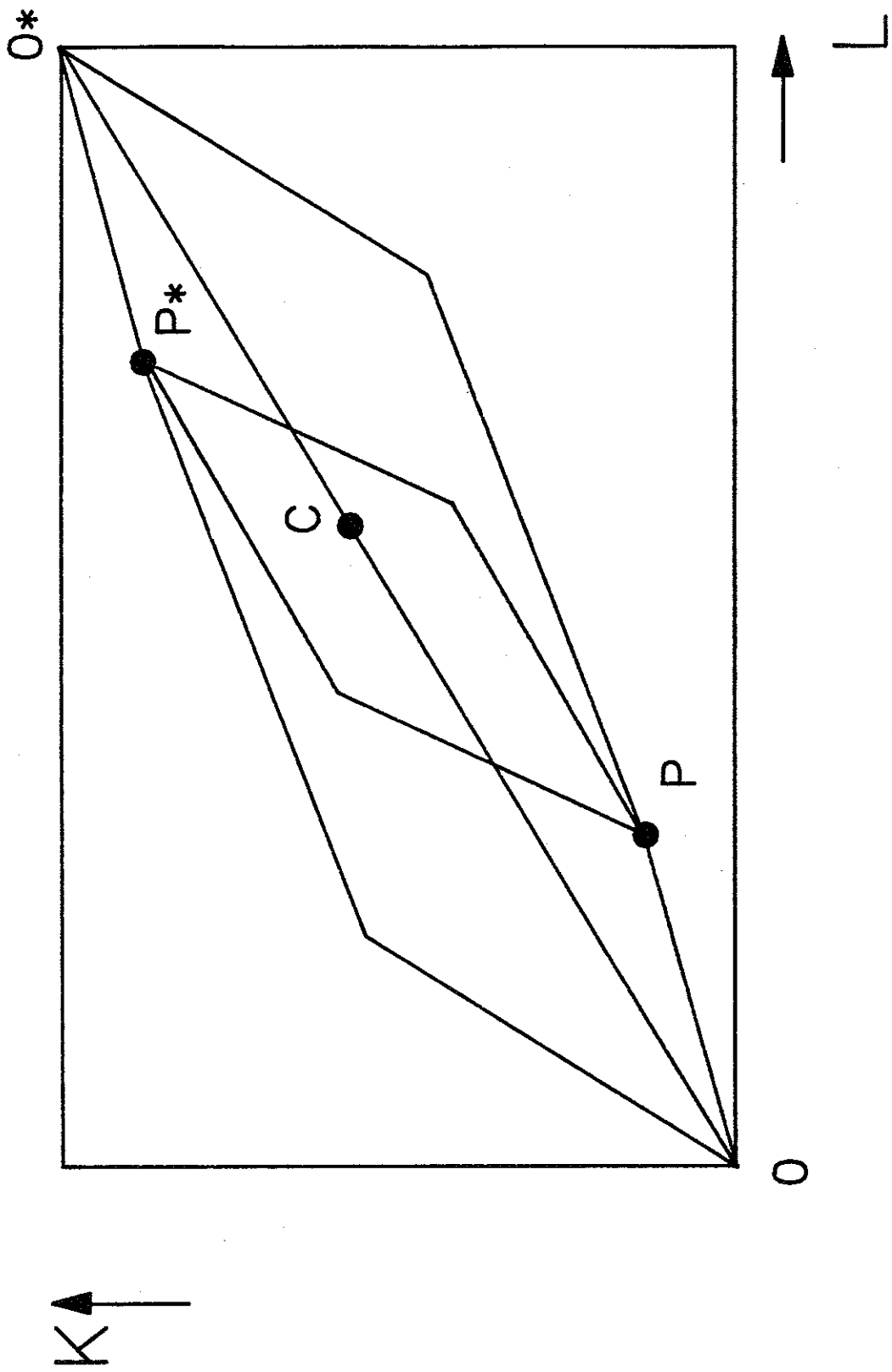


Figure 9

reduces the range of factor endowments for which trade alone delivers the benefits of integration.

Note, however, that mobility of one factor of production again is sufficient to deliver the benefits of integration. In this case, labour migrates to the capital-abundant country (where, in the absence of migration, there would be an incipient excess demand for the nontraded good at integrated product prices). The only circumstance in which this would not be the case is where the production of nontraded goods is subject to increasing returns to scale (Helpman and Krugman, 1985, pp. 201-205).

To analyze increasing returns more fully, assume again that all goods are traded, but that there exist industry-specific, country-specific external economies of scale. To reproduce the integrated equilibrium, the industry featuring external economies (say industry 1) must be concentrated in one country. If it is concentrated in the home country, employment in industries 2 and 3 may be divided up between the home and foreign countries anywhere in the upper parallelogram shown in Figure 11. If it is concentrated in the foreign country, employment in the other industries must lie in the lower parallelogram. It is possible (though not certain) that these parallelograms do not span the vertical axis (the case drawn). If initial factor endowments are E , no amount of labour mobility is sufficient to deliver the benefits of full integration. This is because it would also be necessary to reallocate capital from one country to the other to permit all activity in industry 1 (the capital-intensive industry) to be concentrated there.

So far we have maintained the assumption that the goods produced by each of our industries are homogeneous. An alternative is to assume that one (or more) of the industries produces differentiated products. I assume that industry 1 produces the differentiated goods. If consumers have Dixit-Stiglitz (additive CES) preferences and entry is free, we will have the case of Chamberlinian imperfect competition. Each firm faces decreasing costs and a

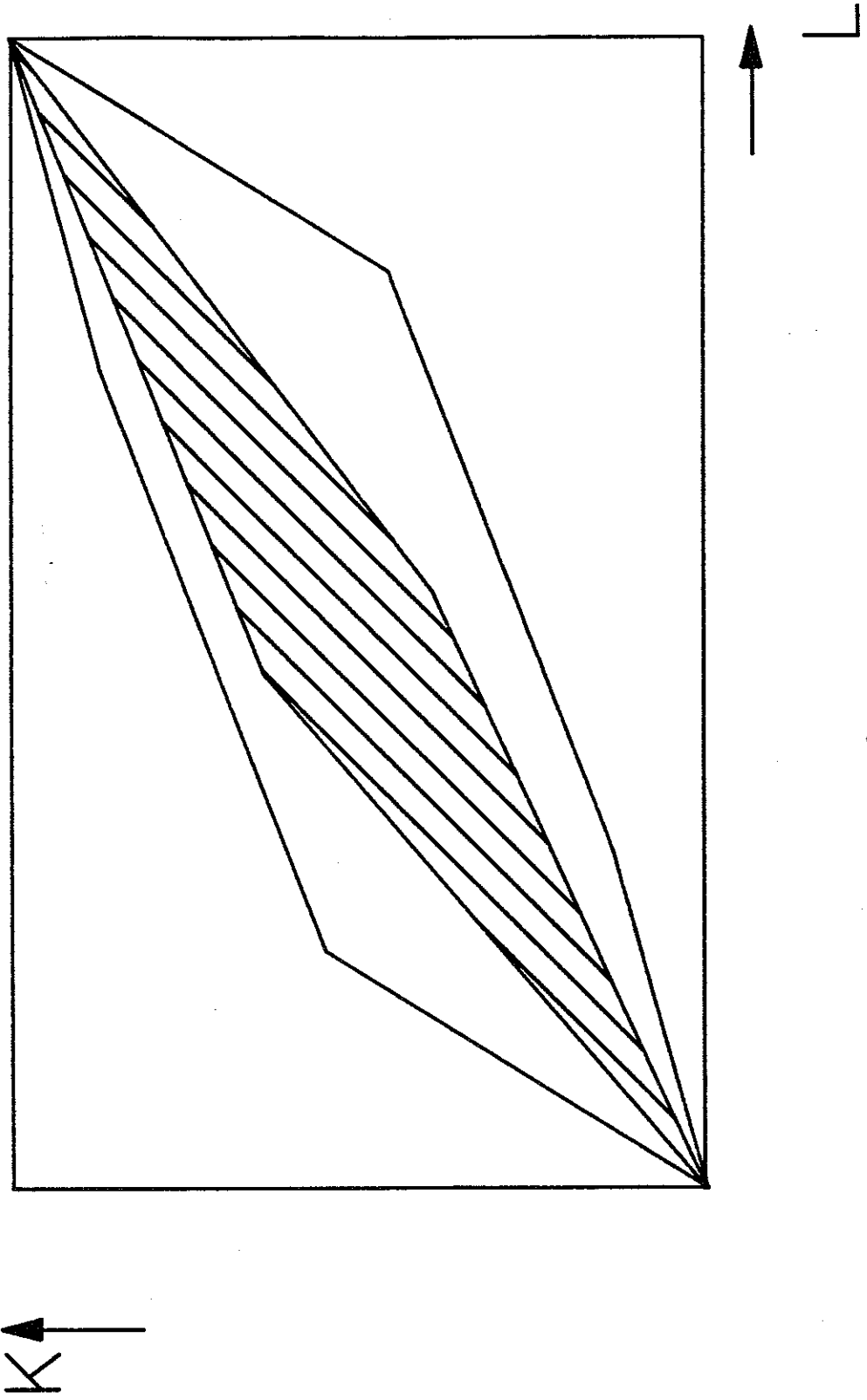


Figure 10

downward-sloping demand curve, but in contrast to the preceding example, increasing returns are internal to the firm (rather than external to the firm and internal to the industry). Entry proceeds until profits are driven to zero. If all goods are tradable, the implications for our question are no different than the standard Heckscher-Ohlin case. Diagrammatically, we again have Figure 6. If factor proportions in the two countries are sufficiently similar, no factor movements are necessary. If they differ more than this, mobility of one factor, such as labour, suffices to deliver the benefits of integration.

A final case that builds on this analysis of product differentiation is when there exists a nontraded intermediate good industry Z in addition to the three final goods analyzed above. Following Helpman and Krugman, assume that the capital intensity ranking in the integrated equilibrium is 1, Z , 2, 3. Z is used only in industry 1. Following Helpman and Krugman, assume that Z is a differentiated product, that the Z industry is monopolistically competitive, and that firms in industry 1 benefit from the utilization of an increasing variety of Z goods. Each Z -firm will then produce a different variety of Z . Full efficiency requires that all varieties of Z be available to each firm industry 1. Hence for full efficiency all 1 and all Z production must be concentrated in one country. This is essentially identical to the case of external economies and homogeneous products described above. The difference is that the origins of the shaded parallelograms lie at the end of two line segments (as in Figure 12) rather than one (as in Figure 11). Once again, if the 1- Z industrial complex is capital-intensive, free trade in goods and labour mobility alone may not sufficient to deliver the benefits of full integration.

Thus, whether goods-market integration and mobility of a subset of factors of production are sufficient to deliver the full benefits of integration depends on the particulars of technology, transport costs and market structure.

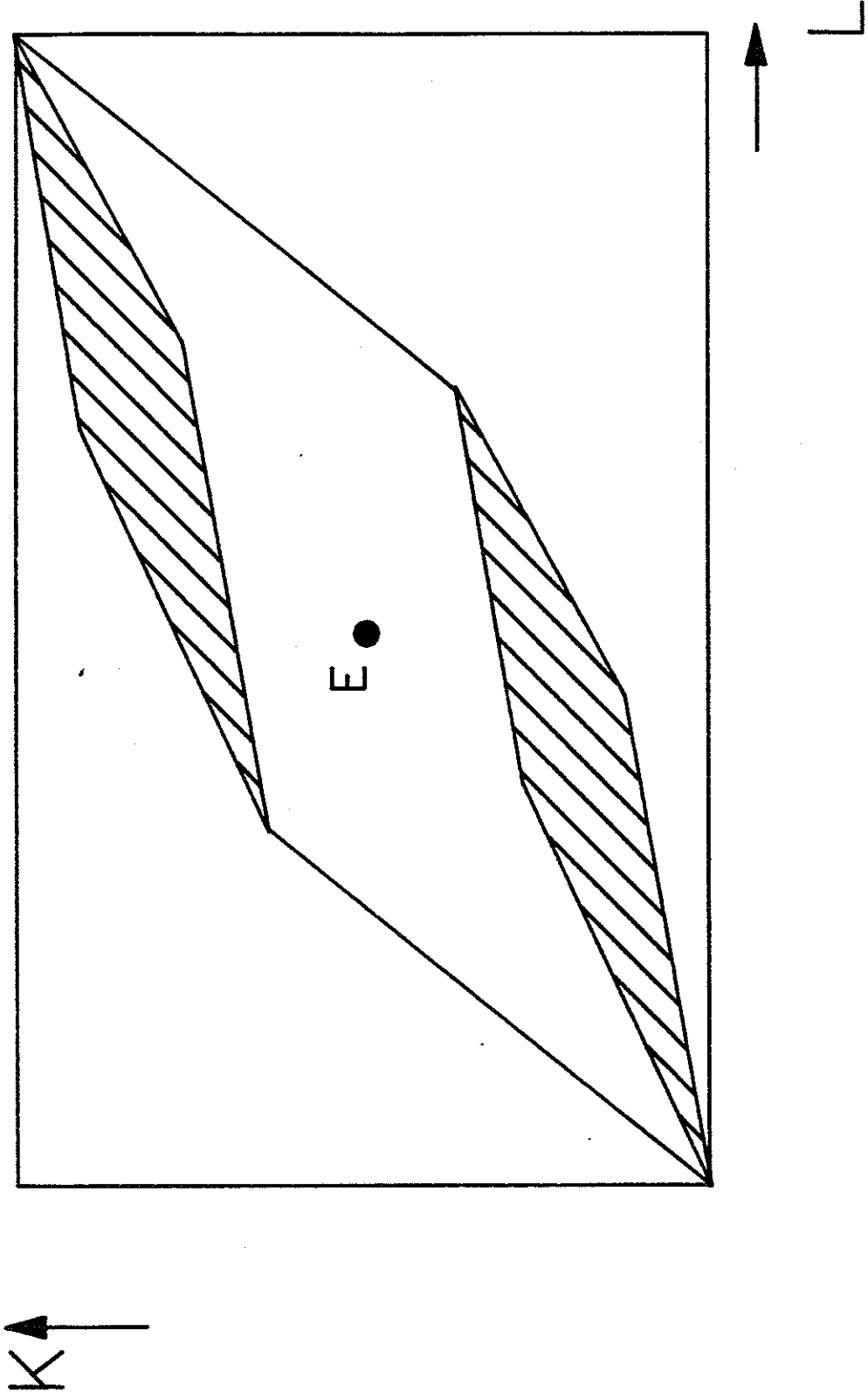


Figure 11

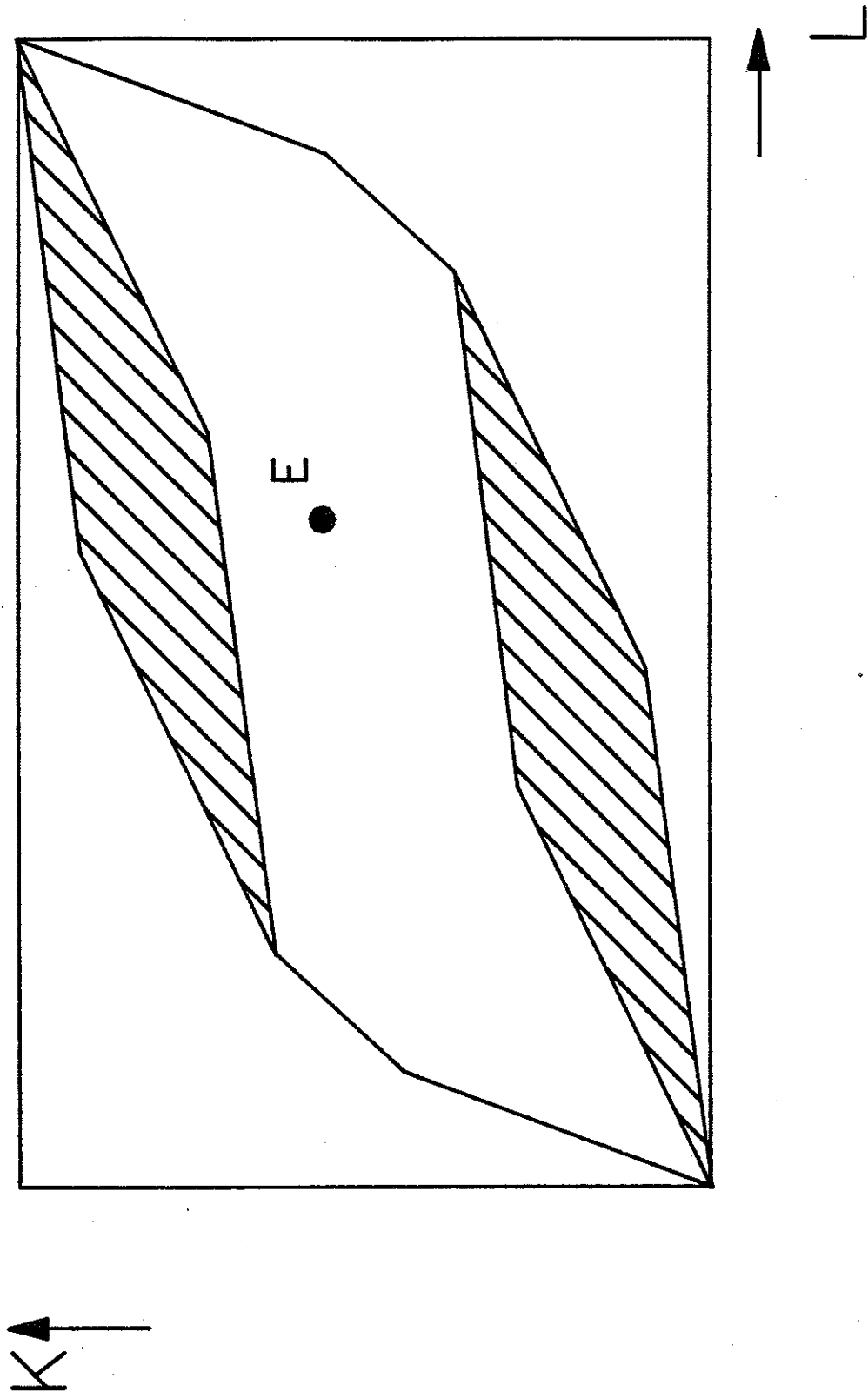


Figure 12

Appendix B. Fiscal Policy in a Monetary Union

The simplest model which illustrates the constraints on policy implied by exchange rate union is the continuous time model of Buitier (1987). Here I reproduce the essentials of the Buitier model to substantiate assertions made in the text. Consider a small open economy.

$$M/(SP^*) = \zeta(i, y) \quad (B1)$$

$$P = SP^* \quad (B2)$$

$$\dot{i}(t) - i^*(t) + \{E(t)\dot{S}(t)\}/S(t) \quad (B3)$$

$$\dot{M} + \dot{SB}^* - \dot{SR}^* = \Delta + i^*SB^* \quad (B4)$$

M is the nominal stock of non-interest-bearing domestic high-powered money, i the domestic nominal interest rate, y domestic real output, P the domestic price level, P^* the foreign price level, S the nominal exchange rate, i^* the foreign nominal interest rate, B^* the stock of government debt, R^* the stock of official foreign exchange reserves, and Δ the nominal primary deficit. Foreign exchange reserves are assumed to be non-interest bearing.^{13/} Initially I abstract from domestic economic growth, changes in foreign interest rates and other factors that alter the steady state demand for money. The foreign interest rate and the primary deficit are assumed to be constant over time.

Assume that the government stops defending the exchange rate when reserves fall to zero. The timing of the collapse can be determined by solving for the shadow (floating) exchange rate that obtains at the time of collapse, and imposing the arbitrage condition that there be no discontinuous jumps (implying infinite profits) at the time of collapse. The equation of

motion for the exchange rate is:

$$E_t \dot{\bar{S}}(t) = \alpha_s \bar{S}(t) - \alpha_M D(t) + z(t) \quad (B5)$$

where

$$\alpha_s = - \left[\zeta_i^{-1} \frac{D}{P} \right]_0 > 0; \quad \alpha_M = - \left[\frac{\zeta_i^{-1}}{P^*} \right]_0 > 0,$$

and

$$z(t) = - \left[\left[\zeta_i^{-1} \frac{D}{P} \frac{\bar{S}}{P^*} \right]_0 P^*(t) + [\bar{S} \zeta_i^{-1} \zeta_y]_0 y(t) + [\bar{S}]_0 i^*(t) \right].$$

The exchange rate is:

$$\bar{S}(t) = \int_t^{\infty} e^{\alpha_s(t-u)} E_t [\alpha_M D(u) - z(u)] du. \quad (B6)$$

Holding i^* and Δ constant and assuming that the fixed rate regime will collapse when $\bar{S}(\bar{t}) = \bar{S}$, (B6) can be rewritten:

$$\bar{S} = \frac{\alpha_M}{\alpha_s} \left[D(t_0) + [\Delta + i^* \bar{S} B^*(t_0)] [t - t_0] + \frac{\Delta + i^* \bar{S} B^*(t_0)}{\alpha_s} \right] + Z(t), \quad (B7)$$

where:

$$Z(\bar{t}) = - \int_t^{\infty} E_t z(u) e^{-\alpha_s(u-t)} du.$$

Hence the time to collapse (assuming money finance) is given by:

$$\bar{t} - t_0 = \frac{\bar{S} - \frac{\alpha_M}{\alpha_s} D(t_0) - Z(\bar{t})}{[\Delta + i^* \bar{S} B^*(t_0)] \frac{\alpha_M}{\alpha_s}} - \frac{1}{\alpha_s} \quad (B8)$$

With Δ , B^* and i^* in the denominator, the higher the interest rate, the larger the initial stock of debt and the larger the primary budget deficit, the shorter the time until the convertibility crisis takes place. Similarly, with D entering negatively in the numerator, the larger the initial stock of domestic credit, the sooner fiscal correction is required.

The implications of debt finance can be analyzed by analyzing the impact of a one-time open market sale. (The implications of repeated or continuous open market sales follow directly.) Imposing the requirement that $\bar{S} dB^* = - dD$ when differentiating (B8) yields:

$$\begin{aligned} \left. \frac{\partial(t-t_0)}{\bar{S} dB^*(t_0)} \right|_{OM} &= \frac{1}{\Delta + i^* \bar{S} B^*(t_0)} - \frac{\left[\bar{S} - \frac{\alpha_M}{\alpha_S} D(t_0) - Z(\bar{t}) \right] i^*}{\left[\Delta + i^* \bar{S} B^*(t_0) \right]^2 \frac{\alpha_M}{\alpha_S}} \\ &= \frac{1}{\Delta + i^* \bar{S} B^*(t_0)} \left[\frac{\alpha_S - \alpha_S i^*(\bar{t}-t_0) - i^*}{\alpha_S} \right]. \end{aligned} \tag{B9}$$

The first term shows how the lower stock of domestic credit outstanding following the open market sale delays the deadline for correction. The second term shows how the heavier debt-servicing burden with which the government is subsequently saddled owing to the larger stock of interest-bearing debt outstanding hastens the deadline for correction. In general, the impact of switching from money to debt finance on the duration of fiscal autonomy is ambiguous. Only if the open market sale takes place immediately before the crisis would otherwise occur is it sure to provide additional breathing space.

If domestic and foreign debt instruments are imperfect substitutes, there will exist a differential between the world interest rate i^* and its domestic counterpart i , with $i-i^*$ rising when additional domestic debt is

issued. Substituting $i(B^*)$, where $i' > 0$, for i^* in (B8), it is apparent from (B9) that imperfect substitutability reduces the degree to which debt finance confers fiscal autonomy. Now an expansionary open market operation not only raises B^* , but it raises i as well, further increasing the interest burden created by debt finance and bringing forward the date of collapse.

Capital controls can be analyzed analogously. They have precisely the opposite effect. Returning to the assumption of perfect substitutability, they can be modeled as a wedge between domestic and foreign interest rates. Equation (3) can be rewritten:

$$i = i^* + \frac{E(t)S(t)}{S(t)} - k \quad (B3')$$

From (8) it is clear that the imposition of controls reduces debt-servicing costs, *ceteris paribus*. For given values of i^* and Δ , it postpones the date by which fiscal correction is required.

Appendix C. Data Used in Analysis of Balance of Payments Adjustment

Puerto Rico

1. The terms of trade is defined as the ratio of the Puerto Rican CPI to the US CPI times 100. The source for the US CPI is the Statistical Abstract of the United States. Base year 1967=100. The source for the Puerto Rican CPI for 1971-84 is Informe Economica al Gobernador, 1984, appendix table A-1, base year=1954. For 1942-43 data are from Basic Statistics of Puerto Rico. For 1944-59 data are from Statistical Yearbook of Puerto Rico.
2. The balance of trade is defined as exports of goods and services minus imports of goods and services, from Balanza de Pagos, 1983 (San Juan: Junta de Planificacion) and earlier issues. In current dollars.
3. Net private remittances are in current dollars. From Balanza de Pagos.
4. Long-term and short-term net capital flows are in current dollars. From Balanza de Pagos.
5. Gross Domestic Product of Puerto Rico is in current dollars. Source is Statistical Abstract of the United States for 1971-87. Data for 1947-70 are from the Statistical Yearbook of Puerto Rico.
6. Gross Fixed Domestic Investment is in current dollars. 1976-85 data are from Governor's Report. 1947-72 data are from Statistical Yearbook of Puerto Rico.

Portugal

1. The terms of trade is defined as the ratio of export prices to import prices times 100. The source is the Banco de Portugal Report of the Board of Directors (various years). For 1953-59 I use terms-of-trade figures (defined as above) with a base year of 1953. There is no 1960 figure in that series. The next series (with a base year of 1960) starts only in 1960. However, from the IMF International Financial Statistics we can infer that the change in the terms-of-trade from 1959-60 was 0.6%. Thus, I converted the 1953 base year series to 1960 on the basis of the overlapping observation for 1960. The same process is used to convert the 1953-64 series to base year 1965 since the 1965-70 data use that year. Finally, the 1953-70 data are converted to base year 1970 which is the base year for all the remainder of the series (to 1986).

2. The balance of trade is defined as exports of goods and services minus imports of goods and services in millions of current escudos. The data are from the Banco de Portugal's Report of the Board of Directors for various years. To keep the Portuguese figures consistent with those for Puerto Rico, I took the merchandise balance, added the service balance and subtracted out net private unrequited remittances, which is included in the services total for Portugal, unlike the case for Puerto Rico. For 1964-86, the Banco de Portugal provides a separate table for Balance of Payments for metropolitan Portugal. Since the countries in the escudo zone change several times during the period under study, I considered the balance of payments for metropolitan Portugal only. Prior to 1964, the Banco de Portugal Balance of Payments tables are for the escudo area but with a seemingly arbitrary breakdown between the metropolitan area and the overseas territories. For the

years that the two methods of presenting the Balance of Payments overlap the data are consistent.

3. Net unrequited private transfers are in millions of current escudos. The source is the Banco de Portugal's Report of the Board of Directors for various years. Net remittances would have been preferable, but those data were available only from 1975. Unrequited private transfers are remittances plus donations, legacies, and pensions. Since the difference between unrequited transfers and remittances is on the order of 1-5% of the former, this should not be critical.

4. Net medium and long-term private and public capital flows are in millions of current escudos. The source is the Banco de Portugal Report of the Board of Directors (various years). Prior to 1964 the Balance of Payments tables show this item as "Long-term Capital" only. However, overlapping observations suggest that the "Long-term Capital" series per-1964 is consistent with the "Medium and Long-term Capital" series since.

5. GDP is in millions of current escudos. Sources are: 1953-73, OECD Main Economic Indicators; and 1973-86 the Banco de Portugal's Report of the Board of Directors for various years.

6. Gross Fixed Domestic Investment is in millions of current escudos. Sources are: 1953-1973 OECD Main Economic Indicators; and 1973-86 Banco de Portugal's Report of the Board of Directors for various years.

Appendix D. Cointegration Regressions and Error Correction Models of the Labour Market

This appendix reports the cointegration regressions and error correction models used to characterize labour market adjustment. Any analysis of labour market adjustment must start with an assumption about how labour markets are related in equilibrium. Alternative assumptions are that in equilibrium there is some absolute differential between each region's unemployment rate $U(i)$ and the US (EC) average unemployment rate $U(n)$:

$$U(i) = a_i + U(n) \tag{D1}$$

or that in equilibrium there is a proportional relationship between each's region's rate and the US (EC) average:

$$U(i) = b_i U(n) \tag{D2}$$

Combining these assumptions yields:

$$U(i) = a_i + b_i U(n) \tag{D3}$$

That a relationship like (D3), of which (D1) and (D2) are special cases, holds in the long run means that $U(i)$ and $U(n)$ are cointegrated. Stronger assumptions (special cases of (D3)) can be tested by examining the coefficients. (For example, the assumption that regional unemployment differentials are eliminated in the long run is the case of $a=0$ and $b=1$.)

The speed of adjustment of these labour markets to shocks can be examined by estimating the error correction model associated with this cointegrating regression:

$$dU(i) = \gamma_i + \alpha_i dU(n) + \sigma_i \text{RES}(-1) \tag{D4}$$

TABLE D1

BASIC COINTEGRATING REGRESSION
 (dependent variable is national or regional unemployment rate)

	<u>Constant</u>	<u>EC9 or US Unemployment</u>	<u>R²</u>	<u>DW</u>
Denmark	-0.54 (0.39)	0.96 (0.07)	0.88	0.54
Germany	-0.80 (0.15)	0.83 (0.03)	0.97	0.72
France	-1.32 (0.25)	1.10 (0.04)	0.96	0.32
Ireland	1.52 (0.35)	1.40 (0.06)	0.95	0.34
Italy	3.37 (0.46)	0.82 (0.08)	0.80	0.17
Netherlands	-1.67 (0.28)	1.36 (0.05)	0.97	0.32
Belgium	-0.37 (0.31)	1.32 (0.05)	0.96	0.29
Luxembourg	-0.39 (0.03)	0.18 (0.01)	0.98	0.61
UK	-0.47 (0.25)	1.08 (0.04)	0.96	0.51
Middle Atlantic	-0.08 (0.55)	1.05 (0.09)	0.84	0.30
New England	1.17 (1.01)	0.72 (0.16)	0.43	0.21
East North Central	-2.69 (0.55)	1.50 (0.09)	0.92	0.43
West North Central	-0.28 (0.40)	0.79 (0.06)	0.85	0.71
South Atlantic	0.01 (0.34)	0.91 (0.05)	0.91	0.52
East South Central	-1.25 (0.80)	1.29 (0.13)	0.80	0.25
West South Central	1.35 (0.84)	0.73 (0.13)	0.53	0.23
Mountain	1.76 (0.38)	0.68 (0.06)	0.83	0.74
Pacific	2.04 (0.59)	0.81 (0.09)	0.74	0.27

Note: Standard errors in parentheses.
 Source: See text.

TABLE D2

TIME-TREND-AUGMENTED COINTEGRATING REGRESSION
 (dependent variable is national or regional unemployment rate)

	<u>Constant</u>	<u>EC9 or US Unemployment</u>	<u>Time</u>	<u>R²</u>
Denmark	-1.02 (0.43)	0.72 (0.12)	0.10 (0.05)	0.90
Germany	-0.79 (0.18)	0.84 (0.05)	-0.01 (0.02)	0.97
France	-2.01 (0.13)	0.76 (0.04)	0.15 (0.01)	0.99
Ireland	1.20 (0.40)	1.24 (0.11)	0.07 (0.04)	0.95
Italy	4.36 (0.39)	1.30 (0.11)	-0.21 (0.04)	0.89
Netherlands	-2.16 (0.28)	1.12 (0.08)	0.10 (0.03)	0.98
Belgium	-0.71 (0.35)	1.16 (0.10)	0.07 (0.04)	0.96
Luxembourg	-0.38 (0.04)	0.19 (0.01)	-0.01 (0.01)	0.98
UK	-0.72 (0.28)	0.96 (0.08)	0.05 (0.03)	0.96
Middle Atlantic	-0.19 (0.49)	1.19 (0.09)	-0.05 (0.02)	0.88
New England	0.92 (0.85)	1.02 (0.16)	-0.11 (0.03)	0.62
East North Central	-2.55 (0.45)	1.33 (0.08)	0.06 (0.02)	0.96
West North Central	-0.20 (0.36)	0.69 (0.07)	0.04 (0.01)	0.89
South Atlantic	-0.07 (0.27)	1.02 (0.05)	-0.04 (0.01)	0.95
East South Central	-1.13 (0.76)	1.13 (0.14)	0.06 (0.03)	0.82
West South Central	1.52 (0.75)	0.52 (0.14)	0.07 (0.03)	0.64
Mountain	1.85 (0.33)	0.57 (0.06)	0.04 (0.01)	0.88
Pacific	2.02 (0.60)	0.83 (0.11)	-0.01 (0.02)	0.74

Note: Standard errors in parentheses.
 Source: See text.

where $RES(-1)$ is the residual from (D4), lagged one period and d is the difference operator. σ measures speed of adjustment. For instance, $\sigma=-1/2$ means that if there is a shock to labour markets which raises unemployment in region i relative to its equilibrium relationship to the national average, half of that divergence is eliminated in the following period.

I estimated these relationships using annual data. The first step is to test whether the series are individually integrated. In every case, the Dickey-Fuller test for the relationship:

$$U = \rho U(-1) \tag{D5}$$

could not reject the null that $\rho=1$. This documents that the tendency of unemployment rates to revert to some stationary level is weak at best. In every case, alternative formulations (such as the augmented Dickey-Fuller test) confirm this conclusion. The weakness or absence of mean-reverting tendencies in European unemployment is well known (see for example Blanchard and Summers, 1986). What is striking is that precisely the same properties characterize the data for US regions.

The next step is to estimate the cointegrating regression (D3). If there is a long run tendency for a relationship like (D3) to hold, the residuals from the estimated relationship should not be highly autocorrelated. Engle and Granger (1987) provide the relevant test statistics, based on the cointegrating regression Durbin Watson statistic (CRDW). The critical 5 per cent value for 100 observations is 0.386. Values for smaller samples are not available.

Estimates of the error correction parameter σ in (D4) will be invalid if $U(i)$ and $U(n)$ are not cointegrated. A solution to this problem is to add to (D3) other variables besides $U(n)$ which also affect regional unemployment rates. It does not change the

conclusion that regional unemployment rates seem only weakly related to the overall rate, but it permits estimation of the error correction model.

The coefficient on σ , the error correction parameter in (D5), is shown in the third column of Table 16. (Under the null of cointegration, the standard t test is applicable.) Overall, the speed of adjustment is nearly 25 per cent higher in the US than in the EC.

FOOTNOTES

Two line bio for cover: Barry Eichengreen, Professor Economics at the University of California at Berkeley, is the author of several books on the history and future prospects of the international monetary system.

1. Statistics for the EC 12 are from Leonard (1988), Appendix I.
2. The definitive account of capital controls in the operation of the EMS is Giavazzi and Giovannini (1989). The view has been incorporated into EC documents such as Servais (1988).
3. The belief that fixed exchange rates are needed to obtain the benefits of customs union is a recent and peculiarly European view. According to Johnson (1971, p. 195), "The central point is that an economic union can obtain the benefits of free trade and factor movements under a variety of exchange rate arrangements, and that which one is appropriate depends on the circumstances and objectives of the membership." Pearce (1974, p. 77) made the same point more colorfully, "To recommend the abolition of European currencies in order to gain economies of scale is rather like recommending that we cut the tails off all monkeys to avoid the need to distinguish them from chimpanzees, thereby gaining economies in the use of language." Both authors, after pointing out that the full benefits of a free trade area can be obtained either with a common currency, fixed rates, or flexible rates, point to the Common Agricultural Policy as the explanation for Europe's tendency to link customs union with currency union. It is noteworthy that recent discussions of a US-Canadian customs union have paid little attention to the issue of a fixed exchange rate or common currency, since the countries are not burdened by the equivalent of the CAP.

4. It is conceivable that capital controls only "bite" (cause deviations from covered interest parity in times of crisis, and that the decline in deviations from CIP reflects not the reduction in controls but the declining incidence of exchange rate crises.

5. There are other possible efficiency rationales for free international capital mobility. One is international portfolio diversification as behavior toward risk. If production shocks or terms of trade disturbances are imperfectly correlated across EC members, residents of one member country can protect themselves against country-specific shocks by holding financial claims on firms in other countries. (This argument is fully developed in Helpman and Razin, 1978). A Frenchman, for example, can protect himself against shocks to the French economy by holding equity claims on foreign firms. In the text, I emphasize the productive-efficiency rationale for free international capital mobility rather than the behavior-toward-risk rationale because it is the former that is especially prominent in the debate over 1992. But in Section 3.1.3 below I return to the issue of portfolio diversification.

6. If nontraded goods were produced by the nonmobile factor (say, capital) instead, it would be necessary instead for the mobile factor (say, labour) to migrate to states where capital was abundant and the price of services was relatively low.

7. See for example Padoa-Schioppa (1987), pp. 72-73.

8. Break (1967), p. 121.

9. Two qualifications to this general statement are in order. The US has maintained quotas on sugar shipments from Puerto Rico to the mainland, while Puerto Rico has made more extensive use of excise taxes on goods such as passenger cars than most states (excises which have the same effects as tariffs in the absence of local production). In addition, US companies investing in Puerto Rico have traditionally enjoyed a grace period during which their profits are exempt from the corporate income tax. See Tobin (1975). This is likely to affect the desired share of Puerto Rican investment in corporate capital given any level of

interest rates, but not the responsiveness of investment flows to interest rate changes and other shocks, which is the main focus of the analysis to follow. That Puerto Rican experience encapsulates both the costs and benefits of membership in a currency union has been argued previously by Tobin *et al.* (1975, p. 58),

"Puerto Rico benefits greatly from its position within the common financial and monetary system of the United States. Its ability to tap Mainland credit markets has been important for the Commonwealth's growth and development. The absence of foreign exchange risk and the guaranteed right to transfer funds freely have made Puerto Rico much more attractive to Mainland investors than other overseas economies.

At the same time, membership in the U.S. financial system has limited Puerto Rico's freedom of action. The mobility of funds makes an independent monetary policy impossible. Without a national currency of its own, the Puerto Rican government cannot monetize its debt, but must borrow in the market at competitive rates."

10. Differences in the magnitude of the terms of trade effects may simply reflect differences in data, since for Portugal I use export and import prices, whereas for Puerto Rico I am forced to use relative CPI's, which contain also some nontraded goods prices.
11. When social security taxes are included, the coefficient of variation for US regions is still smaller than that for European countries but the differential falls to five per cent.
12. Before estimating the cointegrating regression, I tested whether the series are individually integrated. They are not. See Appendix D.
13. As Buitert notes, all that is needed for the analysis to go through is that reserves bear a lower rate of interest than domestic debt. The assumption that they bear zero interest is a convenient simplification.

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