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National Strategies and the Global Economy



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A Special Assessment

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*NI 82-10001
26 March 1982*

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National Strategies and the Global Economy

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A Special Assessment

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Intelligence and reviewed by the National Intelligence
Council. Comments and queries are welcome and
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Scope Note

US national security and domestic prosperity are increasingly influenced by the global economic environment. Thus an understanding of developments and forces in this environment is crucial for the United States to achieve its national objectives. The global economic environment is shaped by the economic strategies of key countries and regions, and by underlying economic trends, shocks, and other unforeseen events. This report reviews these forces and assesses their impact on US national security and economic interests.

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**National Strategies and the
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Preface

The ability of the United States to chart a successful national course will depend in large measure on a grasp of key global economic forces—their status, direction, and impact on the United States and other Western countries and on their chief adversary, the Soviet Union. This paper evaluates the central global economic forces at work today and assesses the direction in which they are moving, along with the opportunities and vulnerabilities they will create. After briefly evaluating the world economy in 1982, we examine the main international trends that will affect the structure of industrial production and trade in the 1980s. We also explore the implications of these forces and the leverage and vulnerability that the United States, the USSR, and other major countries may have in dealing with them. We are concerned not with predicting events or exhaustively surveying trends, but with identifying particular forces and conditions that may generate new or more intense problems or opportunities for policymakers.

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**National Strategies and the
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Key Judgments

The global economy has experienced broad shifts in power during the past decade. Not only have traditional patterns of production changed, but the technological domination of the United States has been eroded by rapid progress in Japan and, to a lesser extent, in Western Europe. The failure of the Soviet economic system could spur the Kremlin to alter its strategies; the Soviets could seek greater accommodation with the West to gain needed equipment and technology, or they could become more confrontational. The shift of economic and technological power from the United States to countries unable or unwilling to use that power to counter Soviet adventurism is a particularly serious threat.

Although the United States remains the most important factor in the global economy, it is losing ground in the critical high-technology arena. This loss will adversely affect not only its economic well-being, but its security interests as well:

- *Microelectronics.* Japan has already achieved domination in key technologies that underpin the US consumer electronics industry and that have highly specialized military applications such as satellite communications, signal processing, and radar.
- *Computers.* The once overwhelming US dominance is being challenged by Japanese and West European firms, whose governments are more willing than the US Government to allow the transfer of military-related equipment to the Soviet Union. At the very least the United States will lose much of its control over access to large-scale scientific computers used for nuclear weapons design, aerodynamic modeling, and cryptanalysis.
- *Telecommunications.* There are a number of telecommunications technologies in which the United States has lost its edge or might lose its leadership position over the next several years. Now, for example, Japan is the world's leader in fiber optic research and applications. Fiber optics is of interest to the military because of its advantages in bandwidth for signal-processing applications and its immunity in high-radiation and intense electromagnetic environments.

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- *Biological Technology.* Although the United States has a clear lead in recombinant DNA (rDNA) technology, with the Europeans next in line, the Japanese are avidly acquiring US and European technology and are engaged in a major effort to build up their capabilities. Applications of rDNA and advanced biological technology for military purposes include engineering and producing biological warfare organisms, and producing toxins and other chemical warfare agents.
- *Space Technology.* US dominance of civilian and military space technology in non-Communist countries is eroding. The West Europeans could account for a fourth or more of the 200 commercial satellite launches expected during the 1980s. Japan's efforts during the 1980s will be much more modest, but its long-range prospects are excellent.

An especially worrisome effect of these shifts in technological leadership is that they will render the United States increasingly dependent on other countries for state-of-the-art defense equipment. Obviously, these countries could also become sources of supply to the Soviet Union, either through normal trade channels or through Soviet espionage.

Japan's high-growth economic strategy shows no sign of faltering. Continued success assures Japan the means to carry a significant security burden. However, Japan will not willingly move in this direction for fear of undermining its political stability and its economic objectives.

Western Europe will face increasing strains in carrying its present security burden as unemployment rises into double-digit levels. Growing demands for social welfare expenditures will draw resources from the defense sector. And as the need for jobs remains paramount, Europe will remain highly resistant to US policy initiatives designed to limit East-West trade.

The **Soviet Union** faces severe economic problems that will constrain its ability to support continued rapid increases in military spending without strangling the civilian sector. The need to prop up Poland and other satellites will constitute a growing strain on Soviet resources—a strain that would be markedly intensified if Western governments agree to restrict access to credit, technology, and food.

Among key **oil-exporting countries**, falling real oil prices will force a dramatic slowdown in economic development spending. This, in turn, will strain the thin political fabric that holds so many of these countries together. Since the West will remain heavily dependent on OPEC oil for the foreseeable future, political instability among producers will make them especially tempting targets for Soviet pressure.

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The economic success of the **newly industrializing countries** (NICs) enables them to contribute to Western security objectives. In some, for instance South Korea, this takes the form of enhanced military capabilities. In others, such as Brazil, the contribution is a more stable political environment. In all cases, the economic success of the NICs—in particular the emphasis they place on the role of the private sector—provides a development model for Third World countries.

A growing number of **Third World countries** are beginning to emerge from years of economic mismanagement. Several of these countries, including Chile, the Philippines, and Argentina, may well achieve NIC status in this decade. Although the “North-South Dialogue” remains an attraction for some Third World leaders, the climate is improving for dealing with the practical issues of development. Those concerned with Third World development—political leaders, officials of multinational lending organizations, and so forth—are increasingly willing to admit that handouts from rich countries can hinder the development process when used in a way that stifles private-sector initiatives.

Despite growing Soviet military power and challenges to US technological leadership by non-Communist countries, the United States has the capacity to maintain its position in the world economy and to achieve its national security objectives. Success depends in part on the willingness of the United States to use the leverage it has—its markets, its capital, and its technology—to operate in the long-run interests of the West.

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National Strategies and the Global Economy

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Short-Term Outlook—Setting the Stage

Economic activity in non-Communist countries should begin to move out of the doldrums some time during the second half of 1982. The vitality and durability of an upturn are uncertain. US economic performance will play a key role in this recovery since most other countries are already straining under budget deficits and are depending on exports to lead their recovery. West European governments need a rapid pickup in economic activity just to prevent further increases in unemployment; large budget deficits are thwarting any major use of fiscal stimulation. Most LDCs and Communist countries face weak markets for their exports and a rising debt service burden. Many oil-exporting countries are being forced to slow the growth of their imports because of the decline in demand for oil and falling oil prices.

Recovery patterns for the **United States and Western Europe** foreseen by economic forecasters range from a sustained upturn to continued economic stagnation into 1983. Most forecasters anticipate a "saucer shaped" recovery pattern, with an initially vigorous recovery being checked by rising interest rates.

This consensus is based mainly on the belief that financial markets will remain sensitive to possible inflationary pressures that could trigger another upturn in interest rates. This, forecasters argue, would be the case even though US inflation rates will probably continue to ease, with less pronounced declines in Western Europe. With a "saucer shaped" recovery, unemployment in both areas would remain near its cyclical high.

Many experts argue that US tax cuts and pent-up demand in the United States and Western Europe will spark a rapid pickup of economic activity. Inflationary pressures during this period should be held down

by the large productivity gains that normally occur in the early phase of an economic recovery. Unemployment, however, would remain high.

Other experts believe there is a chance that the upturn could be choked off quickly by high interest rates which could make households and businesses rapidly retrench. In this case, inflation would probably slow further, but unemployment could rise to new highs.

Japan's economic growth is likely to be near 4 percent, with expansion expected to depend more on domestic demand than on exports. Japan is certain to run a massive trade surplus in 1982 even though export growth will be slowing. This surplus will intensify political reactions in the United States and Western Europe. Neither the politically feasible measures Japan may take in response to these pressures, nor the likely appreciation of the yen, will have much effect on the trade surplus in the short term.

Nonoil LDC growth can be expected to remain below the pace of that of the 1970s. Many important LDCs are already in the midst of austerity programs designed to relieve foreign payments problems. In much of Africa and Latin America, weak commodity markets and declines in earnings from primary exports are compounding decades of economic mismanagement. A growing number of countries in both areas will have to reschedule their foreign debt, but most will meet their obligations by cutting the consumer imports needed by politically crucial urban populations. Among the newly industrializing countries (NICs), Brazil will have to keep the brakes on its economy to handle an enormous debt service burden, Mexico will have to slow its economic growth to adapt to lower

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real oil prices and pay for past policy errors, and South Korea will have difficulty sustaining its renewed dynamism in the face of weak foreign markets and protectionism.

Most **oil-exporting countries** will see oil revenues falling behind planned development spending. The less-well-off producers will have to borrow to maintain development plans. Only if OECD recovery is rapid will there be some firming of the market that could help relieve this financial and political bind.

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National Strategies

How the global economy emerges from its current malaise will set the stage for economic relationships for the rest of this decade. The implications for the United States will depend on US policies and the strategies adopted by other nations.

A country's performance in the global economy is shaped by both the international environment and its own chosen strategy. In the broadest sense, countries can emphasize high levels of growth, high levels of economic security, or high levels of military strength.

High-growth strategies emphasize policies designed to foster technological innovation and the development of new industries. Specific policies are designed to stimulate savings and encourage risk taking. Countries pursuing high-growth strategies typically use tax revenues to promote research and development and new commercial ventures, while welfare expenditures are kept low.

Economic-security strategies emphasize policies that guarantee generous benefits for those who suffer economic misfortunes. These typically include unemployment insurance, sickness and disability insurance, general relief for those who are deemed unemployable, and a variety of "antipoverty" programs. Tax policies are designed to transfer wealth from those who earn money to those who do not, and government spending as a percentage of GNP in these countries tends to be high.

Military-strength strategies emphasize policies that divert resources from consumption and civilian investment to the military sector. Central planning by government is extensive, if not total.

The relative progress of countries in pursuit of their chosen strategies is a crucial factor in shaping the global economic environment. Changes in the global environment arise from national differentials in key

factors including rates of technological innovation, investment levels, product design and marketing prowess, defense burdens, and economic incentives and impediments.

In carrying out a viable national strategy, natural resources are important, but they are less critical than a country's human resources—skills, diligence, and efficiency—and the opportunities and incentive available to them. These factors are heavily influenced by the positioning of government in the national economic system and the policies the government adopts.

Japan

Japan's strategy is to spur economic growth by promoting savings and investment, keeping government outlays low, encouraging education and gaining an edge in key technologies that rely heavily on a highly educated labor force. By pursuing this strategy, the Japanese work to gain such a competitive edge that foreign companies find it difficult to keep pace.

Target technologies for the 1980s include: microelectronics, computers, robotics, biogenetics, aerospace, and telecommunications, including fiber optics. Japan will pursue its strategy by following the same types of policies that brought success during the 1960s and 1970s:

- Government spending, which averaged only 19 percent of GNP during the 1970s, will be kept at this level or may be slightly lowered.
- Public borrowing, which averaged 3.5 percent during the 1970s, now stands at 4.8 percent of GNP, but it will probably drop to 4 percent by 1984.
- The tax structure will continue to favor savings and facilitate the access of fast-growing companies to funds for investment and R&D.

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- R&D will be augmented through government-sponsored research associations.
- Tokyo will continue to resist foreign pressures to improve access to the domestic market, citing deeply rooted cultural aversion to imported goods as the cause of foreign companies' inability to increase sales of their products.
- Tokyo will continue to encourage exports by working to provide package deals that non-Japanese companies are unable to match, a process made possible by Japanese antitrust laws.
- Tokyo will continue to encourage companies in labor- and energy-intensive industries, such as textiles, to export their know-how to other countries.

In the domestic market, intense competition between Japanese firms will continue to foster innovation and efficiency.

Japanese industry is adept at taking full advantage of Tokyo's policies:

- The microelectronics industry now holds 70 percent of the world market for the 64K RAM chip, and may well be ahead of US manufacturers in the race for a marketable 256K RAM chip.
- Computer companies have recently won orders in Australia, a market long dominated by the United States. Japanese companies are also supplying main frames to the European Community (EC).
- Biogenetics companies have developed the mass fermentation technology vital to large-scale commercial application—although the basic scientific breakthroughs were made in the United States.
- Japanese companies have become the dominant suppliers of machinery to the NICs of Asia.

It is reasonable to believe that Japanese companies will win a technological edge in a growing number of key industries or in selected production processes. (For details see pp. 18-22.)

Western Europe

Western Europe is muddling through a period of double-digit unemployment largely due to structural rigidity in its employment practices. As part of its strategy, Europe hopes to gain an edge in selected technologies that will provide a modern base for economic recovery.

Europe is facing the highest level of unemployment since the Great Depression of the 1930s. At present, 8.7 percent of the work force is unemployed. This figure is likely to approach 11 percent by mid-1983, with about 17 million persons out of work.

The explanation is partly demographic. Europe's post-war baby boom came later than that of the United States, and the resulting flood of those leaving school to look for work in the 1980s coincides with an ebb in the number of people reaching the end of their working lives. The ranks of Europeans now nearing retirement at 65 have been reduced primarily by the effects of the two World Wars. To be sure, by mid-decade this demographic effect will begin to wear off; smaller contingents will be entering and larger ones leaving the work force. But even this reversal of trends seems unlikely to solve Europe's unemployment woes.

The unemployment problem does not stem primarily from aging industries (textiles, shipbuilding, steel) and declining regions (Britain's North, Belgium's Wallonia) although these obviously are important factors. Nor does it stem from a lack of mobility among skilled workers caused by language differences.

The key problem affecting employment—and one that seems unlikely to be solved any time soon—is the rigid structure of labor costs. Employers are saddled with fringe benefits—including levies for social security, sickness, and unemployment pay—that are generally higher than in Japan or the United States. For example, in large German companies like Krupp, these indirect wage costs exceed the cash paid to each worker, and, because severance costs are high, European employers are loath to hire new workers, and avoid doing so until absolutely necessary. Europe's

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R&D Expenditures in Major West European Countries

In France, the Mitterrand government wants to increase total spending for research and development from last year's estimated 1.8 percent of GNP to 2.5 percent by 1985. The Research and Technology Ministry has been directed to raise its research outlays by 17.5 percent per year in real terms; this year Paris will spend \$4.5 billion, or about half of total French research spending. Paris's infusions of capital are aimed at providing French companies with the financial muscle to catch up in those technologies in which they are weakest—semiconductor devices, consumer electronics, and minicomputers. The government has begun to work on plans for a four-year R&D project to give selected microelectronics companies and laboratories a total of \$500 million.

In West Germany, public R&D expenditures are slated to rise 25 percent over the next five years to about \$5 billion. Thirty-five percent of the R&D budget is being channeled into energy research, particularly nuclear reactor and fuel technology and coal gasification and liquefaction. The Ministry for Research and Technology is focusing on applications of microelectronics and the development of information technology components; funding for research in this area last year was up 17 percent over the 1980 level.

In the United Kingdom, public boards have been established to foster recovery in traditional industries

and to enhance the competitiveness of high-technology industries, including avionics. The immediate aims of the board responsible for traditional industries are to encourage innovation—including the application of microprocessor technology, computer-aided design and manufacture, and robotics—and to enhance the effectiveness of technology transfer. The key aims of the mechanical and electrical engineering board, on the other hand, are to identify market opportunities and to support R&D for product lines in which the results could be applied and marketed in about five years. However, funding is skimpy; \$144 million was allotted for the fiscal year ending this March.

In Italy, government efforts to stimulate R&D—centering on extension of low-cost loans and grants by Istituto Mobiliare Italiano—continue to fall victim to political bickering and bureaucratic complexities. Funds remain limited. Only \$1.5 billion has been tentatively allocated to R&D programs for the next three years, and the government will continue to provide funds for unprofitable traditional industries—chemicals, transportation, and metallurgy—as well as for potential high-growth sectors such as electronics and energy technologies. Moreover, firms wishing to take advantage of government programs must wait an average of 38 months before receiving funds.

gain in total employment between 1974 and 1980 was a mere 120,000, compared to a US increase of 12 million.

European efforts to cope with the unemployment problem are increasing the cost of the social safety net which had already grown sharply during the 1970s. Largely as a result of the growth in social welfare outlays, public spending has grown to 45 percent of

GNP, up from 36 percent in 1970. (The current range goes from 29 percent in Spain to 61 percent in Sweden.)

At the same time, governments have been trying to hold down unemployment by propping up and restructuring traditional industries. Between 1975 and 1980, individual governments and the EC poured \$20 billion into the steel industry. An additional \$20 billion of

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subsidies is planned between now and 1985. Some direct and indirect government support, although aimed at industrial strengthening, will adversely affect employment. For example, automakers—many of which are state owned—will spend about \$23 billion by 1983 to modernize their plants. Renault (controlled by the French Government) has already installed 100 robots at its Douai plant.

European governments, like the Japanese, are pinning their hopes for future job growth on the development of high-technology industries, with emphasis on microelectronics, computers, biogenetics, aerospace, and energy. Indeed, despite strapped budgets, governments have begun to pump more money into R&D. This effort, however, will need to be more successful than similar past efforts if European economies are to prosper in the new high-technology industries.

Private West European companies are also increasing their emphasis on high technology. Many are trying to acquire technologies they need by direct overseas investment. West Germany's Siemens owns three US companies—Litronix, Sitronix, and Microwave Semiconductors—and owns 20 percent of Advanced Micro Devices. Through a series of joint ventures with Fujitsu Fanuc, Siemens is scrambling to snare a piece of the market for numerically controlled machine tools. Philips, the Dutch electronics giant, relies for its memory chips on a US subsidiary, Signetics, which is the sixth-largest US producer of integrated circuits.

To help speed innovation by both public and private enterprise, the EC Commission has begun to press for the removal of barriers, such as national procurement policies, that inhibit multinational joint ventures. At the same time, the Commission continues to support the retention of barriers to US and Japanese imports.

The Soviet Union

The Soviet Union's announced strategy is to sustain its arms buildup in the face of marked economic slowdown. To maintain a 4-percent real annual increase in military outlay, Moscow will be forced to continue to starve consumption, and increasingly investment, as long as economic growth lags below 2 percent.

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The Adjustment Problem

The adjustment by the mature economies to growing international competition has taken various forms, with varying degrees of success. On the whole, adjustment has been smoother in the United States than in Western Europe, because it began earlier and was less constrained by government controls and other institutional factors. The basic evolution in the mature industrial economies has been from labor-intensive to knowledge-intensive industries and services. Recent experience has shown that competitiveness can be maintained or regained in some components of most industrial branches, including such traditionally labor-intensive branches as textiles. Various combinations of modern equipment, better organization of production, product specialization, and marketing skills can assure health in some industries—for example, in some types of textiles, in the shoe industry, and in some others.

Unfortunately there are many barriers to the adjustment process, and some of these are of recent vintage. High marginal-income tax rates and taxation of capital gains have discouraged new, risky investments of the type that would often be required for quick adjustment to growing foreign competition. Moreover, high inflation, high interest rates, and uncertainty about future conditions have raised the target rates of return on new investment to levels that are bound to exclude new ventures with relatively long payoff periods.

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Soviet economic growth has dropped from nearly 4 percent annually during most of the 1970s to an average of a little over 1 percent annually since 1978. Agricultural output has declined by more than 10 percent since 1978, due to bad weather and the inherent inefficiencies of the Soviet system. At the same time, industrial production—the traditional growth leader—has slowed from an annual 6-percent

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growth rate in the early 1970s to about 3 percent since 1978. The impact of this slowdown has taken the form of smaller growth in goods and services allocated to consumption and investment; the increment to defense remains unchanged. The military sector's percentage of GNP is about 13 percent. If present trends continue, this percentage will rise to 16 percent by 1985 and will approach 20 percent by 1990.

The Soviet Union's share of global output is falling. In 1970 the Soviet Union produced 12 percent of world GNP; by 1981 its share was down to 11 percent. Underlying this trend are drastic slowdowns in labor force growth and labor productivity. It will be difficult for Moscow to reverse the slowdown in growth if the USSR is not able to rely upon increased imports from the West as it did in the 1970s.

Following two years of rising hard currency earnings—because of oil, gold, and arms sales—Moscow has encountered a severe hard currency bind. By early 1982 the Soviet Union had begun requesting slowdowns in payments for Western imports.

The Polish crisis has added to Moscow's economic troubles in several ways. For one thing, the Soviets have had to provide about \$1 billion in hard currency loans to Warsaw to prevent a Polish economic collapse. Beyond this, major reductions in Polish coal and industrial supplies have aggravated already serious production problems in the USSR and elsewhere in Eastern Europe. The Soviet steel industry has been especially hard hit by Polish supply shortfalls. Transportation bottlenecks made worse by the Polish crisis have further compounded regional production problems. In addition, Polish developments have worsened Moscow's economic problems by undercutting Western willingness to lend to Bloc countries.

Newly Industrializing Countries

The NICs—Taiwan, South Korea, Singapore, Hong Kong, Mexico, and Brazil—have moved rapidly from underdeveloped status in the 1960s to semideveloped status today. To reach fully developed status, many NICs have pursued a strategy of climbing the technology scale as rapidly as possible by seizing the lead

in industries, or segments of industries, that have become uncompetitive in Japan and other industrial countries.

The NICs, unlike many other LDCs, have adopted outward-looking growth policies as a means to promote rapid industrialization. This approach has led to a steady, and in some cases dramatic, enlargement of export market shares in many product lines. The NICs have also been able to attract private foreign capital, which has accelerated the infusion of advanced technology into their manufacturing industries (table 1).

The NICs' successes have been highlighted by impressive allocations of domestic output to capital formation. The Asian NICs have been able to hold the growth of private consumption well below that of total output; combined with restraints on government consumption, this has freed substantial resources for investment. Some analysts key the growth of investment in the Asian NICs to a culture imbued with values of achievement, discipline, and willingness to postpone immediate satisfaction for future gains.

Since 1960, gross domestic capital formation as a share of total output has risen from 12 to 39 percent in Singapore, from 11 to 30 percent in South Korea, and from 21 to 31 percent in Taiwan. Investment growth in Brazil and Mexico has been less impressive, in part because of these countries' traditions of high levels of government consumption. Still, they compare quite favorably with the major industrial countries. Gross fixed capital formation as a share of output has risen from 17 to 30 percent in Mexico and has been consistently above 20 percent in Brazil. In the major industrial countries as a group, this ratio has been just over 20 percent for the past two decades; in the United States it has been about 15 percent.

The NICs have gone heavily into debt over the past decade to keep up the pace of their industrialization. Largely by borrowing in Eurocurrency markets, their debt has mushroomed from \$27 billion in 1973 to more than \$150 billion currently. Over the same period, the NICs' share of total Third World debt has climbed from one-fourth to one-third. Brazil and

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Table 1

**NIC Companies on the 1980 Fortune List of 500
Largest Non-US Companies**

Firm	Industry	Sales (Billion US \$)	Rank
Brazil			
Siderurgica Nacional	Steel	1.1	394
Ford Brazil	Motor vehicles	1.1	398
GM Brazil	Motor vehicles	1.0	426
USIMINAS	Steel	1.0	440
Mexico			
Grupo Industrial Alfa	Steel	2.0	229
Valores Industriales	Food	1.2	379
Chrysler de Mexico	Motor vehicles	1.0	433
Ford Motor	Motor vehicles	1.0	444
Altos Hornos de Mexico	Steel	0.9	487
South Korea			
Hyundai Group	Ships, motor vehicles, industrial equipment,	5.5	72
Samsung Group	Appliances, food textiles	3.8	125
Hyosung Group	Textiles, industrial equipment	2.0	237
Ssangyong Cement	Cement	1.7	275
Pohang Iron and Steel	Steel	1.6	297
Sunkyong	Chemicals, textiles	1.4	322
KUKJE	Rubber, steel	1.4	338
Taiwan			
Formosa Plastics	Chemicals	1.7	284

Mexico are by far the Third World's largest debtors, with respective totals of \$62 billion and \$50 billion. Debt service costs now absorb more than 50 percent of their export earnings. Brazil has had to impose austerity measures to reduce its large international deficit and improve its credit rating; Mexico is worrying bankers because of its rising debt and widening current account deficit. The other NICs have been

The NICs and the Global Economy

The NICs' importance in the global economy lies both in the impact of their expanding exports of manufactures on employment in importing OECD countries and in the example they provide for other LDCs. With just 1.4 percent of the world's population, the NICs account for 5 percent of the exports and 7 percent of the industrial output in non-Communist countries. Manufactures constitute nearly 75 percent of NIC exports, more than 65 percent of which go to the OECD countries. The NICs loom larger within the Third World. With about 10 percent of the Third World's population, the NICs account for one-fourth of its output. The NICs' average per capita GNP of \$3,700 is four times as large as that of the Third World as a whole.

Fueled by deliberate policies of industrial and export expansion, the NICs achieved real GNP growth over the past decade of 7 percent annually compared to just 3 percent in the OECD countries. Over the same period, these six countries increased the value of their manufactured exports to the OECD by more than 25 percent annually, against a rise of only 20 percent a year in total OECD imports of manufactures. The NICs' total share of world GNP rose from 3.1 percent in 1970 to 4.4 percent in 1980.

more prudent. South Korea spends 15 percent of its export earnings to service a \$20 billion debt, while Taiwan pays only 6 percent of its earnings toward a debt of some \$5 billion. Debt service costs Hong Kong and Singapore less than 2 percent of their export earnings.

The NICs' export strategy is characterized by a marked selectivity of both products and markets. The NICs choose highly specific products to gain economies of scale and more intensive and efficient marketing. Exports are concentrated in the US market, where protection is lowest. Indeed, the United States

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Table 2
NIC Trade With the
United States and the OECD

Percent in 1980

	NIC Share of OECD Imports	NIC Share of US Imports
Apparel	30	68
Televisions	24	67
Footwear	28	59
Radios	39	50
Telecommunications	25	50
Ships	6	47
Electrical appliances	7	35
Electronics	18	35

Percent Change in 1971-80

	NIC Share of Increase in OECD Imports	NIC Share of Increase in US Imports
Televisions	29	136
Footwear	31	73
Apparel	31	72
Radios	45	61
Telecommunications	28	59

receives nearly half of the NICs' manufactured exports to the OECD market and absorbs nearly 40 percent more NIC products than the Big Six (Japan, Canada, United Kingdom, Germany, France, and Italy) combined (table 2).

In the case of Korea and Taiwan early in their industrialization and of Mexico now, development of "export zones" has been an important element of industrial strategy. These zones offer incentives to foreign investors that include tax and tariff advantages. Initially, these zones were quite isolated from the host country economy and did little more than hire surplus labor. Lately, however, government policies have linked the zones more closely with the domestic economy to include the purchase of local raw materials and investment partnerships with local businessmen.

Economic Development Policies in the NICs

Hong Kong's laissez-faire environment broadly aims at reaping the benefits of a free atmosphere for external trade. The government keeps taxes low and stays out of the way of businessmen. Singapore shares much of the same philosophy but has a more structured approach. The Singapore authorities continually chart the course of industrial development and channel resources into production as they see fit. Singapore is now making a bold attempt to climb the technological ladder by encouraging investment in high-technology, capital-using production processes. As a result, labor-intensive production is being shifted to other countries in the region, such as Malaysia and Thailand, where wage rates are lower.

Economic development is carefully planned in South Korea and Taiwan. Still, both are essentially free enterprise economies. In Korea, government supervision of the industrialization process is pervasive, with a substantial network of tax incentives, subsidies, and government-sponsored cartelization. In Taiwan, the government's role is less specific. Officials depend on the private sector to respond to broad policy measures on taxes, subsidies, and exchange rates that encourage exports.

Economic development policy in the Latin American NICs has long been highlighted by fiscal and tax incentives for domestic producers, along with heavy protection against foreign competition. Import restrictions have tended to vary with the countries' balance-of-payments difficulties, but they remain an important element of economic policy. Latin American NICs also differ from their Asian counterparts in having more direct government participation in industrial production. This trend is most pronounced in Brazil, where the state produces chemicals, steel, transport equipment, and food and beverages either on its own or in partnership with private enterprises.

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Export Performance of the NICs

Taiwan is the leading NIC supplier of manufactures to the OECD market, with sales of \$12.5 billion in 1980. Labor-intensive "soft" goods, such as textiles, apparel, footwear, printed materials, and toys dominate their exports currently, but Taiwan is slowly breaking into the production of high-technology manufactures such as computer equipment. Almost 40 percent of the televisions imported by the United States are made in Taiwan.

*Although displaced by Taiwan as the leading NIC exporter, second-ranking **Hong Kong** still sold \$11.2 billion in OECD markets in 1980. As with Taiwan, apparel and other soft goods dominate Hong Kong's sales. Nonetheless, Hong Kong has successfully caught the wave of consumer demand for such items as calculators, smoke detectors, burglar alarms, and electronic toys and watches. Besides continuing these lines, Hong Kong plans substantial growth in the manufacture of industrial electronics.*

South Korea ranks third among the NICs in manufactures sales to the OECD. Following the same pattern as other Asian NICs, South Korea's exports in 1971—largely apparel and textiles, along with footwear—were large. Unlike the other Asian NICs, however, South Korea has emphasized development of heavy industry and is now a supplier of iron and steel, metal manufactures, and ships, and is emerging as a competitive exporter of automobiles to Third World markets. By attracting and exploiting production that has become less export competitive in the industrialized countries because of high labor costs—a pattern repeated in many NICs—South Korea has wrested black and white television production from Japan and the United States to become the world's largest manufacturer.

Mexico produces a broad range of manufactures for a large domestic market and for export. The country is especially strong in telecommunications equipment, chemicals, electrical goods, fabricated metal products, and automobiles and parts. Bonded industries along the US border are important producers of automotive parts, televisions, electronic components, and appliances. These plants are operated by major multinational corporations, and hence product sophistication and quality are high. Most other Mexican products, however, are not yet competitive in OECD markets, but Brazil and India are emerging as important Third World purchasers.

Singapore is the third-largest manufacturer of off-shore drilling rigs. Demand is volatile, but business is booming now with an increase in oil exploration off Indonesia. Singapore is also a major producer of consumer and small-scale industrial electronic products and parts. About two-thirds of Singapore's \$3.5 billion manufactures exports in 1980 were telecommunications equipment, computer parts, televisions and radios, small appliances, and electronic components.

Brazil ranks last as a NIC exporter of manufactures to the OECD but is growing rapidly in importance. Moreover, Brazilian firms have a domestic market of more than 120 million people, which takes some pressure off individual firms' need to export. Brazil has made rapid inroads into US markets for iron and steel and into US and European markets for automobile parts and subassemblies. Brazil is now among the world's top 10 automakers. Brazil is also emerging as a producer of reliable commuter- and trainer-type aircraft for world markets and armaments for Third World purchasers. Brazil's development plan calls for a dramatic shift from such items as footwear and auto parts toward high-technology machinery and electronic goods as the leading edge of its future industrialization.

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Oil-Exporting Countries

Economic policies among most oil-exporting countries are designed first and foremost to ensure social and political stability. Generally, governments aim to raise living standards and diffuse the benefits of wealth throughout the population, while maintaining traditional cultural and social values. At the same time, they want to modernize and diversify their economies or invest in downstream activities, especially petrochemicals, in preparation for the time when oil runs out.

Saudi Arabia's enormous oil revenues have allowed it to create a welfare state and to fuel rapid modernization of the economy and the military. They have also enabled the Saudis to provide billions of dollars in foreign aid, mainly to other Arab and Islamic states.

With a large part of the country's infrastructure now in place, Saudi resources are being channeled into huge capital-intensive petrochemical and refining projects at Jubayl on the Persian Gulf and Yanbu on the Red Sea. These sites form the core of a planned diversification program. The projects will utilize gas produced in association with crude oil. Up to now, the gas has been flared. The government eventually proposes to sell its shares in the petrochemical industries to private Saudi citizens.

The government's modernization drive has provoked an intense behind-the-scenes debate, primarily between those who favor rapid development and those who favor a more measured approach. The latter fear that Saudi Arabia's present pace will undermine traditional values and increase the country's already heavy dependence on foreigners. They have criticized Saudi leaders for promoting wasteful programs; jeopardizing the country's future oil recovery by maintaining overly high production rates; caving in to US interests on oil policy; and favoring members of the royal family on lucrative contracts at the expense of Saudi businessmen. However, there is little evidence of widespread popular discontent with government economic policy.

Policymakers in **Kuwait**, as in Saudi Arabia, place high importance on ensuring social and political stability. To that end, they have focused on building one

of the most extensive social welfare systems in the world. They have also pushed the development of Kuwait's infrastructure and have been generous with foreign aid to buy protection against regional extremists. The Kuwaitis have deemphasized industrialization in recent years because of a shortage of indigenous manpower and a desire to limit growth of the already large foreign population.

Kuwaiti financial managers, among the best and most experienced in the Gulf, have emphasized equity holdings. The Kuwaitis have invested heavily in downstream petroleum activities, including refining and petrochemicals. They have recently acquired the US firm, Santa Fe Drilling, and may soon purchase Gulf Oil's assets in Western Europe.

The **United Arab Emirates (UAE)** has not been able to pursue a coherent economic strategy because of continued political rivalries among the Emirates and the considerable degree of autonomy each state exercises over its own budget and oil policies. Abu Dhabi, which dominates the federation by virtue of its oil resources, has sought to impose some order in recent years in an effort to eliminate the duplication that marked the UAE's headlong rush toward development in the 1970s. Over the past decade, for example, the Emirates built four international airports to serve a population of slightly over 1 million. Uncontrolled development—the fastest in the Gulf—also expanded the foreign labor force, leaving the native population outnumbered by 4 to 1.

Iraq's prewar economic strategy was designed to improve living standards and to attain a self-sufficient economy. These goals are in line with Baath Party principles of independence and socialism—the government has ownership or control over all agricultural and industrial production.

The war—together with a soft oil market—has put a crimp in Baghdad's plans. Oil production is well below desired levels. Until recently, billions of dollars in aid from Saudi Arabia, Kuwait, and the smaller Gulf producers enabled Iraq to sharply boost military spending and at the same time adhere to a near business-as-usual approach. But Baghdad has finally called for across-the-board cuts in government spending, postponed requests for bids on new contracts, and

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Oil Policy in Selected Persian Gulf States

Even if oil revenues should fall dramatically, the Government of Saudi Arabia probably would opt to draw down its enormous foreign asset holdings rather than reverse current policy directions. The Saudis could not easily curtail the momentum of development without disrupting the economy and generating popular discontent. The Saudis also would be inclined to meet aid commitments to those whose good will or survival they regard as vital to their security.

The Kuwaitis recognize that oil revenues are still the underpinnings of Kuwait's security, and they want to make certain this resource will be preserved. With these conservationist views widely held throughout the nation, Kuwait has adopted a policy of holding production well below capacity, while at the same time seeking higher oil prices. Kuwait's substantial holdings of official foreign assets—\$62 billion in 1981—would enable it to withstand a prolonged weak oil market. The ruling family would be very cautious about making deep cuts in programs that might trigger domestic unrest, especially in the large Shia community. They would also be very hesitant to reduce their aid commitments to the more radical Arab regimes and the PLO.

Like other Gulf oil producers, the UAE has sought to protect its surplus oil earnings by investing in the United States and Western Europe. Official foreign

assets grew from \$7.5 billion in 1975 to about \$34 billion at the end of 1981. These investments earn about \$4 billion annually. Current holdings are sufficient to cover all imports of goods and services for two years.

The UAE could draw down its foreign assets in the event of sharp declines in oil prices or production. UAE rulers would be extremely reluctant to cut spending for fear of generating internal unrest and antagonizing powerful external forces. Iran would almost certainly seek to exploit such an opportunity to stir up unrest or promote the disintegration of the federation.

Oil policy in the UAE varies among the states. Abu Dhabi, for example, usually follows the lead of Saudi Arabia on international issues and OPEC price deliberations. Dubai has pursued a more independent course, seeking to maximize prices and production.

In an attempt to conserve oil and to avoid the problems associated with too rapid spending, Iraq has generally favored holding crude output to levels dictated by long-term revenue needs. Although Iraq hopes to increase production to make up lost ground following the war, a continuing soft world oil market will make it difficult to sell much additional oil.

reduced foreign aid. Manpower requirements for the war have also exacerbated a critical labor shortage that already had slowed some projects.

The regime has announced that after the war ends it will give priority to repairing war damage, especially oil facilities and housing, before it gets its development strategy back on track. The 1981-85 plan emphasizes the need to eliminate infrastructure bottlenecks such as inadequate transportation, power shortages, and lack of skilled manpower.

Economic and political stability in **Nigeria** hinge on a continuing flow of revenues from oil sales. Despite attempts since the mid-1970s to lessen its dependence on oil, Lagos relies on petroleum for 25 percent of GNP, 95 percent of export earnings, and 80 percent of government revenues. Oil revenues are also the basis for Nigeria's ambitious industrialization program and a rapidly expanding demand for consumer imports. Without oil, Lagos would earn enough foreign exchange annually to cover only three weeks' worth of

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Development Policies in Selected Gulf States

In Saudi Arabia education and health care are free; government subsidies cover basic consumer needs for food, utilities, and housing; and government payrolls are padded with unskilled as well as skilled Saudis. Indeed, more Saudis are employed in government than in the private sector.

Various incentives are offered to ensure that Saudi private citizens have a stake in the development process. Large, interest-free loans are readily available for business ventures, real estate development, and agriculture. Saudi companies are favored in the awarding of building and service contracts as well as local purchases of materials and commodities. Moreover, foreigners seeking government contracts must have a Saudi agent, and joint ventures in private industry must have a Saudi partner. The government allows private industry almost free rein.

Most of the problems encountered in the initial stages of economic development, such as transportation bottlenecks and housing shortages, have been alleviated. Inflation has been brought under control. Over the past six years, real GDP growth has averaged 10 percent; in the nonoil sectors, growth has averaged 15 percent. Although the Third Five-Year Plan (FY 1981-85) calls for a drastic slowdown in growth, no deceleration of spending is evident yet. Meanwhile, Saudi foreign official assets continue to mount and now stand at \$150 billion.

In general, each shaykhdom in the UAE has concentrated on infrastructure and industrialization, leaving to the federal government the task of funding the UAE's social welfare and foreign aid programs. Defense spending still falls partly under the control of the individual shaykhdoms.

To maintain popular support while the war with Iran drags on, Iraq has attempted to ensure adequate consumer goods and services. The regime has allocated additional funds for consumer good imports and established price controls. It also is pushing housing construction. Baghdad hopes to eventually provide medicine, health care, education, electricity, and water free to the public.

Iraq's development plans focus on agriculture and industry as the keys to self-sustaining growth. Although independence is a goal, Baghdad is relying on imports of equipment, material, and technology. It has eagerly sought foreign contractors, favoring turn-key projects that conserve its own scarce labor supply.

In the agricultural sector, Baghdad plans to boost agricultural productivity and to eliminate most food imports. Vast irrigation and drainage projects are under way, which will eventually reclaim 80 percent of the potentially arable land. The government also is importing a wide array of farm equipment. In keeping with its socialist ideals and in hopes of greater efficiency, the regime has also begun to collectivize the agricultural sector.

In industry, Baghdad has awarded contracts for petrochemical, fertilizer, and cement factories that can use Iraqi's natural gas, sulfur, and phosphate resources. The \$1 billion Basrah petrochemical complex, for example, will depend on associated natural gas, as will the planned expansion of Iraq's steel-making capacity. Other major projects include a gas-gathering system (most gas is currently flared), crude oil refineries, and paper mills. Baghdad has also invited several foreign contractors to assist in oil exploration programs.

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imports. Altogether then, Nigeria has failed to use its oil wealth to broaden its economic base.

Although Nigeria has constructed more ports, roads, airports, and schools, establishment of an industrial base is not much further along than in 1975. Services for the most part are even more chaotic, and agriculture continues to falter. With the 1983 elections looming closer, any sudden deterioration in the country's financial position—especially if it impacts on urban living standards—will be cited by the opposition as a sign of President Shagari's incompetence. A prolonged revenue shortfall could prompt Lagos to ask Washington to assist by purchasing oil for the Strategic Petroleum Reserve and providing concessional food imports.

Venezuela has used its oil revenues to finance massive infrastructure and industrial investments along with consumer imports. Essentially then, Caracas has employed oil earnings to seed the economy. Specific objectives include developing import substitution industries and nontraditional exports such as aluminum, as well as boosting agricultural production. Progress on all scores, however, has been slow. In these circumstances oil continues to play a critical role in Venezuela's economy and financial planning. It accounts for 23 percent of GDP, 66 percent of the government's revenue, and 95 percent of its export earnings. In addition, the industry makes extensive use of private contractors, stimulates the development of other sectors of the economy, and contributes to social development programs throughout the country. Moreover, foreign lenders follow Venezuelan oil earnings closely as an indicator of ability to take on and repay debt.

Other Third World Countries

The economic growth prospects and strategies of the more than 120 Third World countries vary considerably. Even after excluding the NICs and oil-exporting countries, the variations are striking. For example, the remaining group can be subdivided as follows:

- Countries that have been able to sustain rapid economic growth and that now have sufficient economic momentum to become NICs within a decade.

This group includes Malaysia, Thailand, and the Philippines.

- Countries that have been unable to sustain rapid economic growth mainly because of ill-advised political and economic policies, but have the potential to become NICs within a decade. They include Argentina, Chile, and Zimbabwe.
- Countries that lack the critical mass of entrepreneurial talents, skilled workers, and modern institutions needed to sustain rapid economic growth.

Even in this last group, there are major differences. Many of these countries have abundant natural resources but lack the ability to harness them (Zaire, Angola, and so on). Others lack both natural and skilled human resources and thereby have essentially become dependent on outside assistance to maintain even their meager standard of living (the countries of the Sahel). More than 40 Third World countries have a population of less than a million, a factor that prevents them from developing all but a very few competitive industries and services (mainly tourism). At the other extreme is India, with a population that is more than four times that of the second-largest LDC (Indonesia). India has pockets of economic sophistication matching that of the NICs and has areas where the population is as destitute as the most impoverished Third World country.

Differences in economic strategy also vary considerably. Some countries, such as the Ivory Coast or Malaysia, have a free market orientation; others, such as Ethiopia and Angola, have a Marxist-Leninist orientation. Many Third World states are governed by leaders who, educated in the West, follow socialist tradition. Such leaders—Julius Nyerere of Tanzania is a prime example—combine a naive faith in socialist-collectivist policies with a contempt for Western democratic norms.

One other important distinction that should be made in gauging the economic progress of Third World countries is the difference between growth and development. Some countries—Nigeria, Algeria, and Libya—have enjoyed rapid economic growth because

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The North-South Dialogue

To date, the North-South dialogue has (not surprisingly) borne little fruit. There has been a huge gap between the rhetoric of discussants and pragmatic efforts to confront problems. Both developed and less developed countries have indulged in the articulation of sweeping demands and responses, rarely getting down to brass tacks. There has also been an emphasis on process rather than substance, with enormous expenditures of time and effort wasted in debating how to debate issues and in discussing how best to organize and facilitate discussions of issues.

More specifically, the global exchange has failed to discuss the enormous and growing differences in economic prospects among developing countries, and has paid little attention to the important bilateral economic links that have evolved between the developed and less developed world. Instead the discussion has focused mainly on ways to boost the flow of resources from the developed to less developed world, even though recent experience has shown that this approach does little to spur sustained economic growth and in some cases even hinders progress. There are several reasons that rhetoric and generalization have not given way to realism:

- The most vociferous supporters of the "global" effort, in both the Third World and the West, are captives of strong ideological predispositions which emphasize socialist utopias rather than freedom and free enterprise.*
- Western beliefs in the free market, and in unfettered trade and investment, are incompatible with the socialist and collectivist beliefs of many Third World leaders.*
- The profound economic and political differences among the countries of the Third World have been papered over by rhetoric and generalization.*
- There are significant differences in the perceptions and economic interests of the developed countries themselves.*

- With a few exceptions, LDCs are neither politically nor economically critical to the West.*

The European socialists and their allies see the LDCs as the international equivalent of the "underclass" within their own societies. Thus, they seek to harmonize their international attitudes with their domestic policies of economic and social reform. Despite these oft-stated beliefs, the countries of Western Europe and Japan have relatively little to offer the LDCs. In varying degrees, all of them have acute budgetary and other economic problems at home that preclude bold new initiatives in the North-South arena. Then, too, they are constrained by an array of domestic interests that would resist such initiatives. For example, even though Japan, Canada, and most countries of Western Europe have supported a reduction in trade barriers against LDC manufacturers, their markets have remained relatively more closed to such LDC goods than the United States. Indeed, the EC has recently called for a further tightening of textile imports from LDCs to protect domestic industries.

The changing political-economic environment provides an opportunity to move away from the polemics of the North-South global debate toward a more constructive approach to Third World development. An increasing number of Third World leaders are following more pragmatic policies, spurred by the hard economic times of recent years and by recent policy initiatives of the US Government. This tendency has also been encouraged by the increased awareness among LDC leaders of the success that the NICs have had in utilizing the private sector to encourage economic expansion. For example, Argentina, Chile, Jamaica, and Sri Lanka have adopted policies that are closer to those followed by the NICs. Finally, many LDC governments are keenly aware that concessional aid increases will be small because the industrial countries are coping with fiscal constraints and most OPEC members are facing shrinking oil revenues.

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they are blessed with enormous reserves of petroleum. Despite the large amounts they have spent on internal projects, they still have not developed the wherewithal to sustain rapid growth in economic activity or in exports other than oil.

Some of the poorer Third World countries also have made significant economic progress, even though it will be decades before they will have the critical mass needed for broad-based economic development. Kenya and Malawi are in this category. In these cases, the important factors, besides political stability, that have spurred growth include:

- The encouragement of a small-scale, cash-oriented farm sector through market incentives, co-ops, and technical support.
- The encouragement of traditional manufactures—textiles, crafts, and so on.
- The encouragement of foreign private investment needed to support the above two endeavors.

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Foreign Economic Strategies and US Security Interests

The interaction of foreign economic strategies not only will affect economic conditions in the United States but also will impact on US national security.

The competition among non-Communist countries for technological leadership is accelerating the general rate of the transfer and absorption of innovation.

This changing technology picture will complicate the ability of the United States to pursue its national security objectives in the 1980s. The United States could be affected in three ways:

- Increased foreign competition could reduce the funds US firms have available for R&D and erode the productive base needed to produce some military items.
- The United States could become dependent on foreign production to meet a significant portion of some basic goods needed in military production—for example, electronic parts.
- Denial of high technology to the Soviets will become more difficult as a consequence of the rapid and broad diffusion of sophisticated know-how.

In all these cases it will be important to recognize the specific linkages between military production and the general economic base. (For details see pp. 18-22.)

West European unemployment problems will impinge on the ability and willingness of West European governments to support US policy initiatives, particularly on East-West issues.

The need for jobs in hard-hit industries has made it more difficult for West Europeans to reduce economic ties with the East. Western Europe's rising unemployment levels are likely to intensify debates over defense spending. In essence, Europe during the coming years will be gripped by a guns-versus-butter debate—in which those supporting enhanced defense may lose.

Table 3

Budgetary Impact of Unemployment

	Size of Labor Force (millions)	Net Budgetary Impact of a 1-Percent Change in Unemployment (billion US \$)
United States	104.76	25.0
France	22.43	5.3
West Germany	26.68	5.5
United Kingdom	24.20	5.5
Italy	20.81	0.6
Netherlands	5.32	0.5
Belgium	4.10	0.9

West European pacifists will certainly take advantage of rising unemployment rates to further their own aims. Should pacifist leaders be able to take advantage of the political discontent associated with unemployment to forge stronger links to the middle class, the resulting coalition could take an exceptionally anti-US position—for example, that defense spending, taxes, and inflation are high because the United States cannot get along with the Soviet Union. If the West European unemployment rate hits 11 percent, the budgetary impact in those countries will total about \$45 billion. This would intensify public pressures to pare defense spending, which now totals about \$80 billion (table 3).

Rising unemployment in Europe will also intensify protectionist pressures. Japan would be the immediate target, with the United States a somewhat distant second. To the extent that West European markets are closed to Japan, Tokyo would attempt to direct affected exports to the United States and to the Third World. Any increase in Japan's share of these markets would come largely at the expense of the United States and Western Europe.

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Non-Communist Competition in Key Technologies

Microelectronics

Japan has achieved world dominance in the key semiconductor memory sector and is also making significant advances in complex logic circuitry. Continued Japanese dominance of the memory sector will deny US firms profits and valuable processing experience required for manufacturing other semiconductor components. As a result, a major restructuring of the US semiconductor industry could be required over the next several years. Restructuring in the United States may also be driven by the vertical integration within Japanese companies. Some US electronics firms, for example, are already dependent upon Japanese suppliers for advanced semiconductor components. These dependencies are likely to result in a situation in which many US firms find themselves increasingly competing in the systems market with the same Japanese firms they depend upon for components.

The semiconductor industry worldwide is in a phase of transition to a new generation of sophisticated and expensive production equipment that will quickly become obsolete. Because of the industry structure and government support in Japan, the Japanese will probably be in a better position than the United States to meet the capital requirements of this new generation of equipment. Japanese manufacturers, with government support in key areas, are pursuing several high-risk programs in advanced semiconductor technologies. The only government-sponsored effort under way in the United States focusing on this area is the DoD-sponsored VHSIC program that attempts to push US civil technology for military applications. Japanese technical levels already meet or exceed some of the goals for this R&D program, but the Japanese appear to be reluctant to make any of this technology available to the United States.

Japanese integrated circuit manufacturers probably are the world's leaders in the development and application of complementary metal-oxide semiconductor (CMOS) technology. This technology is of great interest to the military because it offers density and power consumption advantages over other semiconductor technologies. Military applications for this technology include onboard computers, intelligence sensors, and digital communications equipment. This technology may also be more readily radiation hardened than other metal-oxide semiconductor technologies. Japan is also likely to become the world's leader in a related CMOS technology, silicon on sapphire. Today, this technology offers performance advantages over CMOS and would be useful in high-performance airborne or spaceborne processors. In other device technology areas, Japan may emerge as the world leader in magnetic-bubble technology. Recently, many US firms have discontinued the production of magnetic bubbles, citing their nonprofitability, while Japanese firms have continued development and expanded sales. Magnetic bubbles are ideal for ruggedized, nonvolatile mass-memory applications such as spaceborne and ground-based remote sensing. In semiconductor production technologies, Japan leads the world in automated assembly techniques including wafer dicing and die and wire bonding. These technologies are extremely important in the fabrication of high-reliability packaging of all military electronics components.

Japan is also pursuing some very advanced semiconductor technologies that have yet to be proved over conventional silicon-based technologies. The Japanese are probably the world's leader in the development of gallium arsenide semiconductor devices that potentially can offer tremendous speed advantages over silicon devices. This technology would be extremely useful in satellite communications components, high-speed signal processing, and radar and

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receiver integrated circuits. Gallium arsenide also offers the capability for integrated optics for optical signal and data processors having many times the speed of today's systems. In contrast to the Japanese efforts, the US VHSIC program is not sponsoring any gallium arsenide research.

In other "exotic" technology areas, the Japanese are investing considerable manpower and funding in developing Josephson-junction technology for digital applications. Although they are not now the world leader in this technology, the magnitude of their effort in a new, unproven technology and the strategic consequences (for the semiconductor industry, should the effort succeed) make their effort noteworthy and may result in eventual Japanese leadership if the US effort is diminished. Japanese semiconductor manufacturers, with government support, are also exploring exotic variants of today's silicon integrated circuits that offer the possibility of constructing three-dimensional integrated circuits and new sensors mirroring the human senses. Their developments of charged coupled devices for imaging are at the leading edge. These devices could have application in a large number of military and intelligence systems. The Japanese are also exploring the use of organic semiconductors that could offer improvements in density and performance.

Computers

Japan has emerged as the major rival to the United States in the world computer industry, and could garner a significant share of the world market over this decade. Japan has been able to match the United States in many important areas of computer hardware technology; however, the Japanese still trail the United States in software and systems integration capabilities. In an effort to close the remaining technological gaps, Tokyo is sponsoring advanced

research and development programs in software, advanced components, high-speed scientific computers, peripherals, and an ambitious 10-year program to define and develop a fifth-generation computer that if successful could enable Japan to leapfrog the United States.

The Japanese Government and industry have also been the world's leaders in anticipating the linkages between the telecommunications and computer industries. Because of the structure of their industry, they will be in an excellent position to develop technologies that fuse and promote increased use of computers and telecommunications. Until recently, the Japanese strategy has been to attack the low- and medium-range systems market. Soon they can be expected to compete across all sectors, from personal computers to high-speed scientific processors. The competitiveness of the Japanese computer manufacturers is enhanced because of their captive integrated circuit production. Such vertical integration will be a key component in the competitiveness of US and West European computer manufacturers and may force major restructuring of both the computer and microelectronics industries in the United States. The position of Western Europe will become increasingly tenuous over the next several years, and it is likely to become more dependent on US and Japanese components and systems technologies.

Because of the tremendous innovation and strength of the US computer industry, there are very few areas in which foreign levels exceed those of the United States. One area in which the Japanese most likely have a lead over the United States is voice input/output technology. Research has been under way in Japan since the early 1970s in this area and it is continuing to receive government funding in the fifth-generation computer program. Voice input/output will be useful in military environments to simplify man-machine interaction in complex situations such

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Non-Communist Competition in Key Technologies (Continued)

as tactical air support and interdiction. Japan could also be a potential world leader in character and pattern recognition. Handwritten character recognition, shaded pattern recognition, object recognition, as well as the voice-pattern research mentioned above, were part of the Pattern Information Processing System sponsored by the Japanese Government. All of these developments could be of high value in military applications such as advanced sensors, terminal guidance, and image processing. In other areas, Japanese display technology is likely to set world standards; this technology would be useful in photo interpretation and command and control systems.

A number of other Japanese developments could have significant military implications. For example, the Japanese Government and industry are engaged in a number of programs to develop large-scale scientific computers more advanced than those they now purchase from the United States. Although it is unlikely that the Japanese will dominate this sector in the near future, they are pursuing a number of advanced technologies, such as Josephson-junction and gallium arsenide integrated circuits, that could be the basis for improvements in computer performance. At the very least, the United States will undoubtedly lose much of its control over supplying large-scale scientific computers when the Japanese complete development of their scientific processors. Such computers have important applications in military research and development, including nuclear weapons design, aerodynamic and hydrodynamic modeling, cryptanalysis, signal processing, analysis of complex systems, and strategic battle management.

Besides development of large-scale scientific computers, Japanese success in the general purpose computer sector could have important repercussions for the development of US military computers. If fewer US firms compete, the technical infrastructure in both

the hardware and software sectors would be undermined, and corporations might be forced to discontinue development of military systems that typically have not been revenue or profit earners for the industry.

Telecommunications

The telecommunications industry is undergoing one of the most rapid and extensive periods of change in its history. The driving force behind this change is the evolution of microelectronics technology, which offers price/performance improvements. Microelectronics has fueled the trend from analog voice equipment to a fully integrated digital network that optimizes the interactions of all network components and that has the potential to provide a vast array of new information services. Old electromechanical switching systems, the most expensive and complex equipment in the network, are being upgraded with all-digital, stored program control systems.

The United States has traditionally been the leader in this technology, but the Japanese are now challenging the US position, in part aided by technology exchange agreements between the Nippon Telephone and Telegraph Corporation and US firms. Complementing the use of new switching systems, new transmission systems—such as fiber optic and satellite-based systems—will be used in the future. Finally, telecommunications terminals, ranging from residential telephones to advanced office work stations, will probably be the most dynamic area of technological change over the next decade. The Japanese will be strong competitors in this sector because of their excellence in the mass production of advanced consumer electronics and also because of their willingness to bring high technology to the marketplace. They are already developing small Earth stations to receive signals directly broadcast from satellites.

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Many improvements in civil telecommunications technologies have the potential to enhance military command, control, and communications systems. There are a number of specific telecommunications technologies in which the United States has lost its technological edge or might lose its leadership position over the next several years. At this time, for example, Japan is the world's leader in fiber optic research and applications. Fiber optics is of interest to the military because of its advantages in bandwidth for signal-processing applications and its immunity in high-radiation and intense electromagnetic environments. Fiber optics also might provide more secure communications than conventional systems.

The Japanese also may lead in the development of high-speed facsimile, which will have application in future command, control, and communications systems. The United States may also find itself in a secondary position in high-power traveling-wave tubes, which have application in broadcast and wide-band data transmission satellites as well as in electronic countermeasures. Both France and West Germany have strong positions in this area. The Japanese will probably develop a lead over the United States in power field-effect transistors, and in very small Earth stations that might be adapted for general military and intelligence satellite-based communications systems. Japan and Italy are developing high-frequency (20-30 GHz) satellite systems that may allow for more options in secure communications.

Recombinant DNA and Advanced Biological Technology

The United States has a clear lead in recombinant DNA (rDNA) technology, with the Europeans next in line. The Japanese currently lag behind, but are avidly acquiring US and European technology and

are engaged in a major effort to build up domestic capabilities. They could be among the world leaders by the mid-1980s. In the more general field of advanced biological technology, the United States and Western Europe generally share the lead, though the Japanese dominate in a few areas—for example, fermentation technology in general (which is critical to some rDNA production processes) and fixed-enzyme amino acid production. The Japanese are pressing ahead in areas such as bioreactors and mass cell culture, are active in bionics, mimetics, and biosensor research, and are funding some research being done in the United States on biochips, a proposed alternative to Josephson-junction integrated circuits for super-high-speed computers. The state of the art in these technologies is still in the gestation stage, and the prospects for new players to dominate pieces of the action are almost unlimited. A shortage of qualified R&D personnel afflicts all countries, and all are looking at means of addressing this problem.

Obvious applications of rDNA and advanced biological technology for military purposes include engineering and production of biological warfare organisms, production of toxins and other chemical warfare agents, production of vaccines and prophylactic or therapeutic agents to maintain the general health of soldiers in a stressful or unhealthy environment, and use of engineered organisms to extract strategic materials from ores or feedstocks that cannot now be effectively exploited. Mimetics—machines that incorporate or mimic the behavior or function of organisms—and bionics might find application in a variety of sophisticated weapons systems or be incorporated in and improve the efficiency of manufacturing systems making defense hardware. Biosensors conceivably could vastly improve capabilities in infrared and ultraviolet light-sensing systems as well as provide capabilities to detect and identify biological and chemical warfare agents, aromatic effluents such as sweat, exhaust gas, or combustion products

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Non-Communist Competition in Key Technologies (Continued)

from gunpowder, or effluents from submarines deep in the ocean. If feasible, biochips that operate at Josephson-junction speeds at room rather than cryogenic temperatures would be a revolutionary development which would add enormously to computer capabilities. In addition, advanced biological technology may be applied to production of fuels, foods, and chemicals that a modern military force requires in great quantities.

Space Technology

US dominance of space technology within the non-Communist countries is eroding. The West European Ariane program could account for perhaps one-fourth or more of the 200 commercial satellite launches likely during the 1980s. Japanese efforts during the 1980s will be much more modest, but their long-range prospects are better, especially if Tokyo supports the sector.

West European space technology generally is not superior to US technology, but the United States' near-exclusive dependence on the high-cost shuttle appears to make the Ariane expendable launch vehicle an economically attractive alternative. Much the same can be said for the Japanese H1 launch vehicle to be developed by the latter half of the 1980s. Although the H1 second stage uses liquid hydrogen/

liquid oxygen propellant, this stage will be state of the art for its class (the United States has dropped plans to build a similar stage). This stage could be used to carry a payload that had been placed in low Earth orbit into geostationary orbit. The H1 could also be incorporated as a stage in the Ariane, so a sales potential does exist. A liquid hydrogen/liquid oxygen third stage is being considered for the H1, and if it is developed it would likely also represent a step ahead in the state of the art for that application. Japan is considering a minispace shuttle for the mid-1990s, but it is doubtful that work has gone beyond the preparatory stage.

Civil applications of space technology, particularly telecommunications and remote sensing, are driving both the West European and Japanese efforts. There are no major problems, however, that would prevent conversion of these civil satellite systems to military use. Conversion of the Ariane and Japan's H1 booster vehicles for military use would be less than optimal, however, as they use liquid propellant. These vehicles would require several hours to prepare for firing unless one is to pay heavy risk and cost penalties and keep the propellant tanks fully loaded at all times. The Japanese do have smaller solid fuel rockets (M series) that could be convertible to IRBMs, although further development work on a better guidance system would be required.

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The Soviet Union's economic strategy is failing.

Economic problems in the 1980s will make the further expansion of Soviet military power and political influence increasingly difficult and painful. Moscow will try to continue to increase its military expenditures rapidly, sustain its empire, and finance influence in the Third World in spite of slow economic growth.

The crucial question is how long the Soviets can go on—especially if access to trade and credits from the West is curtailed. Beijing has openly recognized the failings of central planning, but it is by no means clear that China can move far enough away from central planning to get decent economic performance without risking political turmoil. The leaders in Moscow have not been prepared even to take the gamble.

The Soviet economy is stagnating; no improvement is likely in the 1980s. Chances are slim that the Soviet leadership can counter this trend. Soviet workers believe that the rewards for their work are not commensurate with their effort. In principle no policy path can be excluded in the post-Brezhnev Soviet Union, ranging from liberalization to the reimposition of Stalinist terror. Perhaps most likely is some "fine tuning" of the present system. This might entail concessions to workers/consumers to encourage more output; marginally less emphasis on heavy industry; and perhaps even slower growth in military spending (as long as the primacy of the military sector is not put in question).

A central element of such muddling through would be increased efforts to acquire Western goods and technology. The preferred way may be heavy borrowing in the West as in the case of Poland and Romania. The use of political blackmail to acquire needed resources on favorable terms from Western Europe or from the oil-rich countries of the Middle East cannot be ruled out. Nor can bold military action if Moscow decides the future of its regime depends on it.

For Western governments, the relevant economic policy instruments are restricting access to their technology and reducing trade and credits that enable Moscow to buy Western goods. Most Western governments, however, cling to the 1970s' hopes that a web

of economic relations will moderate Soviet behavior. They do not believe that the denial of Western goods would substantially alter Soviet policy.

The Soviet Union's economic leverage on Western countries is small and diminishing. Soviet Bloc markets will constitute a diminishing share of Western country exports. Apart from Soviet natural gas, the availability of which can lower the price of gas in Western Europe, and platinum, there are ample and cheap sources outside the Soviet Bloc. Only an exceedingly unlikely set of circumstances could lead to Soviet control of enough of the world supply of any critical material to allow Moscow to gouge the West or disrupt markets on a significant scale.

Access to Persian Gulf oil will remain crucial to allied economic and military power.

The United States and its allies continue to have this access, although it must be considered threatened with the revolution in Iran and the Soviet move into Afghanistan. Although the West is slowly becoming less dependent in this source of energy (that is, the Middle East provides 13 percent of the non-Communist world energy compared to 22 percent a decade ago), it will remain vitally important at least through the 1980s.

The principal reason for the Middle East's enduring importance is that this region is the world's cheapest source of energy. With adequate oil stockpiles and other resources, the West could survive its denial with grave but not unmanageable economic dislocations. However, effective control of this region by the Soviet Union could reverse present economic trends in the USSR. In 1980, for example, the Persian Gulf countries earned around \$200 billion. A modest fraction of that sum at the disposition of Moscow would dwarf expected earnings from the Yamal pipeline. It could be the solution to the Soviets' hard currency problem and its problem with the satellite economies.

Aside from direct military measures, the Soviets could gain some control in the Gulf by internal subversion and coups. At a minimum they might try intimidation to get favorable price or currency arrangements.

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As the United States becomes increasingly pressed in various theaters, Japan will be pushed to assume a greater military role to match its growing economic power.

The United States has been pressing the Japanese to spend more on defense for many years. There is room for debate about which responsibilities Japan should assume. Ideally, the Japanese could help provide a counterweight to the Soviet Union in Northeast Asia.

A Japanese military buildup would require a substantial reallocation of Japanese resources away from the private sector. What this could mean for high technology is unclear; an enhanced military program would provide another outlet for high-technology industries. Although in the short run this could reduce pressure on US and other markets, over the longer term it would give Japan another leg up in selected higher technology areas.

Divergent trends in the Third World will also affect US security interests.

Continued economic growth in the Asian NICs will increase the resources available for their military security programs. This is particularly true for South Korea and Taiwan. In both cases their defense capabilities are already substantial and provide some counterbalance against Communist threats in the area. Military relations between the ASEAN countries also have the potential for considerable payoff. The poorer LDCs, by contrast, pose security risks. Worsening economic and social conditions in many of these countries threaten political stability. This leaves them vulnerable to exploitation by interests inimical to the United States. The situation in Central America underscores these risks. Economic erosion makes it increasingly easy for the Soviets and their surrogates to exploit the potential for instability at low cost to themselves.

The rising level of world trade, by increasing global interdependence, has created opportunities and vulnerabilities in the use of leverage.

As the volume of trade expands, so too does the ability of countries to affect each other's economic strategies. For instance, as the percentage of a country's work force engaged in export production rises, the threat of protectionist policies against that country's products becomes more potent. At the same time, the use of economic leverage can more easily backfire as the level of interdependence rises. For instance, efforts by an industrial country to block Third World competition could not only lower the industrial country's exports, but also impair the ability of Third World countries to pay the debts they owe to banks headquartered in the industrial country itself. This financial situation has given countries like Mexico and Brazil implicit bargaining leverage with the industrial countries.

Since the United States is the world's largest economy, its economic strength could provide a measure of leverage. In this context, it is important to distinguish those countries for which access to the US market is crucial, those which are heavily reliant on US exports, and those whose trade with the United States is relatively unimportant. In aggregate terms, the United States has substantial leverage over Japan; 24.4 percent of Japan's exports come to the United States while just 9.4 percent of US exports go to Japan. The European Community, on the other hand, accounted for one-fourth of US exports, while the United States takes only 6 percent of Europe's exports. The United States is particularly vulnerable to EC policies on agricultural items. Although the West Europeans have not used economic leverage in their dealings with the United States and have been unresponsive to US attempts to leverage them, they have responded to leverage from third parties. Their sensitivity to dependence on Persian Gulf oil supplies, for example, has had a pronounced impact on their policies regarding the Arab-Israeli peace process.

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Potential Shocks to the Global Economy

The economic troubles of this past decade have made the public and policymakers much more aware of the vulnerabilities of the global economy to sudden shocks. Unexpected events can greatly alter the effectiveness of national strategies, thus affecting not only underlying economic trends but also security interests. The types of problems that can jolt the global economy include:

- Large-scale commodity supply interruptions—oil, other raw materials, and grain.
- Collapse of the international financial system.
- Rampant protectionism.

Supply Interruptions

Oil. The painful transition toward a global economy less profligate in the use of oil is clearly under way. Driven by two oil price shocks, a conservation movement has taken hold, and the shift away from oil to other energy sources is well along. The chances now seem low that some oil shortfall will trigger a devastating price runup through the mid-1980s. Although oil stocks have fallen from their record high levels of mid-1981, excess production capacity this year will remain rather large, even if the Iran-Iraq war continues. Even though demand for OPEC oil may slowly increase in subsequent years, the probable return of substantially larger Iranian and Iraqi exports, once the war ends, makes it likely that there will be sufficient OPEC oil to meet demand for several years. It would take a major and prolonged political upheaval in Saudi Arabia or a closure of the Strait of Hormuz to create another oil shock.

In deciding how much should now be spent on reducing the risk of an oil price explosion in the mid-1980s and beyond, policymakers face tough decisions. The problem is that experts differ widely on oil market trends. Although many analysts expect the oil market to tighten in the mid-to-late 1980s, others hold different views—that demand for OPEC oil will continue to decline and unused oil production capacity will remain large. If the first view is correct, it is easy

to justify building strategic reserves and keeping domestic oil prices high to stimulate energy production and conservation. On the other hand, if a long period of low prices and low risk is expected, the advantages of these policies become less clear, and their costs become more burdensome.

Other Raw Materials. The potential problems associated with dependence on imported raw materials are less severe than in the case of oil. It would take a widespread commodity shortage, as in 1950-51 and 1973-74, to seriously disrupt global economic activity. It is unlikely that LDC exporters or Communist countries, individually or in groups, will create shortages by withholding production for political ends:

- For most key commodities, the sources of supply are well diversified with such developed countries as Canada, Australia, and South Africa providing the bulk of Western imports.
- Non-oil-exporting LDCs lack the economic and financial capacity to sustain an embargo of their mineral exports; they need to sell more than their customers need to buy.
- LDC producers of commodities rarely have common political goals powerful enough to initiate large cuts in exports.
- The Soviets, in particular, face a hard currency bind that makes the withholding of commodities or preemptive buying very costly.

One remote possibility is an embargo by black African nations against industrial countries for supporting South Africa. In this case, the United States would be deprived of the bulk of its cobalt supplies and about 40 percent of its manganese needs. In addition to these two metals, the Europeans and Japanese would be affected by more limited supplies of copper, bauxite, and iron ore.

A more serious and enduring potential danger is a prolonged period of racial strife in South Africa, which would disrupt supplies of platinum, chromium, some minor strategic metals, and gold. To have a serious global impact, such a supply interruption

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would have to exceed a few months and/or would have to coincide with a sharp increase in demand. This risk could be significantly lessened through strategic reserves or private inventories.

Platinum is the only strategic metal for which industrial countries depend heavily on the Soviets. Nearly half of non-Communist platinum consumption is supplied by the USSR. Users could obtain sufficient amounts to meet crucial needs (mainly in petroleum refining and chemical processing) for at least several years through increased output of other major producers (mainly South Africa), available stocks, and the ability to substitute or to do without.

Grain. In the case of grain, the international market has become less prone to price fluctuations even though the US Government no longer holds huge grain stocks that can be used to smooth out prices. In recent years, for example, a price runup was averted despite three consecutive poor Soviet harvests, a major US corn belt drought (1980), and relatively low stocks. A major reason is that the significant increase in grain-fed herds worldwide has provided a buffer against fluctuation in supplies. Because of this the impact of a grain shortfall has been shifted from dramatic price fluctuations to major variations in herd size, often leading to distress slaughtering.

Financial Collapse

Since the early 1970s the international financial system has proved resilient to shocks. Nevertheless it remains susceptible. One reason is that differences between domestic and international systems have been greatly clouded, thereby reducing the effectiveness of each country's ability to regulate financial transactions. Moreover, market participants have become less prudent in handling deposits and making loans. The heavy lending to Poland that continued long after problems emerged is a case in point.

Protectionism

Although free trade is still the dominant characteristic of the global economic system, it is becoming increasingly difficult to keep the genie of rampant protectionism in its bottle. Japan's continuing refusal to open its market has already encouraged that country's trading partners to seek protectionist relief. In Western Europe especially, high unemployment will encourage the inclination to use protectionist measures against Japan to save jobs. In coming years, the NICs are likely to be increasingly targeted by European protectionists as the NICs continue to increase their marketing prowess. One risk in all of this is that the United States could increasingly be regarded as a market of last resort—a development that would play into the hands of US protectionist forces.



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