

Technology, MNEs and Convergence in US and EU Industrial and  
Technology Policies

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This paper considers whether US and European trade and industrial policies are in a process of 'convergence' around a common policy type. Convergence is once again appearing in politics journals after a period of relative neglect (Berger in Berger and Dore, 1996). Convergence - the process by which economic activity in states is gradually homogenized - is economically determinist. That is, the process occurs naturally due to the playing out of commercial forces. Firms are expected to adopt best practices in the search for survival in global competition; diffusion of an optimum model for international production was the expectation (Berger, *ibid*: 5). Technology has an important role to play. It changes the nature of international business - a the related industrial and trade politics - in various ways. Technological change and growth can render obsolete national systems of production. Consider for example the challenge that the Internet poses to national systems of communication and regulation. In the most extreme expression of the process, politics can attempt to distort the convergence, but can not prevent it. States are, like Canute, unable to hold back the techno-economic processes shaping the international economy.

Other literature disagrees sharply with the convergence thesis and argues that national systems of production and innovation are resistant to homogenizing tendencies. National economic systems differ from each other in key respects and these differences have become embedded within the national state-firm relationship. The cumulative effect

of the operation of these national arrangements is that states follow a particular economic trajectory (Zysman, 1996). Some writers have taken this further and suggested that distinctive 'models' of capitalism exist in the international political economy. Michel Albert, for example, contrasts the Anglo-Saxon system of the US with the Rheinisch model of continental Europe and Japan (Albert, 1993). In each model the accumulation of historical experience in cultural, economic and political terms places nations (or like groupings of nations) on a particular economic path. This trajectory represents a sunk cost to the national economy; shifting off this trajectory implies enormous cost and dislocation. This being the case, national systems of production and innovation shift only rarely, perhaps only in response to a cataclysmic such as defeat in war. In the normal course of events then, national economies respond to international economic pressures not by homogenizing, nor by abandoning national practices, but by adaptation. Thus, national systems filter exogenous influences and thereby develop a national response to international economic pressures.

There is little question that some of the globalization literature has seriously overstated its case. Many of the motive forces of globalization - such as technology, deregulation and erosion of national cultures - apply themselves with vigour to only the advanced industrialized states of the Triad. That said, the emphasis on the durability of national systems of innovation is not immune to criticism. The criticisms can be grouped under two headings: problems in case selection; and a conflation of policy content with policymaking structures.

If globalists are guilty of taking a Western phenomenon of internationalized production and mindlessly extending it world-wide, the trajectory school can be charged with much the same - taking a small, unrepresentative case sample and extending the explanatory power of the work worldwide. When the trajectory school talks of 'state' systems of innovation when in reality only three states dominate the studies: Japan, the

United States and Germany. The problem here is straightforward. The trajectory school wants to argue that national economic systems are not eroding in the face of international economic activity. But no one would dispute that, among states, these three have the greatest ability to resist globalizing tendencies in whatever form they may appear. The three have a degree of technological autarky and economic muscle which would allow them - more so than other states - to resist homogenization. But are smaller, less technologically self-sufficient states so able?

The second criticism concerns the conflation of policy content with the structure of its making. The trajectory school argues that, in essence, history matters more than political economy. National economic systems vary because each has been built up by a peculiarly national set of institutions and actors that develop policy. Little scope is allowed for the influence of ideas on the economic development of states. To the extent that it is allowed, the national systems operate as excellent filtering methods; limiting and altering the impact of these ideas on the system. For the trajectory school, this process should not result in a major change of direction for the national economic system. Powerful economies (remember that only powerful economies are generally considered) may be swayed slightly, but each continues on its particular path.

But does convergence have to mean a homogenization of the process of making policy? What if we develop a less ambitious formulation that emphasized the ability of the international political economy to shape the context within which a national policymaking process operates? Consider this metaphor. I and several colleagues from around Europe will be attending a workshop at the LSE. From my home I am able to drive, take a coach or train to London; my Dutch colleague could fly or, wishing a more leisurely trip, choose a ferry crossing. Some colleagues in London may be lucky enough to live close to LSE and be able to walk. While we take a variety of transport, we all end up in the same place; we converge on London. Trajectory theorists collapse the

distinction between the means of developing and implementing policy, and the content or goal of the policy itself. However, we must consider the situation where common policy preferences are held by actors - MNE for example - although the actual process by which these demands are dealt with may be different among states.

This paper argues that both the US and the EU are evolving relatively similar policy mixes in response to changes in the IPE. These influences include the ideational hegemony of liberalism; growing internationalization of business and; increasing salience of technology as a motor of economic growth. The policies designed to cope with these pressures emphasise the state's role as an active supporter of home firms in international competition. Pierre Muller uses the term 'neo-liberal interventionism' to capture this policy mix (Muller in Hayward (ed.), 1995: 159). There is a liberalising tendency, which seeks to support firms by lowering the transaction costs associated with regulation. A second, interventionist, tendency seeks to support firms via a form of industrial policy. The effect of both strands represent a significant re-orientation of state activity in the economy away from the assumptions of the Keynesian welfare state. As Cerny argues, Keynesian policies were designed - among other reasons - to protect national economies and their workers from the vagaries of the international marketplace (Cerny:1996:633). Now, states are asked to pursue rather different policies.

The possibilities of selected state intervention have not been lost on two of the most powerful actors in the international economy: the US and the EU. The US has shifted toward a more interventionist policy for selected - particularly high-technology - industries. While this policy has been most pronounced under the Clinton administration, its genesis is further back. As Milner and Yoffie show, the trade policy preferences of US firms shifted during the 1980s ((Milner and Yoffie, 1989). The firms placed increasing emphasis on creating a 'level playing field' in international competition. Concern was expressed about the rent capture policies of other states, notably Japan, but

also the European Community. By contrast, the European states - and latterly the Commission - have moved away from the highly interventionist industrial and trade policies that have characterised business-state relations for decades. The Commission's activity on this front is notable for the increasingly tough line on mergers and on its inability (or unwillingness) to involve itself in strategic trade policies. Instead, R&D activities have been limited to the 'pre-development stage'. As an actor on trade policy matters it still is best thought of as a broker, rather than strategic actor. That said, the belief that states ought to provide infrastructure for high-high technology industries continues to be an objective of EU policy. This is manifest in the continuation of the Framework Programmes, a new phase of which will be unveiled by the Commission in 1998. It is also seen in the Commission's continuing concerns about the competitiveness of European industry.

These shifts in both the US and the EU have their roots in the domestic politics of each actor. In each, a perception that the existing policy paradigm was not working as envisaged, provided the rationale for a change. In the US, strong competition from Japan was the catalyst; in the EU it was the abject failure of national champion strategies. However, why should each actor move toward the neo-liberal interventionist pattern? The argument presented here is that the growing internationalisation of business, thanks largely to technological change, has contributed to the development of an economic policy paradigm that comprises both cooperative elements and competitive ones. Tension in the policy process, and for that matter in the US-EU relationship, arises out of the tension between the two components of the paradigm (Smith and Woolcock, 1993: 100).

If convergence is occurring, then one starting point is to examine European-American relations through the lens on international business. The internationalisation of business has had the curious effect of shifting both actors toward the same policy mix,

but from very different starting points. More specifically, the changing nature of competition in high technology goods such as telecoms, aerospace and computers have exerted pressures on both political establishments. These industries have distinctive characteristics. First, on the production side, they are increasingly characterised by international strategic alliances as opposed to simple oligopoly. Second, their products rely on an international-scale marketing effort to recoup the cost. Those that are 'intellectual' in nature - software, videos, etc. also benefit from broadly internationalized standards for transmission. In short, it is the nature of these industries to produce harmonization pressures on government. In the US, this has resulted in a greater acceptance of selected government support for industry. In Europe, the same pressure produced a more liberal and nuanced industrial policy than previously. The increase in 'functionally convergent' MNEs has put pressure on European and American states to harmonize their regulatory regimes. It also places Europe and America on the same side of the negotiating table on issues such as telecoms liberalisation in the WTO.

#### *The changing nature of MNE activity*

The public policy demands that MNEs make on their home governments are crucially shaped by two characteristics of the international political economy: economic liberalism and schumpeterian competition. The difficulty for MNEs and states alike is that these two features of the global economy are at some tension with each other. Thus, MNE-state relationships are likely to be marked by a considerable degree of inconsistency on matters of trade, industrial and technology policies as firms attempt to deal with situations of great uncertainty (Crystal, 1997). First, the triumph of capitalism over communism in the Cold War has led to the ideational hegemony of liberalism and free trade over - not merely communism - but virtually all forms of social democracy. Deregulation and market openness have become the hallmarks of the 1990s. Firms - even

small and medium size companies not typically associated with internationalization - find that turning to overseas markets has considerable attractions. Thus FDI regimes have been steadily liberalized. State owned enterprises are now privatized on the grounds that state ownership is antithetical to the new, fast moving era of private, internationalized commerce. The seeming salience of international capital as the most important player in economic policy discussions as led to many observers arguing that a neo-liberal hegemony now reigns in the international political power. This ideational power causes states to adopt policies that are defended on the basis of national interest even if, in fact, they are biased in favour of one group. Neo-liberal hegemony emphasises the limited role of the state in economic life and gives pride of place to free markets and private interest as good and proper objectives for society.

Second, the rise of so-called Schumpeterian competition in high-technology sectors has arguably increased the salience of government intervention in support of home firms. In an increasing number of sectors, economic advantage is created by human effort and choice rather than conferred by natural endowments. The process of creative destruction requires not the possession of mineral reserves or vast tracts of land, but active, intelligent and creative people. Industries like computers, telecommunications equipment, advanced materials and aerospace, place an emphasis on globalized firms with deep R&D and production competencies. Often these sectors tend toward oligopoly; firms have a vital interest then in first mover advantages and short product cycle times as both are designed to pre-empt entry by competitors.

Schumpeterian competition, with its emphasis on technology intensive industries and the advantages that innovation can confer on home economies in the form of economic rents and skilled jobs, invites government intervention to ensure that domestic firms are able to appropriate some of the benefits of this type of economic activity. Essentially, the job of the state is to preserve and promote the international



competitiveness of home firms in global competition. States are responsible for adding value to international production via providing an infrastructure capable of supporting home firms in the global marketplace (Sharp, 1997: 101). Infrastructure also ensures that a country's firms remain attractive partners for the growing number of alliances and networks which characterise international business in knowledge-intensive sectors (McGuire, 1997). Thus, states are pressured to lower transaction costs associated with international production by a combination of intervention and deregulation. Drache argues that this type of policy mix represents a middle ground between the surrender to market forces represented by free trade and the discredited policy of protectionism (Drache in Boyer and Drache, 1996: 34-35).

How have economic liberalism and Schumpeterian capitalism affected the development of international business? Liberalism has meant that domestic firms have suddenly found themselves exposed to international competition. Thus, small and medium-sized firms, without really making a choice about the matter, have found themselves pushed into becoming internationalized firms. Whether they like it or not, SMEs must increasingly adopt global strategies that, if they don't actively seek out foreign markets, at least service their domestic customers with one eye firmly fixed on international competitors. Liberalism has meant the increasing interpenetration of domestic and international political economies.

The triumph of liberalism is also reflected in the shift from highly interventionist industrial policy toward the more selective, sponsorship role we see today. This structural change is seen most obviously in the abandonment of national champion strategies; but privatizations in the developing world are also reflective of the marked tendency to regard private actors as the only legitimate owners of productive capital. The French government's moves to privatise its state-owned industries - albeit with some reluctance - is indicative of this trend.

Schumpeterian competition has likewise led to increasing international exposure, even for firms without great ambitions to become MNEs. Technology has affected firms in a myriad of ways; it has offered new opportunities for expansion, but it has also confronted firms with sharply escalating costs of product development. Firms and governments are involved in a complex relationship that tries to ameliorate the tensions imposed by this new economic environment. The European - American business relationship is similarly affected.

The United States - European relationship is notable for the density of business links and for the lengthy history of these ties. The trans-atlantic relationship is a balanced one with none of the structural problems associated with either of the partners; relations with Japan. Both the US and the EU are significant investors in each other's economy and two way trade is the most valuable in the world. That the American and European markets should be so interdependent is not surprising. Notwithstanding the considerable importance of the security relationship, international business across the Atlantic long predates the Cold War. European firms played a significant role in the development of late eighteenth and early nineteenth America. Initially, this was manifest in portfolio investment by British merchant banks helping to finance (with mixed success) American railways and other infrastructure. Later, European MNEs became important direct investors. Early investments were concentrated in resource-based sectors such as oil and mining. However manufacturing industries - particularly chemicals - also saw European firms invest in America. Leaving aside investment for a moment, European universities also contributed to the development of the US economy by providing the growing nation with opportunities for graduate study in scientific fields such as chemistry and aeronautics. Ex-patriot Europeans employed by US universities and research establishments likewise exposed ambitious American minds to the cutting edge in a variety of fields (Irving, 1994).

Similarly, Europe has long been an important market both for US goods and investment. As American firms became more profitable and sought expansion abroad Europe, along with Canada, was a natural first step. Indeed, Europe represented the only other economic region which offered rich enough consumer markets to make internationalization worthwhile. Of course, the massive expansion in American presence on the European continent only occurred after the Second World War, when investment strategies of US firms served an important geo-political as well as economic function.

The trans-atlantic business relationship is increasingly characterized not by FDI, but by the expansion of the number of strategic alliances concluded between US and European firms. Alliances are a relatively new and important development in corporate strategy. The term itself has been defined in numerous ways and is best viewed as an umbrella term for a variety of joint-ventures concluded between firms. However, at one end of the scale are *international strategic alliances* - corporate relationships which engage the participating firms in substantial commitments of assets (capital, technology, personnel) in the pursuit of a long-term strategic goal (OTA, 1993:117). These ISAs can often endure for years and, indeed, often take on the appearance of a separate company. For instance the aero-engine alliance between General Electric of the US and the French firm, Snecma, CFM International, has its own staff, corporate headquarters and production and marketing arms specifically dedicated to a line of small jet engines. In short, it has a corporate identity quite separate from the parent firms. As the OTA report points out, such autonomous and long term alliances blur the nationality of MNEs involved making them, "increasingly 'multi' and less 'national'"(OTA, 1993:14). Less far-reaching alliance relationships can include joint ventures or merely developing a network of firms for the development of a given product.

These alliances can be concluded for one of two reasons: market access and technological access. Market access alliances develop in situations where a firm looking

to enter a market concludes that the cost of entering may be prohibitive, so it concludes and agreement with an existing supplier in the home market. The telecommunications sector provides a good illustration of this. Telecommunications is a highly capital intensive industry where an enormous amount of money is tied up in infrastructure - the fibre-optic cables, switches and customer equipment. Moreover, the evolution of technology in this sector has blurred the distinction between players offering telephony services and those offering television or other data services like the Internet. Fibre-optic cables, as well as satellites, are able to move a phenomenal amount and variety of information. A firm entering the market could chose to invest in this infrastructure; UK cable companies are spending millions laying cable throughout the country. But a more sensible strategy might be to simply invest in one of the existing supplier and agree a common package of services. This is generally less costly, and also prevents a firm investing millions in a technology that may be rendered obsolete. Cable firms now face the introduction of digital broadcast technology as well as increasingly advanced satellite technologies which threaten to supersede cable for some types of services (*Aviation Week and Space Technology*, 17 March 1997: 73).

Currently, three major alliances are engaged in a race to link European national service providers together: Concert (BT and MCI), GlobalOne (Sprint, France Telecom and Deutsche Telekom) and Unisource (AT&T, KPN, Swiss Telecom and Telia). All alliances include a major European supplier and an American. Concert and Unisource were recently involved in a race to conclude an agreement with Spain's Telefonica, a race which Concert won (*Independent*, 18 April 1997: 21). Telefonica offers not merely access to the Spanish market, but access to Latin America through its Tisa subsidiary which operates in a variety of South American markets (*Financial Times*, 19 March 1997: [www.ft.com](http://www.ft.com)). The telecommunications market bears a similarity to the airline

industry, where a web of international alliances tries to offer the customer a seamless package of services among the world's major markets.

Alliances across the Atlantic also arise for technological reasons. In a variety of sectors the pace of technological change has quickened; product life cycle times in the computer industry, for instance, are often less than two years. Technology has a varying impact on manufacturing. In some industries, it increases productivity, but in others, it complicates life for the firm as the increasing complexity of production overwhelms the firm's organizational capacity. In this circumstance, the firm cannot remain a master of all aspects of its product; increasing specialization requires a greater reliance on expert subcontractors and suppliers. Increasing technological sophistication has meant that product development is now a process of negotiation among several firms. This is indicative of a paradox in the political economy of high-technology industries. In the very sectors where states are preparing their firms for neo-mercantilist economic warfare, technology makes autarkic strategies very problematic. Technological sophistication places a premium on the innovative capacity of firms. This innovative capacity includes not merely the ability to generate new technologies internally, but also the willingness to augment proprietary technologies with those of other firms. Increasing specialisation makes it improbable that a given company can master the various and discrete technologies that go into a given product for it implies an increase in the size and scale of research departments that would not be cost effective. Thus technologies develop in networks of firms. One firm may be central to the development of products - a type of core firm - and is surrounded by smaller, specialist firms (Ruigrok and van Tulder, 1995). The core firm may own the smaller ones, or prefer to maintain an independent existence. Either way, the process of innovation is similar: a type of craft-industry structure where groups of specialists engage in a process of cooperation over time.

The civil aircraft industry provides a good example of this phenomenon. Major firms like Boeing, Airbus or even smaller players like Bombardier find that while they are supposed to build the plane, the process is rather different. Modern civil aircraft contain highly sophisticated sub-systems such as computerized flight controls and cockpits. Moreover, the modern plane is composed a numerous materials including aluminium and carbon fibre. Faced with developing an increasingly complex product, these firms are in essence brokers or chief negotiators who, in addition to adding their own technological assets, essentially co-ordinate a design and construction effort involving dozens of firms. Indeed, the programme management skills implied in this role are themselves a valuable competitive asset in modern defence contracting.

A similar development is seen in the computer and biotechnology industries where products are the result of cooperation among a network of firms even if the product is branded as one company's work. These specialist networks are developing across the Atlantic. In the biotechnology field, European firms have been anxious to tap into the American market. The US is considered to be ahead of Europe in most areas of biotechnology. European pharmaceutical firms are anxious to build a portfolio of biotechnology products to augment conventional drugs. The result was a spate of takeovers or alliances involving American and European firms. Not all such tie ups occur between large European MNEs and American start-up companies. Recently, a young and growing British biotechnology company purchased two, small US firms. The company, Oxford Molecular, purchased the two because of their expertise in the area of computer software designed to assist in drugs development (*Financial Times*, 9 May 1997: 21).

Technological developments also 'spillover' into other fields. Networks can arise when one company develops a technology that has applications in sectors different from its own. This type of complementary technology can lead to the innovating firm becoming the centre of a dense network of co-operative arrangements. Corning Glass is

an example. Its development of fibre optic glass led to telecommunications companies seeking the firm out as an alliance partner (Van Tulder and Junne, 1988: 218-219). The same may happen in telecommunications and biotechnology where methods of using biotechnology products to carry signals may be developed (ibid). In another instance, the pharmaceutical industry has become interested in the implications of ever more sophisticated semiconductor chips for its own drug development processes. New chips are able - because of their power and small size - to dramatically increase the number and intricacy of experiments that can be conducted. The promise of this spillover is reflected in the stake taken by the Swiss group Roche in a US firm pioneering the technology, Caliper Technologies (*Financial Times*, 25 March 1997: [www.ft.com](http://www.ft.com)).

### *American policies*

We have suggested that the development of international business is pressing both European and American governments to adopt a more nuanced set of policies for industrial, technological and trade matters. This policy mix must grapple with two conflicting tendencies: a cooperative one where firms increasingly rely on each other and a competitive strand where the nature of oligopolistic competition in high-technology sectors mandates a government policy designed to bolster home firms at the expense of foreign competitors. We may call this rather curious mix of tendencies, “comperation”. In this last section we trace the evolution of comperation in the European and American political economies.

The United States has in recent years rediscovered industrial and technology policies. Re-discovered is the vital word here, for during the American industrialization of the 1800s the US political economy looked very much like the German social-market or Japanese developmental state (Gourevitch, in Berger and Dore, 1996: 239-240). The

American government intervened extensively in industrial development by sanctioning market sharing practices, aiding industrial research via direct grants and through an expanding university sector, and otherwise funding infrastructure such as railways and roads (ibid). However, this interventionist trajectory was successfully and spectacularly altered in the early years of the twentieth century. In a number of industries, the government reversed its policy bias toward business in favour one oriented toward the consumer. The Standard Oil Trust was broken up in response to a public campaign. Banks were offered the choice of operating as either investment or retail banks, thus destroying the American version of the German universal bank.

However, this shift of trajectory did not impede US economic advance; indeed, it may have been vital to it. As Mowery and Rosenberg argue, anti-trust legislation made it difficult for firms to abuse market positions and stifle innovation. Firms also chose to merge with rivals rather than attempt to form cartels. Thus, American firms gained economies of scale and scope which formed the basis of their global dominance after 1945 (Mowery and Rosenberg, 1989: 106). It also reinforced characteristic of US firms even before the Sherman Act; American firms tended to rely more for R&D on their in-house laboratories and less on government funding than their European counterparts. That said, early American interest in using the state to establish the infrastructure for a technologically advanced economy remains a signal feature of that country's development. As US firms emerged from the Second World War dominant in their industries, it was easy to forget the early role of the state and ascribe American success to *laissez-faire*. Thus was born the myth that the US lacked an industrial policy. The benign environment that US firms found themselves in after 1945 made it easy for American firms to believe in the superiority of this arms-length relationship with the state. Non- Americans too, came to regard Ameica's success as a confirmation of the value of *laissez-faire*, non-interventionist government.



By the mid-1980s however, American faith in the arms-length relationship between state and firm was being shaken. The principal agent of this loss of faith was Japan which was succeeding in using a type of state-led capitalism to erode American dominance in sector after sector. In American eyes, the Japanese succeeded in assaulting sectors of traditional US dominance - cars being the prime example - as well as newer, knowledge-intensive sectors such as semiconductors. This success owed a lot to the Japanese adaptation of American innovations and the application of these to successful products. Thus US firms and policymakers become concerned at the inability of the US to apply technological advances to products in a timely and effective manner.

Americans were also concerned that their industries were not merely the victims of successful competitors, but were being targeted by foreign firms operating with the express support of their home governments. Japan's entry into segments of the computer chip market looked like a predatory effort to drive out all American firms. "[A] classic strategy of infant-industry protection 'worked' to create a competitive Japanese industry capable of challenging American supremacy." (Tyson, 1992: 86). The European aircraft maker Airbus Industrie was likewise seen as a direct attack on an industry where American firms enjoyed overwhelming dominance. This perception that international trade was better understood in terms of economic warfare than traditional views that trade was mutually beneficial was bolstered by new work in economics which had a significant impact on American public policy in the 1980s and 1990s.

High-technology industries are not sectors where traditional tenets of free trade apply. High barriers to entry exist in the form of massive R&D costs and steep learning curves which make learning-by-doing a necessary, but expensive requirement. Thus, the industries tend towards oligopoly and firms operating in these sectors can expect rents, or super-normal profits, to accrue to them. Moreover, these knowledge-intensive industries have significant spillover effects for the rest of the economy. Their demand for high-

technology components and materials has the effect of driving large sections of the economy up the technological ladder. In short these, industries positively demand government intervention to secure benefits for the national economy.

Such economic work is bitterly contested by economists. However, the intellectual case is not the issue, the fact remains that large sections of American policymaking and business circles used new trade theory to argue that US policy should, once again, utilise interventionist policies to bolster the competitive position of US firms. As Milner and Yoffie show, the trade preferences of US firms shift in the 1980s away from traditional concerns about market access and toward the creation of level-playing fields. The US state responded by weakening anti-trust policies toward firm cooperation in research and development and by developing a more visible salesmanship role for the Commerce department.

Elements of this renewed interest in industrial policy surfaced in the early 1980s when the American semiconductor industry succeeded in convincing the state that industrial collaboration should, in certain circumstances, be allowed in the face of competition rules. The case for collaboration was based on the belief that Japanese success rested on a judicious blending of competition among firms, as well as cooperation (Lieberman in Gibson and Smilor, 1992: 3). Cooperation eliminated the problem of firms wastefully duplicating research efforts. From the perspective of an individual firm, cooperation also reduced the risks associated with R&D intensive industries. Single, undercapitalized firms would not or could not bring new products to market, but cooperative ventures could.

The 1984 National Cooperative Research Act allowed firms to engage in industrial cooperative ventures in research and development without fear that such collaboration would result in anti-trust actions being brought. One of the most famous ventures developed under this legislative framework, Sematech, combined the resources

of several of the the most competitive American semiconductor firms. The aim of Sematech was to develop new generations of semiconductors that could compete with the Japanese products that US firms claimed were being dumped in the US market in a deliberate effort to drive US firms out of the sector (Tyson, 1992: 108). It was also designed to improve linkages between firms which made chips and those which supplied the equipment for their fabrication. The separation of innovation from process technologies was seen as a weakness in the American industry; advanced designs cannot be built if enabling process technologies do not exist (Tyson, 1992:153; Pisano and Wheelright: 1995).

The late 1980s and early 1990s saw the US continue to develop an industrial policy that sought to improve the competitive position of US firms. One thrust of these policies was to lesson the grip that military applications had on the national system of innovation. Critics pointed out that, while the US military had provided funding for a large number of knowledge-intensive products that underpinned US competitiveness, military R&D was no longer as useful to civilian applications as it once was. Military applications required that products have properties that were simply not relevant to the civilian economy. Stealth technology may be very useful for military aircraft, but has no relevance to civil aircraft design. Stowsky blamed the over-specific demands of military production for the decline of the US numerically-controlled machine tool industry (Stowsky in Sandholtz et al.) Demands were made that the share of US government R&D accounted for by the military decline from over 50% of the total. By 1994, however, evidence of a decline was not clear. According to one estimate, defence R&D accounted for 55.3% of government funding in 1994 (ONS, 1996: table 21).

The Clinton administration maintained, and perhaps even strengthened, the US state's commitment to an active industrial policy. This policy was manifest in the creation of a National Economic Council to oversee the competitiveness of the economy.

The Council was deliberately modelled on the existing National Security Council and was meant to convey the message that 'economic security' was as important as conventional military issues (Peterson, 1996: 81). The appointment of Laura Tyson as chairman of the Council of Economic Advisors was also seen as a manifestation of the new interventionist mood. Tyson herself had long advocated industrial policy measures as a means of countering the unfair trade practices of Japan, the European Union and some LDCs.

There is considerable evidence to support Gourevitch's suggestion that the US has rediscovered the Hamiltonian tradition of political economy (in Berger and Dore, 1997: 256). However, as we have argued above, the nature of high-technology sectors cautions against the adoption of nationally-based industrial policies. In the American case, the sheer size and technological depth of the economy allow the country to develop discriminatory policies to a greater extent than others. However, even in the US case, the highly internationalized nature of business places de facto restraints on the prosecution of such policies. As Ham and Mowery argue, "[for] many US firms, access to *foreign* science and technology is increasingly important to their competitive future." (Ham and Mowery, 1995: 92, emphasis added. While Sematech was an all-American grouping, numerous members of the organization concluded cooperation agreements with European and Japanese firms (ibid). UNCTAD reports that strategic alliance formation is becoming a crucial corporate strategy, in some respects supplanting FDI. "[C]ooperative agreements between United States firms and foreign firms outweigh the number of fully owned foreign affiliates by a factor of four." (UNCTAD, 1994: 140). In the 1980s, the number of US - European alliances increased by 140% in automobiles; 114% in biotechnology; 62% in information technology and 63% in new materials. Only in chemicals did the number of alliances decline (UNCTAD, 1994: Table III.12). Notice

that this increase in alliances happens at exactly the same time as the US is developing its new industrial policy initiative.

Consider the recent flaring of the long-simmering Airbus - Boeing dispute. For the better part of twenty years, a trans-Atlantic trade war has threatened to erupt over the issue of subsidies paid by European states to Airbus Industrie. In 1992, an agreement was reached that specified the nature and level of permitted subsidy. Shortly after taking office, President Clinton indicated American unhappiness with the agreement and briefly threatened to provoke a trade conflict. More recently the EU has requested that the agreement be reopened for negotiation. This desire stems from the belief that the accord does not adequately discipline the provision of indirect subsidy for airline production via defence contracts and other R&D activities (*Financial Times*, 3 May 1997: [www.ft.com](http://www.ft.com)).

Yet this renewed talk of a trade war is occurring at the same time as European and American aerospace firms seek further collaborations. Lockheed Martin, America's largest defence aerospace firm, actively sought talks with Airbus Industrie in the wake of Boeing's merger with McDonnell-Douglas. That merger threatened the company's position in military aerospace as it would allow Boeing to cross-subsidize its military production with revenues from civil aircraft sales. Thus, Lockheed Martin's competition position vis-a-vis Boeing in the defence field may be enhanced if Airbus Industrie remains a viable civilian producer. For its part, Airbus' plans for a large, 500 seat aircraft may benefit from Lockheed Martin's vast experience in large military transports (*Aviation Week and Space Technology*, 5 May 1997: 20-21). This last point once again underlines the potential benefits of eschewing technological autarky in favour of aligning with foreign firms possessing specific technologies.

The US has moved away from the free market orientation that characterized its public policy during the early post-war period. The US government has reacted to perceptions that its partners were trading unfairly, especially in sectors characterised by

Schumpeterian competition. The reaction was to try and develop a more interventionist and discriminatory industrial policy than previously. However, the nature of technology also restrains this nationally-orientated policy. US firms continue to explore and develop links with European firms. Such links are vital to the continued competitiveness of American companies.

### *European Initiatives*

The recent history of European technology and industrial policy has witnessed a shift in the nature of that policy away from state ownership and national champion strategies and toward a type of sponsorship model that emphasizes government support for R&D and infrastructure such as education and transport. This policy shift was brought about two events: the obvious failure of national champion strategies and the successful penetration of the European market, especially in electronics, by Japanese firms. The current policy mix is consistent with our theme; it displays a mix of liberal deregulation with Schumpeterian support for innovation by firms.

European industrial and technology policies have long been framed by the perception that Europe was falling behind the US and the Japanese in technology. One early attempted solution was to create national champions. These firms, usually created by the government-sponsored merger of smaller firms, would enjoy a dominant position in a given national market and thus reap economies of scale benefits. However, the protection afforded these firms gave the wrong series of incentives; the policy produced inefficient, non-innovative firms which were unable to cope with the dynamism of Japanese or American competitors. By the early 1980s, American computer producers held 80 per cent of the European market (Peterson in Kassim and Menon (eds.), 1996: 228). Policy failure highlighted the need to expose European firms to greater competition; this could be achieved in the first instance by creating a proper European

market. The Single Market Programme was the liberal response to the poor competitiveness of European firms.

However, the Japanese challenge in both automobiles and electronics sent a different set of signals; industrial policy for knowledge-intensive sectors could be a successful policy and should not be discarded. What was needed was a commitment to the support of so-called sunrise industries in preference to traditional sectors such as steel and a greater emphasis on developing infrastructure for these knowledge-intensive sectors (Sharp and Pavitt, 1993: 135). Thus, at both the national and EU level, new policies designed to bolster the competitiveness of European firms were developed. Among the most active supporters of a new industrial policy for the European Union were major European multinationals - especially those in the fields of computers, office equipment and electronics. These firms organized the European Roundtable in a high profile effort to press the Commission for a more integrated and effective industrial and technology policy.

The Community's response was to create the Framework Programmes which sought to encourage collaboration among European Union firms. As in the US, the aim of programmes was to lower the risk of innovation for a given firm and to aid in the diffusion of new technologies and knowledge. The EU, "has an excellent scientific base but it is less successful than others in converting its competence into new products and market shares; this is especially true in high-technology sectors." (European Commission, 1995: 5). European efforts differed in one respect from American policies in that they have a redistributive function attached to them. Small EU states use the collaborative programmes as a means of gaining access to technology that they could not hope to develop themselves. This technological welfare function does not sit well with large, technologically advanced European MNEs who would rather see EU funds devoted to

firms with an established presence in European and global markets (Peterson, in Kassim and Menon, 1996: 232).

There remain tensions between the stated policy of fostering European competitiveness and globalization. The 'Europeanization' of industrial policy has not led to the abandonment of internationalizing strategies by MNEs; indeed, they are central to the success. Archibugi and Michie point out that in three technological areas, European firms show a higher propensity to cooperate with American partners than European (Archibugi and Michie, 1997: 183). In the fields of biotechnology, new materials and information technology, "intra-European joint-ventures amount to 19 per cent [of collaborative arrangements concluded world-wide] while European-US ones amount to 21 per cent." (ibid). Technology has again played a role here. European firms find that they must access the US technological base via collaborative agreements with US firms.

In the early stages of the construction of EU-level policies these Roundtable firms accepted that a degree of discrimination against foreign firms would be necessary (van Apeldoorn, 1997: 22). However, he argues that this European orientation among the Roundtable has been superseded by a globalist perspective which sees neoliberal deregulation as the solution to Europe's competitiveness problem (ibid: 23). But why would firms prefer this solution? They prefer it because in knowledge-intensive industries the cost of developing your own technology may be prohibitive compared to acquiring it through international strategic alliances. Liberalism ensures that firms continue to have access to foreign technology. Thus, there is no contradiction between the pursuit of a European industrial policy and neoliberalism; indeed, foreign technology, accessed through alliances, can enhance European competitiveness. The same need for access also places limits on the ability of the Commission or member states to close off foreigners from research and development programmes. In the UK, foreign-owned aerospace firms such as Short Brothers are not barred from participation in UK



programmes (McGuire, 1997). Similarly, the Framework Programmes are able to accommodate foreign research partners, subject to some limitations. Edith Cresson has recently emphasised the need for European research efforts to be open to greater involvement of non-member states - although preference may be given to the CEECs (European Commission, 1996).

### *Conclusions*

This paper has argued that changes in the international business environment have presented the US and the EU with the same problem: how to ensure the competitiveness of national firms in high-technology sectors. Firms in these sectors offer states the promise of high-paying jobs, a vibrant research base and, if new trade theory is to be believed, the accumulation of economic rents. These attractions offer states powerful incentive to develop discriminatory industrial policies designed to favour home firms. Both the US and the EU have developed such programmes.

However, these same industries also place a premium on non-discriminatory policy regimes. The enormous costs of research and development push firms to cooperate as a means of spreading the cost - and the risk - of R&D. Increasing complexity also means that firms are incapable of developing all the requisite technologies for certain products. Thus, products are developed by networks of firms with each company bringing some technology or other asset to the group. In this circumstance, firms are attractive because they possess specialist knowledge. In this situation, the worst outcome for a firm is to be cut off from technology, even foreign technology. As Ham and Mowery point out, technological interdependence is now well established and unwinding it both improbable and damaging (Ham and Mowery, 1995: 92). Thus, an open international business environment is the preferred option.

This paper argued that the resulting policy mix that was emerging on both sides of the Atlantic was 'comperation' a mix of competitive and cooperative policies that co-exist, occasionally uneasily, with one another. This mix is volatile but, if the technological arguments presesnted here are sustained, is fundamentally cooperative. This policy mix does not imply the vanishing of the national corporation; indeed, R&D policies are still centred around the notion that home firms can be assisted by government industrial and technology policy. However, the international business environment is pressing European and American policymakers to develop broadly similar policy mixes. Thus, trade disputes may be less about a clash of different capitalisms, than about two actors struggling to cope the the internal conflicts generated by a largely similar policy environment.

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