

Keller, Dietmar

Article — Digitized Version

Should Europe provide selective assistance for key industries?

Intereconomics

Suggested Citation: Keller, Dietmar (1992) : Should Europe provide selective assistance for key industries?, Intereconomics, ISSN 0020-5346, Verlag Weltarchiv, Hamburg, Vol. 27, Iss. 3, pp. 111-117,
<https://doi.org/10.1007/BF02926320>

This Version is available at:

<https://hdl.handle.net/10419/140347>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

production structures. There is a need to make production "leaner" in order to be able to compete successfully on international markets. The success of Japanese companies is largely attributed to the circumstance that they need less production time, are more successful in eliminating assembly errors, make more use of just-in-time suppliers, are better able to motivate employees in working groups and have lower levels of absenteeism than competitors in the United States and Europe.

The conclusion to be drawn is that industrial policy in Germany will continue to require a clear dividing line between corporate and government responsibility. Adjustment to changing market data will need to take

place on the basis of decentralized decisions in the competitive situation. This is and will continue to be a corporate task. Companies themselves will need to come up with adequate responses to the new challenges being faced in connection with growing international competition, technological change and the implementation of new technologies. The public sector can only provide marginal assistance. It is called upon to create the necessary general conditions so that German industry will be able to assert itself in the face of international competition. There are enough areas where government involvement is possible and necessary without the need to involve itself in a venture as risky as a "strategic" industry policy.

Dietmar Keller*

Should Europe Provide Selective Assistance for Key Industries?

The small market shares of European firms in some areas of high technology combined with large trade deficits are causing growing concern within the European Community. It is feared that Europe will become increasingly dependent on Japanese and American exports of technology if European companies are not able to master important processes that are regarded as key technologies. The loss of key, high-growth sectors would also mean the loss of earning potential. In view of Japan's tremendous success in high technology, there are growing calls for the EC to adopt an industrial policy along Japanese lines to assist the industries of the future.

Before the Maastricht summit the French and Belgian governments had proposed instituting industrial policy as a Community instrument in the Treaty on European Union and introducing qualified majority voting in the Council of Ministers for industrial policy measures targeted on the sectors of the future. The French initiative ran into vigorous opposition from the British and German governments in Maastricht.

The actual shape a European industrial policy would take remains to be determined, however, even after the

European summit. On closer examination, the decisions taken in this regard represent a compromise between the advocates and opponents of an EC industrial policy. The advocates can consider it a success that a separate chapter on industry (Title XIII) was written into the Treaty on European Union; Article 130 gives the Community and member states the task of ensuring "that the conditions necessary for the competitiveness of the Community's industry exist".¹ On the other hand, their opponents managed to limit the Commission's powers over industrial policy. For example, "specific measures in support of action taken in the Member States" that affects the competitiveness of European industry are to be decided by the Council, "acting unanimously on a proposal from the Commission, after consulting the European Parliament and the Economic and Social Committee".² Title XIII nevertheless expressly excludes measures that could lead to a distortion of competition.³

The claim that Western Europe is becoming increasingly dependent on foreign technology has been

* Hamburg Institute for Economic Research (HWWA), Hamburg, Germany.

¹ Cf. Council of the European Communities and Commission of the European Communities: Treaty on European Union.

² Ibid.

³ Ibid.

made particularly forcefully of late by Konrad Seitz, who regards Japanese and American competition as a serious threat to the European high-tech industry.⁴ There is nothing new about this type of debate; alarm at the "American challenge" was sounded as long ago as the sixties in view of Western Europe's supposed technological lag behind the USA,⁵ while in the eighties it was the turn of the USA to hear dire warnings about the challenge from Japan.⁶

In the latest manifestation of this debate, it is claimed that Western Europe lags behind in the "new key technologies": information technology, biotechnology, materials, energy and space technologies. One frequently cited example of technological dependence relates to European imports of computer memory chips from Japan. According to Seitz, technological dependence can also lead to a loss of competitiveness in European industries where these technologies are applied, such as the automobile industry, machine-tool making and chemicals.⁷

Direct investment by Japanese and American multinational corporations in Europe is said to pose a further threat. It is argued that these so-called "transplants" only create jobs with low skill requirements and low pay, generate few technological spin-offs and contribute to the dequalification of the host country's reservoir of skilled labour. Europe therefore faces the danger of "technological colonisation", which must be countered by assisting key industries.⁸

The arguments in favour of an industrial policy imply that it is beneficial to an economy or region if firms in possession of particular technologies are located within the region, so that it is more or less self-sufficient in products manufactured using such technologies. Here it should be stated right away that mutual dependence in combination with specialisation are hallmarks of the international division of labour.

External Effects

State intervention to aid key industries can nevertheless be justified on the grounds of externalities. Benefits of this kind, which accrue not to the originator but to other market participants, are thought to stem

⁴ Cf. K. Seitz: Die japanisch-amerikanische Herausforderung – Deutschlands Hochtechnologie-Industrien kämpfen ums Überleben, Munich 1990.

⁵ Cf. J.-J. Servan-Schreiber: Le défi américain, Paris 1967 (The American Challenge, London 1968).

⁶ Cf. K. Stegemann: Wirtschaftspolitische Rivalität zwischen Industriestaaten: Neue Erkenntnisse durch Modelle strategischer Handelspolitik?, in: M. E. Streit (ed.): Wirtschaftspolitik zwischen ökonomischer und politischer Rationalität, Wiesbaden 1988, p. 6.

particularly from companies' research and development activities. Externalities arise partly because information and knowledge have the properties of a public good (non-rivalness and not complete excludability in consumption) and partly because complementarity plays an important role in research and development.

Two kinds of externality can be distinguished. First, product or process innovations in a particular industry can lead to welfare gains in markets downstream. If the cost of intermediate inputs falls in user industries or the quality rises while the price remains constant, the producer's or the consumer's surplus rises, depending on their relative market power.⁹

The second type of externality stems from complementarity in research; in other words, new knowhow in one sector can have a positive effect on the conception of new ideas in other sectors. Research complementarity can be both horizontal and vertical. Some authors stress the importance of vertical complementarity between suppliers and consumers of intermediate inputs; the close communication between them means there is a constant exchange of information and ideas in research and development between supplying and consuming firms.¹⁰ For example, it is assumed that there is a high degree of complementarity between microelectronics and downstream user industries (the office machine, computer and telecommunications industry, entertainment electronics, machine-tool manufacture and the automobile industry).¹¹

Given such externalities, state subsidies for private R&D expenditure can be justified, for otherwise the utilisation of resources for research and development would be sub-optimal.¹² A priori, however, this justifies only a uniform rate of subsidy for all industries; preferential treatment for particular industries would make sense only if their R&D expenditure had above-average external effects.¹³ To date, however, it has not been possible to identify empirically branches of activity that clearly meet

⁷ Cf. K. Seitz, op. cit., pp. 51 f.

⁸ Cf. K. Seitz, op. cit., pp. 337 ff.

⁹ The spreading of R&D costs in Germany via input and investment linkages has recently been examined on a sectoral basis. Cf. M. Krakowski et al.: Die deutsche Wirtschaft im Anpassungsschock, Strukturbericht 1991, Hamburg 1992, pp. 133 ff.

¹⁰ Cf. M. E. Porter: Nationale Wettbewerbskraft – woher kommt die?, in: Harvard manager, Vol. 12 (1990), No. 4, pp. 103-118.

¹¹ Cf. A. Nefiodov: Europas Chancen im Computer-Zeitalter, Munich 1984, pp. 96 ff.

¹² Cf. K. J. Arrow: Economic welfare and the allocation of resources for innovation, in: R. Nelson (ed.): The rate and direction of inventive activity: Economic and social factors, Princeton 1962.

¹³ Cf. G. Bletschacher and H. Klodt: Braucht Europa eine neue Industriepolitik?, Kieler Diskussionsbeiträge, No. 177, 1991, p. 15.

this criterion. American and Canadian studies certainly show that R&D externalities are significant and that the difference between the social and private benefits of research spending appears to vary considerably between industries,¹⁴ but it is impossible to generalise on the basis of these rather specific studies, and their findings can therefore not be used to deduce guidelines for industrial policy. For example, in view of the hitherto inadequate quantification of external effects, Grossman concludes that there is no evidence to indicate whether the current level of state R&D subsidies is appropriate, too low or too high.¹⁵

The fact that externalities existed would not in itself be sufficient reason for state assistance for research even if they could be precisely quantified. The precondition for a welfare-raising research policy is that external effects occur primarily in the region whose taxpayers must finance the subsidies. In the case of the EC, this means that external effects should occur only within the Community. If externalities occurred outside the EC, aid for research would simply be subsidising foreigners, thus leading to welfare losses. In addition, externalities within the EC must occur across national borders. If they had an impact only in those countries in which they were produced, national aid for research would be more appropriate than an EC-wide policy.

A second frequent argument in favour of an interventionist industrial policy relates to the diversion of monopoly profits to the country from abroad. According to strategic trade policy models, in certain circumstances state intervention in oligopolistic markets can increase a country's national welfare at the expense of other countries.¹⁶

High-tech markets are mostly oligopolistic, as indivisibilities in production as well as in R&D increase the optimum plant size, so that high-tech markets often have room for only a small number of producers. A reduction in unit costs can also come about as a result of "learning by doing" if rising cumulative output is accompanied by more efficient production, organisation or marketing. In these circumstances a long-established firm with a high market share achieves lower unit costs than its competitors.

The state could create competitive advantages for domestic firms by providing targeted assistance (export and R&D subsidies, protection against foreign

competition). Let us assume that the high optimum plant size in a foreign market means that there is room for only one supplier, which earns high monopoly profits; in view of static and dynamic economies of scale, the monopolist enjoys unit cost advantages over potential competitors, who are therefore discouraged from entering the market. On the other hand, if a rival firm is subsidised by the state to such an extent that its unit cost disadvantages are more than compensated, it could drive the monopolist out of the market and itself reap the monopoly profit.

Most commentators take a sceptical view of the scope for a strategic trade policy, however;¹⁷ welfare gains can be achieved only in very special conditions that rarely occur in the real world. The practical implementation of such a policy would also call for information which is generally not available. In addition, the results of model simulations tend to change considerably when alternative assumptions are made about the behaviour of oligopolists. Retaliatory measures abroad, the evaluation of welfare losses as a result of opportunity costs and "rent seeking" are further problems.

The foregoing considerations show that market failure is not a conclusive justification for selective assistance in favour of key industries, although a different conclusion might be reached in the light of new findings. As there are no objective criteria at present for selecting key industries or projects, the state could only justify an industrial policy by proving that it knew better than the market. Moreover, the economic benefits of a policy of selective assistance seem doubtful.

Technological Dependence

Does the danger of technological dependence cast the arguments for or against an industrial policy in a different light? In Europe, industry's heavy reliance on imports of semi-conductor products has been under discussion for some time. For example, in a report for the Federal German Government, representatives of German industry expressed the fear that German firms' access to the newest and most modern semi-conductor products and

¹⁴ Cf. P. Mohnen: New technologies and interindustry spill-overs, in: STI Review, 7/1990, pp. 131-147.

¹⁵ Cf. G. M. Grossman: Promoting new industrial activities: a survey of recent arguments and evidence, in: OECD Economic Studies, No. 14, Spring 1990, p. 108.

¹⁶ See for example J. A. Brander and B. J. Spencer: Export subsidies and international market share rivalry, in: Journal of International Economics, 1985, No. 18, pp. 83-100; P. R. Krugman: Import protection as export promotion: international competition in the presence of oligopoly and economies of scale, in: H. Kierzkowski (ed.): Monopolistic competition and international trade, Oxford 1984.

¹⁷ The problems to which such a strategy gives rise have been examined in detail by several authors. Cf. K. Stegemann, op. cit.; H. Siebert: Strategische Handelspolitik. Theoretische Ansätze und wirtschaftspolitische Empfehlungen, in: Außenwirtschaft, Vol. 43 (1988), pp. 549-585; W. Kösters: Freihandel versus Industriepolitik, in: Wirtschaftsdienst, Vol. 72 (1992), No. 1, pp. 49-56.

technology might be restricted by the USA on grounds of national security and by Japan for reasons of corporate strategy.¹⁸

It is assumed that Japanese chip manufacturers could abuse their dominant position in the world market by delaying supplies to European firms, charging excessive prices for their products or, in extreme cases, suspending deliveries entirely.¹⁹ This would also endanger the competitiveness of downstream user industries that are heavily reliant on these products; hence, whoever possesses the key technology, ultimately also controls industries further along the chain.²⁰ It is argued that the pronounced vertical integration between Japanese chip manufacturers and firms using their products makes such a strategy even more likely. An additional indication of Europe's technological dependence is seen in the fact that Japanese firms also have a monopoly in the machinery and fine chemicals needed to produce memory chips.²¹

A further danger is seen in the use of application-specific chips (ASICs), which often carry the entire system knowhow. The users of ASICs risk revealing their system knowhow, with the result that chip manufacturers would be

able to produce the machines themselves. This would pose little difficulty, as the system knowhow often constitutes the bulk of the entire value added, whereas the manufacture of the remaining components requires no special knowledge. In addition, the chip manufacturers could drive other users from the market by producing ASICs only for their own use or not releasing the most modern components to their competitors.

The dependency theory is the basis for concluding that Europe must build up its own semi-conductor industry. To that end, the European microelectronics project Jessi (Joint European Submicron Silicon) was launched in 1989, originally with the aim of laying the foundation for the independent production of 16 and 64 Mb memory chips in Europe by the mid-nineties.

The dependency argument is not convincing, at least not in the case of the memory chip industry. The assumption that Japanese suppliers would impose a complete embargo on exports of chips for strategic reasons is "simply absurd".²² If this were to happen, the countries affected could take countermeasures, and if the

¹⁸ Cf. *Mikroelektronik 2000*, paragraph 0.3.

¹⁹ Cf. *Frankfurter Rundschau*, 13. 3. 1990, Lejeune: Jessi kann japanischen Durchmarsch nicht stoppen.

²⁰ Cf. J. Starbatty and U. Vetterlein: Must the Semi-conductor Industry be Subsidised?, in: *INTERECONOMICS*, Vol. 23 (1988), No. 3, p. 109.

²¹ Cf. K. Seitz, *op. cit.*, p. 49.

²² Cf. J. Starbatty and U. Vetterlein, *op. cit.*, p. 115.

PUBLICATIONS OF THE HWWA-INSTITUT FÜR WIRTSCHAFTSFORSCHUNG-HAMBURG

New Publication

E. Ulrich Cichy

**WIRTSCHAFTSREFORM UND
AUSWEICHWIRTSCHAFT IM SOZIALISMUS**

**Zur Rolle der Ausweichwirtschaft im Reformprozeß
sozialistischer Planwirtschaften, dargestellt am Beispiel
der DDR, Polens und Ungarns**

The shadow or alternative economy in socialist countries is a result of the centralised planning of the economy. This study was begun under the sign of a rigid centralism in the majority of the socialist planned economies. With his analysis of the complex links between economic reform and the alternative economy the author demonstrates the inevitability of far-reaching reforms in the direction of a market economy and presents us with valuable material for the understanding of the reform processes presently taking place in Eastern Europe.
(Only available in German.)

Large octavo,
256 pages, 1990,
price paperbound,
DM 65,-
ISBN 3-87895-391-7

VERLAG WELTARCHIV GMBH – HAMBURG

worst came to the worst they could even completely close the European market to Japanese competition, which would have a profound effect on Japanese firms.

Even a delay in the supply of the latest generations of chips is unlikely. Bearing in mind that memory chip production entails very high R&D spending, high static and dynamic economies of scale and extremely short product cycles, only those companies that market their latest products worldwide as quickly as possible will earn high profits. In these circumstances, a temporary withholding of the latest products would have serious consequences for a firm, particularly as prices usually fall dramatically once products have been put on the market.

Formation of Cartels Doubtful

The third possibility is that Japanese producers might restrict the volume by reaching cartel agreements in order to drive up prices. There are limits to such a strategy, however. First, Japanese manufacturers are competing fiercely with one another,²³ and secondly other suppliers in the Far East are piling into the world market in memory chips.²⁴ The fact that manufacturers have behaved like a cartel in the Western European memory chip market is due to protectionism in Western Europe, where the market is protected by customs barriers and voluntary restraint agreements with Japanese firms. The VRAs, in particular, are thought to have had a serious destabilising effect on the European market.²⁵

The argument that the use of application-specific chips causes system knowhow to be divulged is only partly correct. The applications firms have the option of programming the system knowhow into the chips themselves and also testing the chips themselves. On the other hand, if programming is done by the chip manufacturer (turnkey design), disclosure of the knowhow cannot be completely ruled out. Nevertheless, it must be borne in mind that these firms have a reputation to maintain, for they do want to sell their products.

It does happen that a company decides for strategic reasons not to make a chip available to the general market. For example, Motorola produces ASICs for incorporation in radios, but keeps them solely for its own use in order not to jeopardise its lead in this product field. Vertical integration appears to offer competitive advantages in this case, but given the wide range of uses for microchips, there

will never be comprehensive vertical integration between chip producers and user firms. For that reason, application-specific chips are likely to continue to be available on the world market in sufficient quantity. The need to recoup the heavy expenditure on research and development also prevents chip manufacturers from becoming captive producers who meet only their own requirements.

The claim that Japanese direct investment in the EC is a manifestation of the technological "colonisation" of Western Europe is also unconvincing. The Japanese and American semi-conductor plants in Southern Scotland are cited as examples of direct investment in Europe with few spin-offs and requiring a low level of labour skills.²⁶

Multinational corporations do not think in national terms; they site their plant on the basis of the comparative advantages and demand potential of the countries concerned. Hence, if the conditions are suitable, research and development may well be carried out abroad and highly-paid jobs created there. One example of this is direct investment by European multinationals in biochemicals in the USA. The migration of R&D activities associated with this investment occurred because the legal requirements for biotechnology research are less restrictive in the USA than in Europe.

In view of the international mobility of capital and knowhow, it is therefore primarily the national environment that is to blame if little research is carried out by the subsidiaries of foreign multinational corporations. An improvement in locational conditions is more likely to encourage the creation of highly-paid jobs than a selective industrial policy. Market protection, by contrast, may distort direct investment by multinational companies. For example, if trade barriers are the reason for direct investment, it is probable that the jobs created in these "transplants" will require a lower level of skill and that the factories will be located in regions with low labour costs.

The "Jessi" Project

The example of the semi-conductor industry shows that the dependency argument cannot really be used to justify assisting key industries. Is a rather cumbersome state industrial policy a suitable way of handling such a dynamic area of high technology? It is more likely that it would always be lagging one step behind the helter-skelter developments in the market.

The point is exemplified by events surrounding the Jessi project under the Eureka programme. The project was

²³ Cf. H.-H. Härtel et al.: *Neue Industriepolitik oder Stärkung der Marktkräfte?*, Hamburg 1987, p. 69.

²⁴ Cf. J. Meyer-Stamer: *Die Widersprüche der europäischen Technologiepolitik*, in: *Reihe Eurokolleg, Vierteljahresberichte*, 1991, p. 62.

²⁵ Cf. G. Bletschacher and H. Klodt, *op. cit.*, p. 25.

²⁶ Cf. K. Seitz, *op. cit.*

launched in 1989 at the urging of the three large European semi-conductor manufacturers Philips, Siemens and SGS Thomson. In order to ensure commercial success, an extremely tight timetable was drawn up; pilot production of the static 16 Mb chip was to begin by 1993 and that of the dynamic 64 Mb chip by 1996.²⁷ The project costs were estimated at DM 8 billion, half of which would be met by national governments and the EC and the other half by industry. Philips' withdrawal from static memory chip technology and Siemens' decision to develop the dynamic 64 Mb chip in co-operation with IBM have already invalidated most of the original objectives of Jessi. It would seem that Siemens and Philips did not consider the development of memory chips within the Jessi framework to be worthwhile, despite state subsidies.

It is also doubtful whether memory chips are strategically important in any case, as they are standardised mass-produced components. Memory chips account for only a relatively small part of semi-conductor production. The total world market for semi-conductors in 1991 is put at around \$ 55 billion, of which just over \$ 12 billion represents memory chips (MOS). The market in application-specific chips was even smaller, at \$ 7.7 billion,²⁸ and yet it is this kind of chip, rather than memory chips, that bears the hallmarks of key products.

The Jessi project is now focusing its sights more on these products. According to the German Research Minister Riesenhuber, the European microelectronics industry can survive only if there is also mass demand for application-specific chips in Europe. So-called "flagship projects" should take care of this, in fields such as high resolution television, digital radio reception and mobile telephones.²⁹ Chip producers and users and the suppliers of apparatus for chip production should co-operate across national borders in these projects. Since Jessi aims to establish independent European chip production, participation by non-European firms is accepted only reluctantly, if at all. The circle of potential participants is therefore biased towards European firms, despite the fact that non-European companies often have more to offer than their European counterparts as regards their complementary technological capabilities. This is demonstrated, for example, by the co-operation between Siemens and IBM on the 64 Mb chip.

²⁷ Cf. P. Fisch: Das europäische Mikroelektronik-Projekt Jessi, in: WiSt, 8/1990, pp. 400 f.

²⁸ Information from German industry.

²⁹ Cf. Süddeutsche Zeitung of 21. 1. 1992: Jessi konzentriert sich auf Flaggschiffe.

³⁰ Cf. W. Gerstenberger: Auswirkungen der Informations- und Kommunikationstechnik auf die zukünftige Beschäftigung in der Europäischen Gemeinschaft, in: Ifo-Schnelldienst, No. 30, 1991, p. 13.

The Example of Japan

In the debate about a European industrial policy, Japan is repeatedly held up as an example of a country with a successful industrial strategy. Japan has come from behind to achieve a high technological level and has actually become the leader in wide areas of information and communications technology. Between 1985 and 1988 44% of all patents in this sector were taken out by Japanese firms.³⁰ Moreover, half of all semi-conductors now come from Japan.

Japan's successes are all the more remarkable for the fact that until the beginning of the seventies the USA still held the upper hand in all sections of the information and communications industry. Japan's rapid catching-up and strong competitive position in high technology have caused surprise worldwide and are attributed by some observers to the industrial policy of the Ministry of International Trade and Industry (MITI).

The record of Japan's industrial policy is not all positive, however. As well as sectors that have been successfully assisted (steel, automobiles, shipbuilding) there are industries where state aid has manifestly failed to produce results so far (petrochemicals, aircraft and aerospace); moreover, there are successful sectors that received no assistance or were aided only late in the day, such as entertainment electronics, cameras, watches and precision instruments. Nevertheless, it cannot be denied that heavy industry, the automobile industry and the machine tool industry benefited greatly from "industrial targeting" in the fifties and sixties.³¹

The importance of Japan's industrial policy for the high-tech area is often overestimated, however. The range of policy measures in favour of high technology was significantly narrower than for the steel industry, for example; in its promotion of information technology, MITI avoided directing investment into specific areas, setting production targets, imposing strict controls on technology imports, initiating amalgamations, cartels, and so forth.

In some cases MITI misread the development potential of new technologies. In the early fifties, for example, it did not want to allow the young and unknown company Sony to purchase transistor technology from Western Electric, as it considered that scarce foreign exchange should not be spent on such uncertain and risky technology. MITI only consented when Sony presented it with a *fait accompli*. At

³¹ The most important measures were the preferential provision of low-cost capital (window guiding), protection of the domestic market from foreign competition, obstacles to direct investment, the initiation of mergers and cartels to prevent excessive competition and the provision of foreign exchange for technology imports.

the beginning of the seventies MITI was still opposed to the development of an independent entertainment electronics industry in Japan. This alters the picture of MITI as an omniscient, visionary body identifying and promoting industries of the future on the basis of objective criteria.³²

MITI's Promotion of Research

The national research projects under the direction of MITI form the core of Japanese industrial policy for the high-tech sector. In these projects – the aim of which is usually to develop basic technologies, with the emphasis on technology – Japanese firms co-operate at the pre-competition stage. Research of this kind is regarded as so risky and expensive that a common approach and state support are considered necessary. The best known projects are the VLSI project (very large-scale integration) to develop the 64K RAM memory chip (1976-79) and the project to develop the fifth generation of computers (1979-91).

Although in general these research projects appear to have been more successful in Japan than elsewhere, their contribution to technological development is disputed. On the one hand, it is thought that they helped drastically to reduce the United States' technological lead over Japan (in the case of the VLSI project, it is thought to have decreased from ten years to several months).³³ On the other hand, no single project, not even the VLSI project, appears to have made a technological breakthrough or to have developed state-of-the-art technology. Some projects, such as the "3.75 computer development project" or the "software development project" are not thought to have achieved even modest objectives.³⁴

In the eighties the MITI projects appear to have virtually lost touch with market developments.³⁵ An indication of this is the disinclination of leading companies to take part in the national projects, as they see little advantage for themselves and fear a loss of knowhow.³⁶ It is also significant that MITI has switched to financing most of the projects fully itself, as companies frequently refused to share the cost in view of the high risks involved. In the seventies, by contrast, it was normal for MITI to subsidise loans that had to be repaid if the project was a success.³⁷

State aid represents only a fraction of the sums firms themselves spend on research and development in their own research laboratories. In most Western European

countries R&D is subsidised much more heavily than in Japan, and in Japan there is almost no state military research.³⁸ It can therefore be assumed that technological progress in Japan would have followed a similar course even without the MITI projects, although it might have been a little slower. The experiences of the eighties seem to suggest that national research projects are, at best, a suitable strategy for adapting to technology that already exists and spreading its application. The avoidance of duplication may also be important.

If the high technology policies pursued in Western Europe and Japan in recent years are compared, it can be seen that in some respects the state exerted less influence in Japan than in most European countries. For example, Japan has no protection against imported technology, no "national champion" strategies to benefit just one or two companies and no state participation in industrial companies. To that extent, Japanese policy is certainly a model Western Europe could emulate.

Conclusion

There is no conclusive justification for a selective industrial policy for technological industries, either on the basis of theoretical considerations or from practical experience. In order to improve the competitiveness of European industry, not least in high technology, attention must therefore be focused on alternative economic policy measures. The creation of a European internal market is a step in the right direction. The telecommunications industry and its users can draw particular benefit from this, provided market fragmentation in this field can be overcome. By harmonising standards, abolishing national procurement policies and curtailing the monopolies of national telecommunications providers, substantial productivity and growth potential can be released.

The primary objective of a European technology policy must be to improve locational conditions for technological firms in Europe. In order to do that, the distortions to competition caused by subsidising contracting sectors such as agriculture must be eliminated. The resources saved in this way could be better used for reducing taxes and/or creating a modern infrastructure.

³² MITI's selection criteria included: high expected growth in demand, production processes requiring high skilled labour intensity, favourable impact on infrastructure and high value added. MITI gave preference to producer goods over consumer goods and to capital-intensive industries with large mass production advantages. Cf. D. B. Audretsch: *Eine Evaluation der japanischen FuE- und Industriepolitik*, Berlin 1988, pp. 4 f.

³³ Cf. W. G. Ouchi: *Political and economic teamwork: the development of the microelectronics industry of Japan*, in: *California Management Review*, Vol. 26 (1984), No. 4, p. 27.

³⁴ Cf. D. I. Okimoto: *Between MITI and the market. Japanese industrial policy for high technology*, 1989, p. 70.

³⁵ Cf. G. Bletschacher and H. Klodt, *op. cit.*, p. 25.

³⁶ Cf. D. I. Okimoto, *op. cit.*, p. 70.

³⁷ Cf. D. I. Okimoto, *op. cit.*, p. 80.

³⁸ Cf. H.-H. Härtel et al., *op. cit.*, p. 73.