The European Semiconductor Industry:
2005 Competitiveness Report

Executive Summary

EECA ESIA

European Semiconductor Industry Association

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Why this report deserves special attention

The semiconductor industry is a key driver for the future of advanced technologies in Europe, and understanding it is therefore key to anticipating that future. The question at the heart of this report is, how can the semiconductor industry in Europe maintain and enhance its competitiveness? Because of its direct exposure to worldwide competition, understanding the opportunities and threats to this industry will enable stakeholders to address some of today's and tomorrow's challenges better, challenges reaching well beyond the industry itself and affecting the prosperity of Europe's economy at large and its citizens.

In Europe more than everywhere else, the semiconductor industry sector stands at a crossroads on the global playing field. The decisions taken in the immediate future will be decisive for determining which turning the industry will take. We, as the representatives of the industry in Europe, are determined to address the measures and actions that are required to enable the semiconductor industry to continue pursuing the formidable technological progress it has brought to end-user industries and to the economy at large. This is why the report outlines those aspects that make the semiconductor industry in Europe so uniquely important to the development of the European economy; indicates where Europe currently stands in comparison to other regions of the world; identifies which set of competitive factors Europe needs to focus on; and suggests actions that need to be taken. We see this report as a platform for further initiatives in specific areas of activity as well as a basis for discussing our recommendations with concerned decision makers.

What makes the semiconductor industry unique?

It is important to realize that this industry features a number of distinct characteristics that position it uniquely in the economy and in the global competitive arena. These include:

- *The very high intensity of R&D (up to 20% of annual revenues) and the required level of capital expenditures in semiconductor plants or 'fabs' (up to 25% of annual revenues).* Both are the industry's main characteristics. They are the prerequisites that ensure constant innovation, be it in terms of increased performance, miniaturization, cost reduction or ever shortening design cycles. They also make the industry highly sensitive both to the global research infrastructure and the financial returns on investments.
- *The role of the industry as technology enabler.* The semiconductor industry is widely recognized as a key driver for economic growth in its role as a multiple lever and technology enabler for the whole electronics value chain.

  Semiconductor products form an increasingly vital part of a whole range of products ranging from electronic devices and systems (e.g. PCs, mobile phones, TV sets) to solutions and services (e.g. Internet

providers, telecom operators, broadcasting services). Revenues in the overall microelectronics industry have a multiplier effect on other major downstream sectors where electronic content is central. In other words, from a worldwide base semiconductor market of $213bn (€171bn) in 2004, the industry enables the generation of some $1200bn in electronic systems business and $5000bn in services, representing close to 10% of world GDP.

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The pervasiveness of semiconductors in other fields has become key to the industry's competitiveness: e.g., in the automotive industry for safety, energy consumption and driver assistance; in telecommunications for ubiquitous accessibility; in consumer applications for quality of products; etc. The global leadership of a number of European industrial sectors is a perfect illustration of how microelectronics represents a major if not predominant differentiating success factor and value added contribution in their respective markets.

- *Maximal exposure to international competition*. Dramatic changes in the conditions of global competitiveness have had an exceptionally strong impact on the semiconductor industry for over 20 years. For this reason, and as an advanced indicator of economic performance, it is mandatory for us to examine the present and future factors of success and failure with great care.
- *Continuous growth but in a cyclical pattern with high volatility.* While the current 20 year annual average growth of the semiconductor industry is on the order of 13%, this has been accompanied by equally above-average market volatility, which can lead to significant if not dramatic cyclical swings.
- *The need for high degrees of flexibility and innovation in order to constantly adjust to the rapid pace of change in the market*. Many products embedding semiconductor devices often have a very short life cycle. At the same time, the rate of constant price-performance improvement in the semiconductor industry is staggering. As a consequence, changes in the semiconductor market not only occur extremely rapidly but also anticipate changes in industries evolving at a slower pace. Yet another consequence of this rapid pace is that established market strongholds can be displaced all too quickly.

Where do we stand in Europe? – The challenges we face

The original motivation of this report lies in the real concerns of the industry about its future in a Europe where strengths in one area are so rapidly undermined by weaknesses in others. Too often Europe appears to be its own worst enemy. The semiconductor industry in Europe has mobilized all its energy to face the challenges highlighted in this report.

"There are real concerns of the industry about its future in Europe..."

- The European market represents approximately 20% of the world semiconductor market but *imports a much higher value from overseas that is not matched by equivalent exports*. Europe currently attracts less than 10% of investments in production capacity, which means that its future is in real danger. Can the semiconductor industry in Europe sustain growth and stay a source of innovation in such an environment?

"... the EU lacks a dedicated sectoral approach to supporting this key industry."

- Although Europe today enjoys a strong technological base, it also faces *structural weaknesses due to the information technology and computer industry's limited share in the economy*. In particular, we observe a comparatively smaller production of electronic goods for the mass consumer market (from PCs to videos) and attached services. These weaknesses slow down the productivity enhancing benefits of ITC diffusion in Europe, and reduce the semiconductor industry's capacity to reach the scale of production and market necessary to establish its products and applications as standards of competitiveness.
- There are many positive, world-class examples of European R&D programmes and co-operation. There are also encouraging initiatives regarding specific technology platforms in Europe. Nevertheless, *these fall short of a coherent and consistent concept for stimulating R&D investment* in the private and public sector, investment needed in order to reach the vital Lisbon target of 3% of GDP for R&D spending. The biggest R&D potential today lies with partnerships among semiconductor industries as well as with co-operation schemes along the supply chain.
- Whereas China, Japan, Korea, Malaysia, Singapore, Taiwan and the US have developed special incentive schemes to attract and retain foreign semiconductor investment, the EU lacks a dedicated sectoral approach to supporting this key industry. The revision of the Multisectoral Framework has actually reduced the financial support for the large investments that are necessary for leading edge semiconductor manufacturing facilities, leaving a void in large-scale future investment. As elsewhere, investment schemes have been crucial for supporting the build-up of a competitive and distinctly European semiconductor industry. From this perspective *the Multisectoral Framework should be replaced by a sectoral approach for semiconductors*.
- Leaving aside other strategic factors, our snapshot cost comparison study of the factor costs involved in setting up a leading-edge model fab in eight locations in the world concludes that *the net cumulative income over a given period of time in China, Korea and Malaysia is around 220% times higher than for the same fab in Germany*, with little difference between key regions in Europe. Apart from the known differences such as lower wages, lower social costs and higher number of working hours, the main single difference shown by this international comparison is that of the existence of favourable incentive schemes in the emerging markets.

  Considering the volatility of prices in the industry, these huge differences can be decisive for the survival of semiconductor companies in global competition. In light of such differences it also becomes more difficult to emphasize the perceived European strengths such as the existence of a highly skilled workforce and researchers along with the advantages of a sizeable internal market.

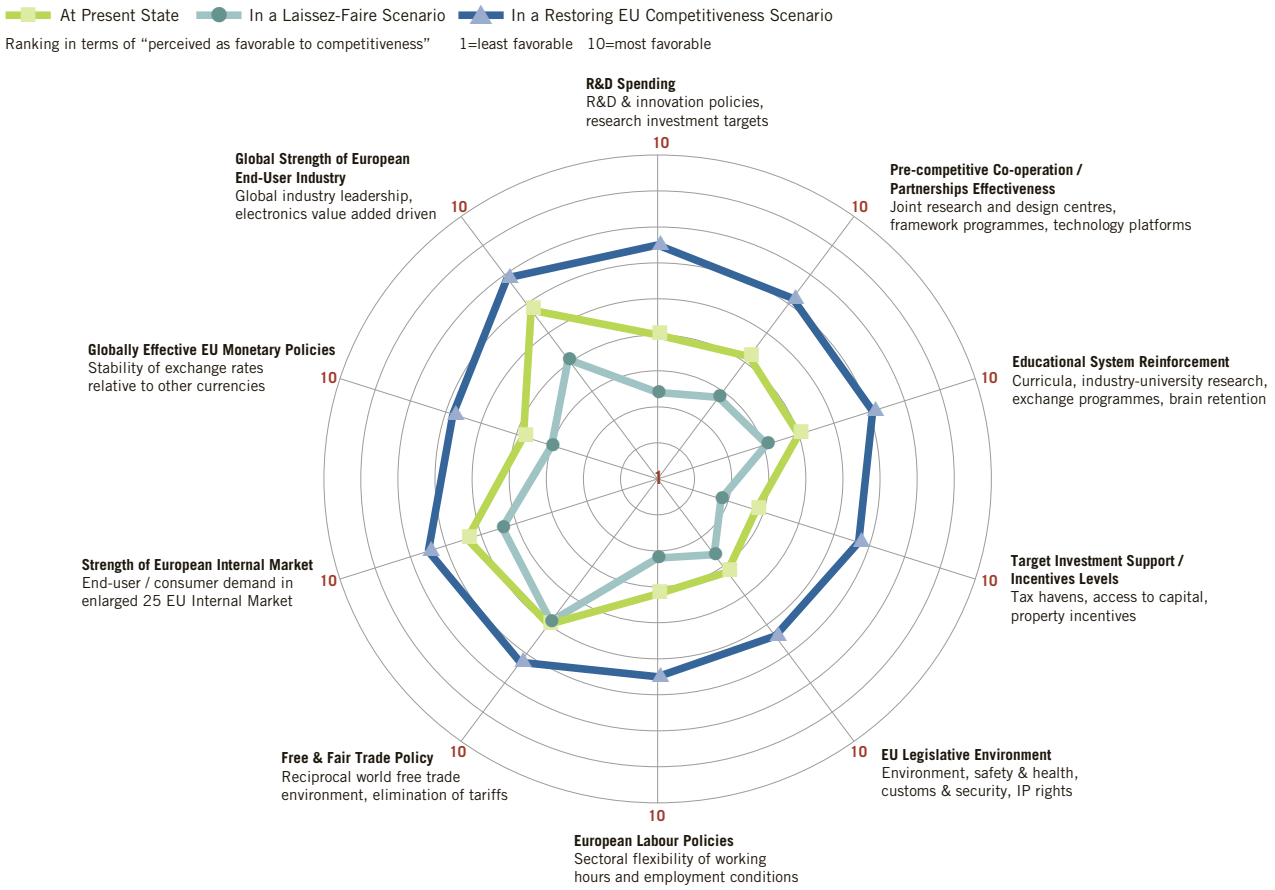
Where do we want to go – *laissez-faire* or restoring competitiveness?

The report lists ten competitiveness dimensions that are critical for the future of the semiconductor industry in Europe and which fall into three broad categories: *Investing for Europe*, *Level Playing Field*, and *Market Performance*.

- ***Investing for Europe*** looks at factors that have a sustained effect on the competitiveness of Europe's semiconductor industry. Focusing on stronger capabilities in R&D, technical education and industry partnerships will impact on the future orientation of the industry's economic environment and can be determinant for its sustainability and competitiveness over time.
- Establishing a ***Level Playing Field*** addresses the necessity of reaching comparable incentives and regulations for market entry, factor costs and legislative environment between regions and/or nations, thus avoiding disadvantages like the ones the European semiconductor industry is experiencing today.
- ***Market Performance*** refers to the European economic position and conditions in the overall environment of the world economy that have a more or less favourable impact on the industry, such as, e.g., the impact of the Euro.

The competitiveness dimensions indicate possible directions for targeted measures or policies that would help enhance the competitiveness of the European semiconductor industry in the future. Depending on the responses to these indications, two alternative scenarios may unfold.

Alternative scenarios based on an assessment of selected competitiveness factors conducted by the members of EECA-ESIA



"... eliminating the obstacles to ensure that Europe fully reaps the benefits of a globally competitive industry at the cutting edge of technology."

- ***Laissez-faire:*** The situation is left to the industry players themselves and no additional efforts are undertaken at the EU or national governmental levels to create incentives for innovation or to restore a level playing field.
- ***Restoring EU competitiveness:*** Both the semiconductor industry and the EU and Member States embrace the competitive investment challenge and seek to initiate a virtuous circle throughout the semiconductor and the global end-user industry (see figure on page 5).

The advisability of taking the option of constructively and decisively building on Europe's strengths and resources is clear: It is the option of eliminating the obstacles to ensure that Europe fully reaps the benefits of a globally competitive industry at the cutting edge of technology. Faced alternatively with the slow decline of its manufacturing base, gradually followed by that of its R&D, the semiconductor industry in Europe is convinced that concerted initiatives which aim at actively investing for Europe, creating a level global playing field and focusing on market performance issues constitute the only way forward towards enhancing competitiveness.

A call for action from the semiconductor industry in Europe

In order to maintain and enhance the competitiveness of the Europe's semiconductor industry, EECA-ESIA calls on all concerned stakeholders to act upon the following recommendations:

Investing for Europe

For Europe's semiconductor industry, three crucial priorities stand out. It is essential to:

- unleash Europe's R&D capabilities and achieve the 3% or more of European GDP spending level for R&D. A crucial requirement to accomplish this is the introduction of a *generalized tax credit on R&D spending* for all companies in the semiconductor industry in any European geographical area.
- open up *Europe's educational system,* from technical school education to research institutes, so it can also work for the industry. The range of initiatives to be developed needs to address all levels, increasing the attractiveness of technology and inverting the present trend toward brain drain.
- develop further successful models of *future-orientated R&D partnerships* such as setting up a limited number of mega-projects and promoting three-way cooperation between industry, university and government, e.g. under the European technology platforms for nanotechnologies (ENIAC) or embedded intelligent systems (ARTEMIS), or through research programmes such as Medea+. Building on horizontal, pre-competitive semiconductor partnerships and programmes, these may be expanded to encourage vertical cooperation along the supply-chain.

"Europe cannot afford to ignore what other regions in the world are striving to achieve."

Providing a level global playing field

For Europe to profit from an innovative semiconductor industry it is indispensable to provide a level global playing field that not only matches that of other regions but is Europe-specific. Hence we recommend:

- creating a *sectoral framework* that offers globally comparable incentive schemes for large investments.

- continuing to promote *free and fair trade*.
- ensuring a *European legislative environment* compatible with the imperatives of competitiveness, especially in the areas of environmental, safety & health (ESH) policies, customs & security and IP protection. Competitiveness has to be established as a criterion for legislation. Pooling the existing pockets of semiconductor expertise within European and national bureaucracies is an important pre-condition for creating the necessary awareness and coordination of targeted policies.
- establishing a *more balanced approach to ESH initiatives*, which promotes environmental practices and awareness without restricting innovative capacities.
- speeding up the implementation of *harmonised customs & security procedures*, an area that warrants particular attention given the nature of Europe's diverse boundaries and traditions.
- allowing for *more flexible labour conditions,* in particular facilitating a better organisational alignment of working hours - in terms both of total amounts and distribution - to meet the competitiveness requirements of today's global market.
- rationalizing and simplifying procedures for *effective IP protection in Europe,* which is key to protecting competitiveness both within and outside Europe.

"If our call for creating the conditions that enable the European semiconductor industry to express its winning innovation capability and market approach is heard loud and clear, this plea for action will have served its purpose."

Answers for maintaining and enhancing the competitiveness of the European semiconductor industry are within close reach. Indeed, some of the measures mentioned are common to many industries in Europe and should reinforce a general industry perspective. Many are already on government action agendas.

However, as illustrated in the above Figure, *all* of these measures are especially relevant to the semiconductor industry inasmuch as they apply to the industry's characteristics and competitiveness factors. Two prerequisites have to be emphasized here, which will give these recommendations a better chance of enactment:

- It will be the *whole* rather than the sum of parts of the recommended actions that will determine the future of the semiconductor industry in Europe and help shape the European environment it needs to compete at the leading edge of the information society.
- It will require the concerted and explicit *will* of all concerned actors, i.e., EU authorities, national governments and industry representatives, to focus their joint attention on the unambiguously essential role semiconductors play in Europe as a catalyst and accelerator for economic performance and the quality of life of society as a whole.

Europe cannot afford to ignore what other regions in the world are striving to achieve. If our call for creating the conditions that enable the European semiconductor industry to express its winning innovation capability and market approach is heard loud and clear, this plea for action will have served its purpose.

EECA-ESIA

The European Semiconductor Industry Association (ESIA), part of the European Electronic Component manufacturer's Association (EECA), represents the European-based manufacturers of semicoductor devices. The semiconductor industry provides the key enabling technologies at the forefront of the development of the digital economy. The sector supports over 86 000 jobs in a market valued at around EUR31.7bn in 2004.

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