Fighting the chip pirates

by Representative Don Edwards

Piracy. The word conjures up images of skull-and-crossbone flags, eye patches, and men driven by ruthless greed. Piracy of one form or another has been known from the dawn of civilization, and civilized nations have always taken what actions they could to protect their commerce from the ravages of pirates. Julius Caesar and Hamlet, Prince of Denmark, were victims of pirates. In one of its first military acts as a new nation, the United States declared that it would pay millions for defense but not one cent for tribute, and it sent its finest warships to the coast of North Africa to battle against pirates for the rights of its commercial mariners.

Today piracy remains a major problem for United States commerce, but its forms have become more varied. The reach of modern-day piracy extends far beyond the looting of ships. Today it includes the looting of technology. In a number of industries, the unauthorized reproduction of products threatens the well-being of innovative firms. The semiconductor industry is one sector in which such piracy is occurring with increasing frequency and with increasingly harmful effects, and for that reason I have introduced in the United States Congress a bill (HR 1028) which would make such piracy, and the sale of pirated semiconductor chips, illegal.

Piracy of semiconductor chips is relatively easy and inexpensive. The pirate firm can obtain a semiconductor chip simply by removing it from a measuring instrument, calculator, video game machine, or other electronic product.

Then the pirate can expose the top layer of the chip, photograph it, and, by using chemical agents, peel back successive layers of the chip and repeat the process until the design of the entire chip is photographically copied. Then, by transferring the photographic images onto stencil-like devices (known as masks) through which light is projected onto a properly prepared silicon wafer, the pirate can reproduce the original chip by techniques similar to those employed by the original manufacturer. The copying process requires little or no further research and development effort by the pirate, and it results in no advances in the state of semiconductor technology.

Piracy is obviously harmful to innovative semiconductor firms. The copying process described above can be carried out for as little as $50,000 to $100,000 for a single chip, and for much less than $1 million even for a complete family of chips. In contrast, the development of an original innovative semiconductor chip is far more expensive. The innovative firm must conduct market research to determine the needs of its potential customers and thus the desirable specifications for a new chip. It must engage in the basic research which leads to the technology embodied in the new chip. It must work to develop a chip design which efficiently embodies that new technology, and it must develop also the family of complementary chips which enables the primary chip to function effectively. All of this effort can result in research and development expenditures of up to $100 million for a new family of chips (such as a 16-bit microprocessor and its support chips).

When an innovative firm first introduces a new product, it sets its prices, given the anticipated quantity of production, at a level sufficient to cover its high R&D costs and yield some return on investment. This return or profit can then be invested in the development and production of still other new semiconductor devices. Although firms in the semiconductor industry have always reduced prices to expand the size of the market, the prices charged by an innovative firm must necessarily reflect past and future R&D costs. This pattern of pricing and product development has enabled the semiconductor industry to continually improve semiconductor capability, continually reduce semiconductor energy consumption, and, ultimately, continually cut semiconductor prices (25 to 30 percent each time total output doubles).

This product development and pricing strategy is upset when a pirate firm introduces a copy of an innovative firm's semiconductor chip. Because the pirate's costs for creating the copied chip are much lower than the innovator's costs for creating the original chip, the pirated version can be sold at a substantial discount from the price of the original device. This causes the innovative firm to lose sales to the pirate's copy, to lose profits when it lowers the price of the original to remain competitive, or both. Worst of all, once returns on investment to the innovative firm have been choked off by the copy,
internal funds will no longer be available for the development of future generations of semiconductor products. Moreover, a disincentive effect can occur when other firms see the misfortunes of the pirate's victim.

To risk the loss of new chip development in the US is to risk the loss of the entire US semiconductor industry. US semiconductor products compete successfully on international markets precisely because they are, on the whole, the best and most innovative products available. US semiconductor manufacturers have achieved that position because they have long stressed the development of innovative products and have utilized pricing structures enabling that development to take place.

HR 1028, the Semiconductor Chip Protection Act of 1983, which Congressman Norman Mineta and I introduced and which is cosponsored in the House by over 25 other representatives, will ensure that US semiconductor producers are protected from the threat of unfair competition from pirated chips. The act will accomplish this by amending the present Copyright Act to provide for the registration of new semiconductor designs with the Copyright Office. Once registered, a semiconductor design cannot be legally copied by another firm. The term of the copyright protection will be 10 years, as compared to 75 years for other copyrighted items.

The bill is designed specifically to encourage innovation. Hence, it will not prevent legitimate reverse engineering—the practice by which engineers of one firm photograph, analyze, and study the semiconductors produced by other firms in order to understand and improve upon the technology embodied in the other firms' chips. Nor will legal action under the terms of the proposed legislation result in the termination of semiconductor utilization "innocently" entered into by an American user. If a supplier's semiconductors are determined to be illegal copies, an innocent customer whose end product is based on those semiconductors will be able to continue to produce and sell his product, but will do so under a license agreement by which reasonable compensation will be given the copyright owner. In such a situation, the purchasing firm will pay reasonable royalty fees to the innovative firm. This will offset most, if not all, of the pirate firm's unfair initial cost advantage. Furthermore, innocent purchasers of copied semiconductor devices will face no penalties as a result of their use of the pirated product.

The piracy of chip designs can be readily prevented through the enactment of the Semiconductor Chip Protection Act. Currently such piracy, though viewed as morally wrong or at least unfair by most members of the semiconductor industry, is not specifically forbidden by US law. The change in the legal environment itself can be expected to reduce dramatically the incidents of chip piracy, since most people prefer to obey the law once it has been set down. In addition, enforcement of the act should be relatively simple and straightforward. Should a firm believe that its chip has been copied, it need merely take the alleged pirate firm to court and compare its copyrighted original with the alleged copy. Enforcement of the bill's provisions will require no new government expenditures; it will result in the creation of no new federal bureaucracy; and it will cause no loss of tax revenues. In fact, if pirated chips are removed from the US market, the US semiconductor industry can anticipate an improved financial position, and, as a result, tax revenues can be expected to rise.

Piracy in the second half of the twentieth century takes forms which were previously unimaginable. The technology which has given us the semiconductor industry has begotten also the means to copy semiconductor chips. Though this modern form of piracy may appear more ethereal than the piracy carried out on the seas of yore, it is no less a threat to the victimized industry. The two types of piracy are tied by the common greed of the perpetrators, but they differ in the ease with which they may be stopped by government action. The fight against the pirates of semiconductor chips requires no guns, no ships, no millions for defense, no new government resources. All it requires is the passage of the Semiconductor Chip Protection Act. Once this is done, the private sector will provide the necessary police action. The fight against piracy was a major role of nineteenth-century governments. Twentieth-century governments cannot afford to abandon that role.

Don Edwards has been a congressman from California since 1963. He is chairman of the House Judiciary Subcommittee on Civil and Constitutional Rights and is the senior member of the House Veterans' Affairs Committee. He also serves as chairman of the California Democratic Delegation.

To obtain additional information about the Semiconductor Chip Protection Act, contact either of Congressman Edwards' offices: 2307 Rayburn House Office Building, Washington, DC 20515, (202) 225-3072; or 1625 The Alameda, Room 709, San Jose, CA 95126, (408) 292-0143.

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