Export Controls

Industrial Policy in Reverse

Robert Kuttner

Economic Policy Institute

Robert Kuttner, one of the founders of the Economic Policy Institute, currently covers economics for the *New Republic*. He is also one of four contributing columnists to *Business Week* magazines' Economic Viewpoint." His areas of specialization include political economies, international economic interdependence, and international trade. His books include ***The End*** *of Laissez-Faire* (forthcoming February 1991), *The Life of the Party*, and The *Economic Illusion*. He is the author of another EPI report entitled ***Managed Trade and*** *Economic* ***Sovereignty.***

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Table of Contents

Executive Summary

Since 1949, the United States has maintained an extensive and little appreciated system of export controls. The intent is to keep products and technologies with potential military uses out of the hands of America's enemies. In practice, however, the system has grown far beyond its original purposes. To the detriment of American industry, it now requires licensing of some 40 percent of U.S. industrial exports. Moreover, the assumptions of the system have been overtaken by technological advances and proliferation. Controlled products which were once considered militarily sensitive—like high-powered computers or numerically controlled machine tools-are no longer monopolized by U.S. producers. The attempt to control their diffusion is increasingly futile.

Supposedly, our NATO allies and Japan maintain comparable controls through their own national licensing systems and the international ad hoc Coordinating Committee on Multilateral Export Controls (CoCom). But in practice, the United States tends to place far tighter limits on exports than its allies, who define security differently and give higher priority to commercial interests than military interests. A 1987 report by the National Academy of Sciences estimated that the system costs U.S. exporters $9.3 billion a year

The cumulative cost far exceeds that because the system applies the greatest constraint to U.S. exports at the cutting edge of technological advance, where American products still enjoy the greatest competitive advantage. In many cases, ironically, this potential export advantage is itself the result of research and development outlays by the military aimed at ensuring America's national security But the focus on one narrow conception of security-denial of high-tech exports-undermines security in a broader sense by harming the nations commercial technology base. So the military tilt of America's technology policy comes full circle and cancels itself out.

Much of the export control effort even fails to achieve its own national security goals, since many controlled products, such as advanced computers, telecommunications technology, and machine tools, are now widely available from other nations. Denying export licenses does not keep products out of circulation; it merely denies the business to U.S. producers. Even when export licenses are eventually granted, harm often results to American exporters; customers often cancel orders because of the red tape, the delay, the unique extraterritorial pretensions of U.S. export law, and because the entire system signals that American producers may be less reliable suppliers than those in other nations. Unfortunately, foreign competitors play on these concerns in their marketing day in and day out

Unlike that of its allies, the US. approach to export controls is further complicated by bureaucratic fragmentation and rivalry In every other nation, export administration is the province of a single agency whose larger mission is to promote the nations commercial advantage. In Japan, for example, export controls are administered by MITI, which has one

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twentieth the manpower and requires one-twentieth the licenses of the comparable U.S. bureaucracy. In the U.S., the Commerce Department has primary jurisdiction over "dual-use" exports, the State Department regulates arms shipments, the Department of Energy and the Arms Control and Disarmament Agency are responsible for non-proliferation of nuclear materials, the National Security Agency governs diffusion of encryption technology the Pentagon is responsible for military technologies, and the Pentagons Defense Technology Security Administration (DTSA) has authority to insert itself in the other control regimes and to veto shipments to controlled destinations and other results it considers harmful to the national security Inter-agency disputes tend to produce lowest-common-denominator outcomes that err on the side of caution-which is to say license delay or denial. In some cases, unresolved disputes have had to be decided by the President of the United States personally

US. policy makers have to acknowledge that the U.S. needs a set of goals and policies concerning technology that are commercial as well as military.

Last June, under pressure from the allied nations, Congress, U.S. industry and the new post-Cold War realities, the Bush Administration agreed to a series of limited measures toward export liberalization, including creation of a narrowed "Core List" of highly sensitive products as well as selective decontrol of technology in computers, telecommunications, and machine tools. The liberalization exercise, however, is still leaving intact the framework of the system and its assumptions. It still arrogates to the U.S. the prerogative of maintaining more stringent controls than those of its close allies, to no good military purpose and to the detriment of American industry

The paradox of export controls-destroying Americas technological security in order to save it-needs to be seen as part of a larger problem. The U.S. alone disdains industrial or technological policy as unacceptably mercantilist. Yet it relies heavily on the technological goals of the Pentagon as an implicit industrial policy The result is that technology policy pursues opposing and self-canceling missions. One set of Pentagon officials, at DARPA and elsewhere, spends roughly $40 billion a year on R & D, and helps incubate and procure highly advanced products and technologies for use in weaponry and intelligence gathering. A related set of Pentagon officials closely monitors the health of America's "defense industrial base," painfully aware that high-tech industry cannot survive merely as expensive wards of the military; for the most part the Pentagon needs to piggy-back on healthy commercial industry Yet a third branch of the Pentagon-the Defense Technology Security Administration (DTSA)-exists explicitly to limit the commercial diffusion of America's very best technology Worse yet, the officials at DTSA and DARPA literally don't talk to each other; they are located in different branches of the military establishment, and never discuss tradeoffs of industrial base objectives versus export control objectives.

The resolution of this paradox requires more than merely a bureaucratic reorganization. Ultimately, it requires ideological revision as well. U.S. policy makers have to acknowledge that the U.S. needs a set of goals and policies concerning technology that are commercial as well as military Only then will the necessary tradeoffs be conceptually as well as bureaucratically

imaginable. As in other nations, one cast of policy makers needs to be charged with weighing which technologies are important to incubate, commercialize, or restrict, and how these goals necessarily trade off against each other

The Congress has recently passed legislation which liberalizes the current system (see p. **39).** **The** new reforms represent a positive beginning, but they should go further This paper recommends a series of additional reforms, including:

- A "license free zone" of export within the CoCom community (NATO plus Australia and Japan);
- Creation of CoCom-wide common controls on exports of weaponry and arms technology that apply identical constraints on the commercial exports of *all* allied nations, so that US. industry is not disadvantaged unilaterally
- Recognition that the Cold War rationale for export controls has been largely overtaken by events, and the narrowing of East-West "dual use" controls to a very small list of advanced products and technologies with explicit military applications.
- Consolidation of separate systems and regulatory bureaucracies for controlling chemical, nuclear missile, and "dual use" technology exports.
- Indexing and sunsetting of remaining technical standards for export controls, so that sensitive technologies are decontrolled as they become widely available.
- Creation of a single Office of Strategic Trade Policy, that would at a minimum coordinate all strategic export regulation; and possibly other trade policy questions as well.
- Assurance that U.S. exporters operate under the same set of constraints, in practice as well as in theory as their foreign competitors.

Policy makers need to be charged with weighing which technologies are important to incubate, commercialize, or restrict, and how these goals necessarily bade off against each other.

Introduction

Military priorities in American diplomacy often undercut the national economic interest.

With the end of the Cold War, many voices have urged that the United States adjust its conception of national security to give greater weight to economics. Not only does the sheer cost of our military establishment constitute an economic drag, but military priorities in American diplomacy often undercut the national economic interest. This is evident in our trade policy-in which we preach free trade but tolerate a good deal of mercantilism on the part of our trading partners who happen to be close military allies. It is evident in our technology transfer policy-in which we typically give a good deal more than we get. It is evident in the use of the Pentagon as a de facto industrial policy-which American officials treat as a cause for ideological embarrassment rather than technological spillover But nowhere is the confused conception of national security and national interest more damaging than in Americas convoluted system of national security export controls.

The United States has a mixed history as a free trader It had high tariffs and an embryonic set of industrial policies through much of the 19th century But even before the Constitution was ratified, America was committed to free flows of exports. During the Constitutional Convention of 1787, America's founding fathers argued about taxes on exports. They finally concluded that the new federal government should have the power to levy tariffs on imports but that exports should be unregulated and export taxes prohibited. The young republic needed to develop export industries.

Only when the U.S. became a great power did the federal government decide that exports were too sensitive to be left entirely to private commerce. In July 1940, with Europe already at war, Congress authorized the President to prohibit or curtail the export of militarily significant technologies and products. When the US. joined World War II in December 1941, the War and Commerce Departments devised an ad hoc system of export licensing to ensure that militarily sensitive technologies would not be exported to, say, Argentina or Sweden, whence they might be reexported to Nazi Germany This system had no constitutional basis; it was simply launched under the President's emergency war-making powers.

In 1949, Congress gave legal form to this exercise. It enacted a comprehensive export control regime, empowering the executive branch to determine those categories of products which required export licenses, create a licensing system, and impose penalties for violations. But because the legislation has remained under the rubric of the executive branch's war-making powers, export control has been exempt from the usual due process for issuance of federal regulations under the Administrative Procedures Act as well as from judicial review The whole system, in other words, is beyond civil challenge. There is a large element of discretion in granting or withholding export licenses. Firms are dissuaded from complaining too loudly about ill treatment because they need the government's cooperation for future shipments. It is hard to think of another area of commercial life in which government regulation is so arbitrary or vulnerable to abuse.

The Export Control Act of **1949** (amended several times) was intended to limit the diffusion of "dual-use" technologies-a dual-use product being a commercial product that might have a military application. Because products shipped to friendly nations might be reexported to the U.S.S.R, the export control regime from the outset required licenses on exports of sensitive products to potentially hostile countries as well as friendly ones. The system is unbelievably complex. There are several distinct categories, ratio nales, and bureaucracies for the control of different kinds of strategic exports. Different categories of countries and end users are subject to differential treatment. All of these overlapping and sometimes contradictory goals and regulatory routines impinge on U.S. firms seeking to carry out ordinary business relationships.

Traffic in technologies and goods that have an explicitly military function are controlled under another statute, the Arms Export Control Act, with regulations known as ITAR (International Traffic in Arms Regulations). These regulations define a "Munitions List," which is administered by the State Department Sales of arms are closely regulated to assure that they serve American national security objectives. Sometimes, sales to friendly nations are promoted by the government itself, while arms sales at odds with government objectives are tightly restricted. In theory this munitions list is limited to armaments, but in fact includes many products, such as communications satellites, that have substantial commercial uses. If an item is on the Munitions List, or a new technology falls into its general category, the exporter must apply to the State Department for a license for each shipment of products, as well as comply with an elaborate set of controls Often, an exporter is not even aware that a product is on the Munitions List until he attempts to export it.

Dual-use products comprise a much larger volume of exports. Some 40 percent of all US. industrial exports fall into this category Dual-use products are subject to regulations issued by the Commerce Department through its Bureau of Export Administration, which acts with the advice and consent of the Pentagon, the Energy Department, and the intelligence agencies. That is, the Commerce Department may propose to grant a license, but another government agency may object. The Pentagons Defense Technology Security Administration (DTSA) reviews roughly **15** percent of the applications received by the Commerce Department, and sometimes refuses to concur on a proposed Commerce Department approval. Existing law gives the Pentagon the authority to veto proposed licenses to "controlled," i.e. East Bloc, destinations, and to request a presidential veto if the Pentagon believes that a proposed export to another destination risks being diverted to a hostile country (A GAO report found that the Pentagon disagreed with Commerce 7 percent of the time.') If the dispute cannot be resolved at the working level, it occasionally goes all the way to the subcabinet or the National Security Council for resolution, and in several cases the President of the United States has had to make the final decision personally Needless to say the President has other calls on his time, and it is not practical for him to serve as the nations chief export licensing officer.

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The current U.S. Commodity Control List of dual-use products runs i28 dense pages of small type and includes such broad product categories as metal-working machinery, chemical and petroleum equipment, electrical and power generating equipment, transportation equipment, electronics, and precision equipment; this list is being whittled down somewhat in negotiations that began last June. Exports of "technical data" are also subject to licensing under similar procedures. Since 1985, the Commerce Department has divided products into less sensitive and more highly sensitive items. For less sensitive products, exporters can get a general "G-COM" license, which covers multiple shipments. More sensitive items, which include most high-tech products, require individual licensing. Approximately 200,000 applications are processed for "individual validated licenses" (IVLs) yearly.[2] Although the primary purpose of the export control system is to keep sensitive technologies and products out of the hands of Eastern Bloc countries, about 90 percent of individual license applications are for products in ordinary "West-West" trade. According to the National Academy of Sciences, the average application requires 54 days for processing, but 5 percent take more than 100 days.[3] Yet only 1 to 2 percent of U.S. license applications are denied. MITI, on the other hand, turns around applications in 2-3 days.

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At first blush, this doesn't sound all that serious, but most of the denials and delays occur precisely at the frontiers of technology and competitiveness, discouraging the commercial sale of technologies and products made in the United States that could compete vigorously on world markets. Moreover, the sheer complexity of the system discourages exports by companies too small to afford Washington lawyers specializing in export control matters. (The Export Administration regulations fill nearly600 pages of dense type in the Code of Federal Regulations.) Even a thirty-day delay in licensing can result in the loss of a sale. Likewise, doubt on the part of customers whether repeat shipments or the next generation of improvements will be permitted leads them to seek alternative, non-U.S. sources. That, in turn, is a strong disincentive against U.S. producers seeking export markets.

overtaken **by Progress**

This entire system rests on four tacit presumptions that were more or less correct in 1949, but that have been overtaken by progress: that the US. is the leader in, and hence controls the diffusion of, most advanced technology; that exports don't matter much to the U.S. economy and thus the commercial costs of this regime are trivial; that military and "dual use" technology is something esoteric and easily isolated; and that the flow of technical know-how with possible military benefits can be readily contained.

To the export-control mentality, virtually every technologically sophisticated item is defined as having a potentially military use.

Since this regime was installed, the development and production of manufactured goods using advanced technologies have become key to the wealth of nations. Yesterday's rarefied high technologies have become today's commercial norms. My thirteen-year-old daughter does her book reports on a computer whose counterpart would have been a top military secret in 1970. But to the export-control mentality virtually every technologically sophisticated item is defined as having a potentially military use. Commonplace technologies and high-tech mass commodities are still subjected to export licenses. As high-tech products are "cornmodified," the grudging liberalization of the export-control regime has not kept pace with technological advance. Personal computers, for example, are still deemed sensitive exports. Only in 1989 did the government, over the Pentagon's strenuous objections, agree to move 286-level personal computers from the IVL list to the more general list. More powerful 386-level personal computers were supposedly decontrolled last June, though there are some exceptions to this (see below). In the past, as "old' technologies have been periodically decontrolled and taken off the list, new technologies are added more quickly

This, of course, is the nature of technological advance. The export control exercise has become the technical equivalent of "tax bracket creep." I am writing these words on a not very sophisticated computer Recently, I purchased a tiny circuit board from a computer retailer for $129 to upgrade the computing capacity by a not very impressive 768 kilobytes of random-access memory On the package was a warning statement that this component was being sold in conformance with export control laws and was not to be re-exported.

The DTSA and the CIA at one point attempted to develop a data base which would keep track of all the technology that the Soviets already had, all the technology that the Soviets wanted to acquire, and all products and technologies that should be restricted on grounds of potential usefulness to the enemy The idea was that a licensing officer should be able to enter the specifications of a proposed export into a computer terminal, and the computer would indicate whether or not the export was proscribed. The project collapsed of its own weight. Technology simply advances too quickly these days, and the detailed intelligence of what was available to the East Bloc from their own internal sources or from other producers simply wasn't comprehensive enough.

Indeed, in a nation that generally eschews industrial policy or economic planning as contrary to both prevailing doctrine and to economic efficiency, our one bureaucratic apparatus charged with keeping track, in minute detail, of the multiplicity of technologies and products generated by U.S. firms and their foreign competitors is a set of roughly a thousand government officials *whose larger mission is to prevent exports. No* other nation in the world has a commercial policy or bureaucracy so at odds with its own commercial interests.

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Multilateral **Controls**

In **1949,** when NATO was established, the United States induced its allies to join an ad hoc Coordinating Committee on Multilateral Export Controls, generally known as CoCom. CoCom members include NATO nations except for Iceland, plus Australia and Japan. Logically, if the U.S. is supposed to have free trade with friendly nations, then they must have essentially the same strategic export-control regime as the U.S. in order to create an allied *cordon sanitaire* without loopholes. CoCom member nations were required by the U.S. to enact their own regulations and to maintain comparable enforcement programs. Restrictions on exporting strategic products apply not only to the Warsaw Pact nations, but to others outside CoCom's control that might reexport to the East Bloc countries or that might pose an independent threat to Western interests. CoCom, with its small technical secretariat based in Paris, is supposed to coordinate the export control policies of all cooperating nations. Though nominally a supranational institution, CoCom is mainly an extension of the U.S. national security policy In CoCom deliberations, the U.S. is invariably the force for the hardest line and the most restrictive policies. Since CoCom decisions must be unanimous, this gives the U.S. a veto. However; other nations can and do choose to enforce compliance with CoCom norms with a lighter hand than the U.S., disadvantaging American exporters.

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Conversely, the United States reserves the right to maintain higher exportcontrol standards for its own producers than do other CoCom nations. The U.S. unilaterally controls some 27 broad categories of products and technologies not on the counterpart CoCom international list It also requires American exporters to obtain certifications from their customers regarding the end use of the product And uniquely among CoCom members, the U.S. requires licenses for reexport to all destinations of products made in America, by U.S. subsidiaries of foreign companies, or with U.S.-originated technology In other words, a buyer of a controlled American high-tech product cannot use it or re-sell it freely without U.S. government approval, and this applies even to U.S.-made components embedded in foreign products. In this way the United States uniquely claims an extraterritorial reach for its export control laws. A foreign buyer must agree to comply with U.S. laws regarding the ultimate disposition of the component or the technology For instance, a foreign product containing a U.S.-made microprocessor is often subject to U.S. export-control laws and is denied license to be shipped either to a Warsaw Pact country or to a non-aligned one that is not party to CoCom and thus lacks re-export controls. All of this has a chilling effect on U.S. exports.

CoCom has its own munitions list and its own list of controlled dual-use products; these roughly parallel but are not identical to the counterpart U.S. lists. There are several categories of exports subject to CoCom review The most sensitive category includes items that are embargoed and may be exported only when CoCom members unanimously agree to an exception.

When a company applies for a license to export a product that is on a CoCom embargo list, the host government is supposed to "take it to CoCom." The CoCom technical secretariat then makes a usually binding determination on whether the product may be granted a license. Invariably, the U.S. holds out for the most stringent restriction criteria, but for foreign policy reasons the State Department often accommodates requests by friendly nations for exception requests, often other nations are allowed to ship items that U.S. exporters are not permitted to ship. Some categories of products that fall below the general embargo line may receive favorable consideration if suitable end-use controls are put in place. Still other products only require notification to CoCom. In practice, however, member nations have wide latitude in deciding what needs to be taken to CoCom in the first place, and what may be shipped without prior CoCom approval. And nations that put commercial interests first often decide on their own authority that a particular product fits the general guidelines and may be shipped. Since 1985, CoCom has conducted annual reviews of products on its proscribed list: virtually every member nation has been pressing for a more extensive liberalization than the United States has been willing to accept.

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Thus, CoCom is not really a *cordon sanitaire.* Rather, it is treated as a minimum system of controls, and U.S. officials tend to be contemptuous of how seriously allied nations take their CoCom obligations. This becomes a vicious circle; our allies see CoCom mainly as a U.S.-inspired and sponsored endeavor, and live up to their reputation. The corollary is that the U.S. maintains higher standards than CoCom—and it is this habit that places American exporters at a particular disadvantage.

A Bureaucratic Nightmare

In addition to several layers of domestic and international regulations and enforcement bureaucracies, there are also multiple layers of rationale for the export control exercise. Besides the ostensible purpose of keeping weapons and weapons technology out of the hands of hostile nations, there is a separate export control regime, with its own international counterpart, for nuclear non-proliferation, administered by the Department of Energy and Nuclear Regulatory Commission (in their capacity as successor to the Atomic Energy Commission) and by the Arms Control and Disarmament Agency In particular countries that have not signed the nuclear non-proliferation treaty are subject to more stringent standards for the export of materials, products, and technologies that might help them develop nuclear capability These include not just fissionable materials and bomb or missile technology As we shall see shortly, the government considers the supercomputer-a product pioneered in the United States-tantamount to a kit for designing nuclear weapons. The problem, of course, is that supercomputers are generic devices with a multiplicity of civilian commercial uses. By restricting their usage and sales too tightly, the U.S. is giving away a competitive edge in a technological crown jewel.

Countries that have not signed the nuclear non-proliferation treaty are subject to more stringent standards for the export of materials, products, and technologies that might help them develop nuclear capability

Two additional ad hoc export control systems, unrelated to either CoCom or to the nuclear non-proliferation regime, attempt to restrict exports of chemicals and of missile technology In addition to these several shared rationales and systems for export controls, the United States—alone-has a third unilateral rationale, under the rubric of foreign policy The U.S. may suddenly decide—purely for foreign policy reasons-to tighten, loosen, or even reverse, its own standards for export of entire categories of products to certain countries that have abruptly become "friendly" or "unfriendly" "Foreign policy export controls" may seek to deny products that do not fall under CoCom strictures simply in order to place defined enemies in an economic squeeze. The U.S. is the only CoCom member country that arrogates to itself a separate unilateral export regime for foreign policy reasons, For example, after the Soviet invasion of Afghanistan in 1979, the Carter Administration reversed the policy (which dated to the 1972 detente era) of selectively permitting sensitive exports to the U.S.S.R. When the Reagan Administration took office, this embargo was tightened, not as a system for denying strategic products or technologies, but as a form of economic warfare. This policy of "no exceptions" to CoCom standards for shipment of sensitive products to the U.S.S.R was perpetuated by the Reagan Administration, which attempted with varying degrees of success to have our allies follow suit. The virtual embargo was lifted only in May 1989, as a reward to the U.S.S.R. for withdrawing from Afghanistan.

Conversely in the early 1980s, when the Reagan Administration intensified the policy of playing the Soviet Union off against China, the Administration unilaterally liberalized China's access to sensitive technologies. After barraging its allies with demands to tighten their own export strictures, by 1984-85 the U.S. was flooding CoCom with requests for exceptions to allow advanced technology to be shipped from the U.S. to China. In 1985, a

peak of 3,800 requests was reached, overwhelming CoCom's tiny technical staff.[4] According to a case study by Michael Mastanduno, "Western European export control officials complained in 1985 of being buried in paper by the U.S., and of having time to do little more than process U.S. exception requests for China and to respond to U.S. proposals for stricter controls to the Soviet Union."[5] These policy twists, predictably, tend to enrage America's CoCom allies. In the case of China, after bowing to long-standing American pressure for a strategic embargo, European and Japanese officials suspected that the U.S. was seeking an economic sphere of influence as well as a foreign policy tactic vis á vis the Chinese. In the case of the U.S.S.R., the harder U.S. line of the early 1980s operated at cross purposes with Western Europe's own strategy of building and nurturing economic links with the East, and came at the expense of a European regional comparative advantage. At this writing, to the dismay and indignation of Europe, China-site of the Tiananmen massacre—still has more liberal access to Western technology than Poland, Hungary, or Czechoslovakia, let alone the Soviet Union. Only in mid-1990 did the United States, under intense prodding from its NATO allies, agree to let the nations of Eastern Europe have access to technology approaching levels that China has been getting for over a decade.

Only in mid-1990 did the United States, under intense prodding from its NATO allies, agree to let tie nations of Eastern Europe have access to technology approaching levels that China has been getting for over a decade.

In practice, American export control policy defines several distinct tiers of countries. First is the United States itself Within the U.S., commerce in high technology goods is generally unrestricted, though there are some categories of products, such as technology for coding and decoding data and high-end supercomputers, which are considered so sensitive that diffusion is restricted even domestically After US. domestic uses come other CoCom members. Despite the presumption of a common *cordon sanitaire* around CoCom, trade to nations such as Britain, France, Germany, Japan, etc., is subject to the entire licensing regime, apparently because U.S. policy makers believe that the controls and foreign policy goals even of closely allied nations are not entirely reliable. The main difference inintra-CoCom trade is that licenses are more readily granted.

It should be understood that a "license" is not merely a permit authorizing shipment of goods. For materials deemed sensitive, the license typically includes a plan for end-user certification that the product has been received, as well as a system of measures controlling access and regulating re-export. In some cases, employees of the supplier are deputized to make periodic inspections to assure that the product is being used as promised. Most other CoCom member nations do not require as elaborate a system of certifications and end-user checks as the United States, and none impose re-export controls.

After CoCom member nations come nonaligned nations that cooperate with CoCom. These include Austria, Sweden, and a few other nations which for foreign policy reasons have not officially joined CoCom, but have adopted CoCom-like controls. Then come most Third World nations which do not have export control systems thatsatisfy Washington. They are often sources of export or re-export of products and technologies that the U.S. would prefer not go to the U.S.S.R. or to nations that sponsor terrorism.

IBM, for example, must get individual licenses even to ship computers to its own overseas research facilities. Taiwan, Brazil, and Korea are often singled out as nations that will sell anything to anyone, and despite the fact that Korea and Taiwan are very close military allies, the US. government has not been able to induce them to adopt acceptable export control policies of their own. As a consequence, U.S. firms that sell to such nations are required to obtain assurances from the customer regarding both the end use and the end user of the product. These controls are required in all cases where a product requires an Individual Validated License, but the controls may be somewhat less stringent when the sale is to a CoCom country that supposedly has its own control regime. However, regardless of the locus of sale, the U.S. producer may be held liable if the product should fall into the wrong hands.

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In 1984, the Digital Equipment Corporation, one of America's premier high-tech export firms, was fined several million dollars on the grounds that it *should have known* that one of its family of VAX computers sold ostensibly to a West German businessman would be diverted to Bulgaria, and presumably thence to the Soviet Union. The government took the position that the German businessman was not a credible end user, and in effect put Digital into the intelligence business. Reportedly Digital has been a particular target for Soviet acquisitions because the Soviets were able to clone a VAX machine early on, and much Soviet military software is designed to run on VAX clones. Subsequently, Digital found itself being required to get individual licenses for long standing customers in Western Europe, including its own facilities. (This episode made Digital so risk-averse that almost uniquely nobody from Digital would give me an interview, on any basis. My sources are from elsewhere in the industry)

Finally come Third World terrorist regimes and Warsaw Pact nations -the object of the export control exercise-which have been subject to the tightest controls of all.

The Costs of Control

The costs of this rigamarole to U.S. industry are immense, and not all of them are obvious. The cost to U.S. competitiveness only begins with the overt out-of-pocket expenses of compliance. Multinational corporations typically have plants in several countries, some of which are CoCom members and some of which are not; if they want to ship components of sensitive materials from one plant to another, they must get export licenses. Even though these are private firms engaged in purely commercial transactions, some technical data on civilian products are deemed too sensitive to let out of the United States at all. One high-tech producer had to fly in engineers from all over the world to discuss a manufacturing problem because the technical data could not be disseminated.[6] Export licensing regulations also restrict access to advanced technology by foreign nationals working for firms in the United States. This is not a trivial matter: roughly one-third of new engineering Ph.D.s working in the United States are citizens of other nations.' Regulations even require licenses before a U.S. producer can *repair* a piece of high-tech equipment that has been previously sold![8] Major U.S.-based multinational firms, unlike their foreign competitors, must get individual licenses to move their own equipment from one location in a friendly country, say Britain, to another And their customers must do likewise.

Even more sizable, however, are the losses in the normal bade among the leading capitalist nations—normal "West- West" trade-which accounts for about 90 percent of export licenses.

Far more serious, of course, is the cost of lost business, Most topically, the United States is losing vast trade opportunities in Central and Eastern Europe-a part of the world where Western Europe already begins with a geographic and cultural head start. For example, in 1989 the Germanfirm Siemens concluded a billion-dollar deal to sell personal computers to the Soviet Union. Atari, a U.S. firm, was discouraged by the Commerce Department from even applying for export licenses for a similar deal. In 1988, Simon-Carves, a British engineering firm, contracted to build a $450 million factory-automation equipment plant in the Soviet Union. The U.S. indignantly objected that the proposal should have been submitted to CoCom, but the British government interpreted the standards differently By the same token, France's Alcatel, despite U.S. objections, agreed to sell telephone digital switching technology and manufacturing equipment to the Soviets in 1989.[9] Siemens reportedly has made a deal to produce digital switching equipment in the U.S.S.R.. Even with partial liberalizations in 1989–1990, U.S. suppliers are losing vast potential business in Central and Eastern European markets such as telecommunications and mainframe computers where relationships with EC or Japanese suppliers, will not be easy to crack once they are forged.

Even more sizable, however are the losses in the normal trade among the leading capitalist nations-normal "West-West" trade-which accounts for about 90 percent of export licenses, In theory, the government is supposed to waive export restraints if the product is readily available abroad, but in practice controls are often maintained on the premise that U.S. technology may be superior and that the U.S. needs to set a good example for its allies. As alternative Japanese or European sources of supply become avail-

able, many foreign customers simply reject U.S. suppliers because they do not want the red tape that goes with making an American purchase. This is also the case with North-South trade, where other CoCom member nations simply don't enforce the same standards as the U.S. (Since the Toshiba incident, Japanese enforcement of very high-end export licensing has improved, as has German enforcement of missile technology and chemical controls since the Libya chemical weapons plant affair.)

As the hegemonic Western nation and until recently the technological leader, the U.S. has always shouldered a disproportionate share of the export control burden, Other Western nations have seen the exercise mainly as an inn-a-alliance foreign policy problem to be managed: how to keep the United States relatively happy while also maximizing export opportunities for their own producers. With the intermittent exception of Britain, our allies have never fully shared the American enthusiasm for the broad strategic premise of the exercise. Our allies have been delighted with the extent to which the U.S. has imposed tighter unilateral controls on its exporters. They have, however, been more resistent to multilateral controls that cost their own firms business. As the Cold War has wound down, America's NATO allies have begun to lose patience with the entire system.

Though countries allied with the United States are supposed to be subject to the same export control regime, they have wide discretion to enforce their own systems with a lighter hand.

As noted, though countries allied with the United States are supposed to be subject to the same export-control regime, they have wide discretion to enforce their own systems with a lighter hand. Germany has generally allowed its makers of sensitive technology to export to Third World countries and even to Eastern Europe. When France withdrew from NATO's common command structure in 1966, it briefly stopped cooperating with CoCom, and at about the same time established a French national computer company, Machines Bull, because the United States would not permit American computers to be sold for use in the French nuclear *force de frappe*. Bull sold some computers to the Soviet Union, and if you visit the Tass office in Moscow today, you will see a Bull computer, vintage 1967, twenty: five years out of date and still operating. IBM has been prohibited from selling Tass a modern model.

In 1987, a blue ribbon commission known as the Allen Panel-under the aegis of the National Academy of Sciences and Engineering-produced a report for Congress documenting numerous cases in which the delay in processing an application for an export license cost American firms business. The panel estimated the total annual cost to American industry to be some $9.3 billion a year,," the majority of it in "West-West" trade. This understates the true full cost, since the lost business comes mostly at the frontier of advanced technology A follow-up report will be published in 1991. The Commission concluded, "[A]s the relative restrictiveness of U.S. controls becomes more apparent abroad, foreign customers are exploring alternative sources and some have already turned to non-U.S. suppliers. At the same time, U.S. firms are losing their relative competitive edge, not only in technological sophistication but also in price competitiveness, product quality marketing, and service-factors that previously compensated for the negative competitive effect of export controls.""

According to one of the research papers prepared for the Academy, "U.S. firms … report that U.S. export license processing requires five to thirty times longer than Japanese licensing procedure, even where no such license has ever been denied in the firm's history."[12] Where competition with Japanese producers threatens, Japan can't find enough clerks to staff its patent office, but somehow, when the purpose is Japanese high-tech exports, MITI spares no expense to expedite the paperwork. Interestingly enough, Japan's Defense Agency is not involved in export control, which is entirely the province of MITI. Not surprisingly, MITI gives priority to Japan's commercial interests. Japan also subjects a far smaller fraction of its exports to licensing in the first place, and approvals are often pro forma; its entire export control bureaucracy is just 25 people, compared to nearly 1,000 in the U.S. With a larger volume of industrial exports, Japan process only about 10,000 export license applications a year, compared to 20 times that number processed in the U.S.

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Many West European businesses in fact have made a major effort to "de-Americanize" products that once used U.S.-licensed technology or U.S. components. CoCom gives its European members a handy (and not unreasonable) cloak behind which to hide their emerging technological nationalism. Some U.S. companies with. European installations have been kept out of EC-funded research consortia such as BRITE and ESPRIT, for which they would otherwise qualify lest the entire research product be "tainted" and subjected to U.S. export controls. The chairman of Philips publicly declared that his company would seek to replace American components wherever possible, so that Philips products would not be subject to extraterritorial U.S. export controls. ICL, Britain's leading computer manufacturer, got tired of having to apply for a U.S. export license whenever it transshipped products with U.S.-made or engineered components. According to a senior executive of ICL, his company recently decided to stop using the semiconductors which it had long purchased from a U.S. supplier. "We knew them, we had a long-standing relationship, and we would have preferred to keep doing business with them. But the export controls made it more trouble than it was worth."[13] British Aerospace has also adopted a company-wide policy of avoiding U.S. components if another source is available.'*

In addition to lost export opportunities, whole categories of technology in which U.S. firms have a clear lead are being denied commercial exploitation by U.S. producers, either because their development was assisted by companies having Pentagon contracts, or because the product is deemed too sensitive to export, or even to develop at all. The latter includes what intelligence exports call encryption: the coding of electronic messages. The National Security Agency operates on the premise that it must be able to listen in on foreign communications, while top-secret communications of the U.S. government must be securely foolproof If encoding technologies that NSA could not break were in general circulation, this would undermine NSA's entire logic. So it has a gentlemen's agreement with U.S. electronics firms that the industry will produce no encoding technology that NSA could not break in the event of an emergency All encryption technology must use

a standard algorithm known as the Data Encryption Standard or DES, which is about 15 years old It is a matter of some debate in the technical community whether NSA designed DES to include a "trapdoor" for easy eavesdropping. But this technology, too, is evolving rapidly and it is only a matter of time before non-DES encoding systems are produced by firms of competing nations. Increasingly, "encryption" is coming to include much of advanced telecommunications. It took extensive negotiations and a special waiver before American banks were able to employ encoding technology secure enough to permit the mass use of automated teller machines yet breakable enough to satisfy the NSA. The export of this technology is still restricted.

There are countless other Catch-22s. For example, U.S. companies are sometimes denied the right to apply for patents overseas because the Pentagon or the NSA doesn't want the patent offices of even friendly powers to see their specifications. Yet comparable products made overseas are exportable, without equally stringent licensing constraints; as a consequence, made-in-the-U.S.A. technology is denied patent protections overseas, leaving competing foreign firms free to acquire technologies and processes to which U.S. firms should have proprietary rights. The Japanese lately have taken to requesting highly detailed technical specifications for import of U.S.-made microelectronics components, ostensibly to make sure they do not fall afoul of export control strictures. This also has the handy benefit of giving MITI a look at proprietary commercial data.

This system engenders a good deal of ill will among our allies, who ironically view it as a form of the very mercantilism that the United States supposedly eschews. Logically, that seems contradictory since export controls put U.S.-originated products at a particular disadvantage, and American producers suffer the most damage. However, when an allied nation has a competitive advantage-such as Germany's in machine tools-the effect of the CoCom regulations is to hamper its exploitation. Older generations of machine tools have been traded freely under the most general and least onerous licensing strictures since they are deemed less important militarily These include some product categories where U.S. manufacturers are still competitive, but many of the more advanced products, where Germany leads, have the tightest restrictions. The West Germans have accused the Americans of using a national security rationale to keep them from exploiting its lead: would that American policy were so coherent!

Export opportunities have been lost in a number of important industries, including computers, machine tools, electronic test equipment, telecommunications, complex control systems, and aircraft virtually every manufacturer of products using advanced technology has an export control horror story American computer sales outside CoCom have been retarded because the shipment of advanced computers requires not only an individual validated license, but a "Security Safeguard Procedure," which can include on-site inspections and 24-hour monitoring of those accessing the computer Special software has been developed to keep track of who logs on,

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and for what purposes. This consumes so much of the computers processing capacity and represents such an intrusion, that customers have begun to seek alternative suppliers.

A distinctly American problem is the fragmentation and overlap of our export administration system. Not only are there multiple agencies and multiple opportunities for delay, but the Pentagon often literally operates its own export control policy notwithstanding what has been agreed to as the government-wide policy For example, in the case of wirebonders (a widely available component used in the production of semiconductors) the Commerce Department made an official finding of foreign availability in mid-1987. When this is done, only the President may make an override on national security grounds, and in this case the President declined to do so. Still, the State Department, apparently at the behest of the Pentagon, managed to delay the process another two years before finally taking the case to CoCom for multilateral approval. And DTSA made accusations to the Commerce Department's Office of Inspector General that Commerce Department licensing officials had misrepresented the sensitivity and foreign availability of the product At this writing, more than three years after the initial application by the exporter, the decontrol still has not been granted, which means that individual licenses are required for every shipment of a commonly available product.[15] Because the system is immune to judicial review, there was no way that the exporter could appeal the administrative abuse. No other nation has bureaucratic infighting to this degree, and no other category of regulation has this many agencies involved in the same exercise.

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According to one former official, a dispute between the Departments of Commerce and Defense about exports of recreational scuba diving gear to an unfriendly country had to be resolved at the assistant secretary level: 'There was intense pressure to deny a license. We did a Solomon-like decision. Face masks and wet suits were permitted. Flippers and under-water scooters were not."[16] This suggests that this little-known system has become a kind of monstrous MITI-in-reverse, where vast bureaucratic resources are devoted to restricting U.S. exports.

In another case, a large US. multinational entered into a contract to pro vide process automation controls to a Soviet fertilizer factory Factory process automation is a sector where Japanese industry is opening up a lead over its U.S. competitors. The Soviet representatives wanted to buy both the American technology and training from the U.S. producer. The Defense Department took the position that it did not want Soviet engineers learning this technology Revealingly, DTSA officials argued not that the technology had direct military applications, but that increasing Soviet grain output with better fertilizer was not in the US. national interest. Eventually the deal was escalated all the way to a Cabinet meeting, with national security adviser Colin Powell mediating personally between the Defense and Commerce Departments. Even afterward, the Pentagon continued to take the position that training and technology required special licenses."

To cite one more case, another major U.S. multinational company produces navigation systems with both military and commercial applications. Because of the sensitivity of the technology these can be sold to East Bloc countries only if repairs are performed at an approved Western location. The Airbus consortium has used American suppliers for key sub-systems, but has made it clear that it fears U.S. extraterritorial export controls and will favor European suppliers and even help incubate them.[18]

In critiques of industrial policy the bureaucratic culture is often held to be antithetical to the entrepreneurial culture. However, in cases where the purpose of the exercise is *enabling* of new technologies and products, government employees and private companies have been able to coexist fruitfully Examples include the Department of Energy's several National Laboratories, DARPA and its successes over the years, biotechnological breakthroughs spawned by NIH grants, technology pioneered by NASA, as well as technologically inventive companies such as AT&T that existed in a sheltered regulatory environment with close connections to Defense and intelligence agencies. However, the purpose of the export control bureaucracy is not to enable technology, but to constrain it. And the mission of this agency combines with ordinary bureaucratic risk-aversion to create outcomes truly poisonous for U.S. industry An export control official risks little if he or she decides to encumber or deny a license. But if a license is granted and the product falls into the wrong hands, there is hell to pay

An export control official risks little if he or she decides to encumber or deny a license. But if a license is granted and the product falls into the wrong hands, there is hell to pay.

The export licensing director of a US. high-tech company observes, 'The incentive in a company like ours is to move quickly and aggressively, to innovate, to make the sale, to move the product, to take risks. We're constantly risking the company In our business, risk is rewarded. In government, risk is not rewarded. In the export control bureaucracy you're rewarded for being cautious, for taking the conservative approach. The clash of the two cultures is intolerable. A company can't afford these delays and restrictions; it can literally put us out of business."[19]

In general, the two greatest costs to American firms of export controls are the suspicion sown among foreign buyers about whether the American producer can be counted on in the future as a reliable source of supply, and the multiple constraints that buying American introduces into the customers ability to conduct his business. The twists and turns of American foreign policy give substantial credence to this concern. The worst single such episode in recent years was the Soviet gas pipeline affair, the repercussions of which are still reverberating, to the disadvantage of American industry

Taking Gas

Although American corporate executives had been pressing for a liberalization of export controls for decades, the Reagan Administration tightened them, in line with its general policy of getting tough with the U.S.S.R.. This was not without irony since most of those same executives looked to Reagan as one who would "get the government off the backs' of American entrepreneurs. The Reagan Administration also persuaded NATO allies to allow whole new product categories to be added to the CoCom list, The architects of the hardening line included Secretary of Defense Casper Weinberger, Assistant Secretary of Defense Richard Perle, and National Security Adviser William Clark. They had allies in the Pentagons career force of export-control bureaucrats, who have a near-paranoid fear of technological espionage, coupled with outdated expertise on manufacturing technology

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Beyond controlling strategic materials and technologies to keep them out of Soviet hands, the Reagan Administration pursued a more general policy of squeezing the U.S.S.R. economically The "no exceptions" policy on technology exports to the U.S.S.R. was first imposed by the Carter Administration after the Soviet invasion of Afghanistan in 1979. Then, after the Solidarity movement in Poland had been repressed and martial law was imposed by General Jaruzelski in mid-December 1981, President Reagan in his Christmas Day message announced a series of economic sanctions against the Soviet Union, including suspension of all Aeroflot service between the U.S.S.R and the 'US., and denial of export licenses for electronic equipment and other high-technology materials. The Administration also decided to interfere with a pending project that had been troubling Weinberger and Perle all year--a grand scheme to enable the Soviets to sell natural gas to Western Europe.

Several years before, the Soviets had entered negotiations with a consortium of West European governments, banks, utility companies, and manufacturers to help develop the extensive natural-gas fields of western Siberia. A group led by West Germany's Deutsche Bank agreed to lend the Soviets $10–15 billion to purchase gas-drilling equipment and lay two 3,000 mile pipelines. In return, the West Europeans would get a reliable source of cheap energy, the equivalent of roughly a million barrels a day of crude oil. The Soviet Union may not have been the ideal supplier, but at the time, Western Europe's principal source of gas was an even shadier supplier—Libya. The proposed pipeline would supply an estimated 6 percent of Europe's total energy needs. A series of contracts were signed in the Fall of 1981.

Reagan officials had been extremely wary of the pipeline deal. They argued that it would leave Europe partly reliant on the Soviets for a crucial product, and hence vulnerable to Soviet pressure in the event of crisis, and more likely to curry Soviet favor generally They also objected that the Soviets would have a new source of hard Western currency-over $10 billion yearly-which contradicted the general American policy of intensified economic pressure. Interestingly, the Administration did not contend that the

West Europeans were shipping the Soviets militarily sensitive technology only that they were undercutting a policy of what amounted to economic warfare.

Western Europe was then at the peak of the worst recession since World War II. The pipeline was the biggest trade deal ever with the U.S.S.R, and it was expected to provide Western Europe with not only reliable cheap energy but also with a new source of orders for its depressed steel industry and several hundred thousand badly-needed skilled jobs. When the Europeans refused to heed Washington's wishes, the Administration tried to use the export-control machinery to bring their recalcitrant NATO allies to heel. At the time, U.S. companies, then also reeling under the twin impact of recession and Japanese competition, had chances to make sales to the pipeline project totalling an estimated $300–600 million. Caterpillar Tractor, which had developed advanced pipe-laying and gas-compressor technology for the trans-Alaska pipeline, was set to provide two hundred pipslaying machines at a cost of $90 million. Another U.S. company, General Electric, had contracts to supply $175 million in rotors and nozzles for gas field turbine compressors to John Brown of England, AEG-Telefunken in Germany, and Nuovo Pignone in Italy, prime contractors for the pipeline. But pursuant to the Presidents new policy, the Department of Commerce announced on December 29 that Caterpillars export license was revoked and that no new licenses in connect with the pipeline project would be issued.

The Administration did not contend that the West Europeans were shipping the Soviets militarily sensitive technology, only that they were undercutting a policy of what amounted to economic warfare.

It was exactly this sort of stricture, along with Washington's episodic Cold War caprices, that gave American companies the reputation for being less than reliable business partners. Unlike Reagan, most European leaders in the early 1980s were not pursuing a policy of economic warfare against the Soviet Union. This time our NATO allies flatly refused to back United States policy On January 4, 1982 the ten foreign ministers of the Common Market Countries signed a declaration indicating they would make their own decision about whether or not to proceed with the pipeline. In late January France became the first EC nation to sign a long-term contract to buy Soviet natural gas.

Perle and Weinberger then convinced Reagan to extend U.S. pipeline sanctions to foreign subsidiaries of U.S. firms and even to U.S. technology already under license to foreign concerns. This decision was made while Secretary of State Alexander Haig was away, trying to negotiate compromise with the Europeans. According to Haig's memoirs, at the National Security Council where the decision was made, only the hard line was pro posed. This new policy was a flagrant attempt to extend U.S. law to Europe, extraterritorially, and to compel private companies to violate contracts EC foreign ministers, again unanimously, condemned the action. The French government instructed French companies to proceed with the work, and the foreign minister declared publicly, "[T]his day, June 18, 1982, could well go down as the beginning of the end of the Atlantic Alliance."[20] Reagan's closest ideological ally, Mrs. Thatchers government in England, went so far as to issue an order prohibiting any U.K. company from complying with U.S. extraterritorial law (So the John Brown engineering firm would be in

violation of American law if it ignored the U.S. directive, and in violation of British law if it obeyed.) Haig resigned, and his successor, George Shultz, has told associates that he spent virtually his first year as Secretary of State cleaning up the damage.

In the end the pipeline was built ahead of schedule. U.S. companies lost hundreds of millions of dollars' worth of orders, and the nations of the European Community learned that if they stuck together, they could pursue an independent foreign policy despite intense American pressure. In the mid-1970s, Caterpillar Tractor had 85 percent of the Soviet market for pipe-laying machinery, while its arch Japanese rival, Komatsu, had 15 percent. Ten years later, that ratio had reversed. Komatsu, buttressed by earnings from its Soviet sales then substantially displaced Caterpillar in the domestic U.S. market. GE has long been known as the worlds premier manufacturer of turbines, but since the pipeline dispute, the European manufacturers and the EC Commission have embarked on a program to free themselves from dependence on an American supplier

When the pipeline affair was over and the U.S. position had been thoroughly humiliated by its European allies, it continued to be widely used as a rationale for European mercantilism.

Anthony Blinker-r's history of the pipeline case quotes Horst Kerlen, vice president of AEG's compressor subsidiary "There is a doubt, a lack of trust, a feeling against the United States. .. We have to be very cautious now about any new contracts that would bind us so totally to the U.S."[21] Though the pipeline affair was a far more dramatic imbroglio than the typical dispute over export controls, it suggests precisely what happens hundreds of times daily-when American producers lose business and customers or governments of allied nations lose confidence in America.

Indeed, when the pipeline affair was over and the U.S. position had been thoroughly humiliated by its European allies, it continued to be widely used as a rationale for European mercantilism. One senior French official proposed, facetiously, that the European Community erect a statue of Richard Perle, in the city of Brest, on the spit of land on the French coast that juts out farthest into the Atlantic, to remind Europeans never to rely on the Americans for advanced technology

Some of the hard-liners of the Reagan Administration now insist that the hard line on export controls deserves substantial credit for bringing communism to its knees. After all, the policy of denying the Soviets the opportunity to purchase advanced Western technology-in particular key military technologies-forced them to wallow in the consequences of their own inefficiency and spend more on military hardware at cost to their consumer economy But in fact, computer, machine tool, and microelectronics technology has been amply available in the U.S.S.R. from non-U.S. sources. And though the cost may be slightly higher than it otherwise would have been, the Soviets have had no difficulty developing highly sophisticated weapons. These very same hard-liners were the ones insisting that the Soviets enjoyed military superiority One former senior official of the Reagan National Security Council, who is a hard-line anti-communist but a critic of the cost of export controls to U.S. industry, scoffs, "It wasn't export controls that killed the Soviet economy; it was Marxism."

Recently an international inspection team verifying an arms control agreement travelled to a Soviet site to observe the destruction of 100 Soviet missiles. The missiles were to be destroyed by firing them off harmlessly The team was transported to the site in three Soviet-made buses. Every bus broke down, and had to be replaced. Every missile fired.[22]

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Export Controls After Perestroika

In recent years, the Bush Administration has grudgingly agreed to liberalizations in the system as a result of pressure from four sources: Congress, domestic industry, other CoCom allies, and events in Eastern Europe. For decades, Congressmen and Senators responsive to outcries from industry have attempted to streamline the system. The 1988 revision of the Export Administration Act did accomplish a modest degree of streamlining, and more improvement was made in the 1990 amendments (see below). In general, the Administration has sought to retain as much discretion and authority as possible and to discourage Congress from "tying its hands."

Thanks to events in Eastern Europe, pressure for reform has escalated from America3 allies.

Thanks to events in Eastern Europe, however, pressure for reform has escalated from Americas allies, Until 1988, the pressure ran largely the other way; Washington was pressing Europe and Japan to tighten export limitations. In 1982, the Pentagon pressed CoCom to add 100 additional items to the control list, of which 58 were eventually accepted. The U.S. did agree to some liberalization of low-end computer sales, but in return the Europeans agreed to tighter restrictions of such technologies as digital switching and software. The U.S. also intensified customs inspections to assure compliance via a new program called Operation Exodus, and prevailed on some allied nations to do likewise.[23] The occasional spectacular security breach, such as Toshiba's sale of highly sensitive machine tools used to produce submarine propeller gearing to the U.S.S.R., or the German sale of equipment for chemical weaponry to Libya, lent credence to Washington's concerns. Throughout the Cold War era, the Commerce Department, the one U.S. agency seriously concerned about the effects of export controls on U.S. competitiveness, was largely outgunned by the Pentagon, the intelligence community the Department of Energy, and the National Security Council. The State Department played the role of referee.

In the past two years, this balance has begin to shift, both globally and in the inter-agency infighting in Washington. As Eastern Europe has liberalized, and the EC has *come* of age in the councils of world economic policy European pressure for liberalization of export controls has intensified. In 1987, the European Parliament passed a resolution calling for a substantial overhaul of the entire system. European companies have grown more aggressive in seeking alternatives to American suppliers, and this has justifiably intensified pressure by American firms for relief In 1987, after the Toshiba affair export control officials began talking of the need for "higher fences around fewer products." At the January 1988 high level meeting, CoCom members agreed to a system by which they would tip each other off to attempted diversions of restricted military equipment (higher fences). This worked well when Iraq was foiled attempting to buy parts disguised as drilling equipment that turned out to be barrels for a long range super high velocity cannon.

It has taken somewhat longer for the U.S. to deliver on the "fewer products" part of the bargain. In mid-1989, the Bush Administration reversed the "no exceptions" policy regarding exports to the U.S.S.R.-but of course left

the licensing **system intact. In early** 1990, CoCom nations agreed in principle to a substantial liberalization of products destined for Eastern Europe, but retained higher barriers on exports to the Soviet Union pending further reforms, a strategy known as "differentiation." After much inter-agency dispute, the Bush Administration agreed to a common position last May: development of a less restrictive "Core List" of goods and technologies; the elimination of certain categories of products from the list; and in three critical sectors-computers, telecommunications, and machine tools-greater access to more advanced technology for Eastern Europe, roughly on a par with that permitted to the People's Republic of China (known as the China Green Line).

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At the June 6-7, 1990 High Level Meeting in Paris, the U.S. acceded to European demands for further liberalization, allowing machine tools with somewhat finer tolerances, and computers with higher processing power **to** be exported to the newly emerging democracies of Eastern Europe. The Germans, newly influential in world politics and East-West economics, had flatly threatened to pull out of CoCom unless standards were significantly liberalized for exports of machine tools and computers. The British had initially argued that it was absurd to insist on one set of liberalized standards for Eastern Europe and another for the U.S.S.R, since it was now in the interest of the West that the economic reforms of Mikhail Gorbachev succeed, and the Soviet Union desperately needed Western technology Nonetheless, the American stand on "differentiation" prevailed: In some cases products could go to Eastern Europe that would not be permitted to the U.S.S.R., and in each case the "end use" of the product would have to be certified by the importer, lest a machine tool ostensibly destined for a bicycle shop in Prague not be diverted to a missile factory in Minsk. The CoCom nations also agreed to the "CoreList" exercise (originally a British idea), in which a much narrowed list of truly sensitive technology would be more stringently protected. Technical working groups are currently continuing this exercise, pending another high level meeting tentatively set for January 1991.

In the case of computers (see below), the CoCom agreement removes all controls on machines with a processing data rate (PDR) of up to 275 bits per second, which allows most 386 level PC's and small mainframes to be traded freely In the case of machine tools, the agreement decontrols machine tools with slide positioning accuracies of plus or minus two microns in the case of standard machines, and three or four microns in the case of milling or grinding machines (a micron is a millionth of a meter). This is slightly above the level of technology now allowed China, but somewhat below the more advanced machines in common commercial use in the West, which have positioning accuracies in the one micron range. In telecommunications, the CoCom nations agreed that Poland, Hungary, and Czechoslovakia could get somewhat more advanced technology, including common channel signalling equipment, as well as fibre optic and micro wave transition equipment of up to 156 megabits, subject to control regimes permitting for on-site inspection.

In CoCom jargon, "national treatment" means that the government of the exporting country decides, case by case, whether a license to a particular end use may be granted, without consulting the CoCom secretariat. This was the principle used with both computers and telecom. As noted, the problem with this approach is that European governments, once permitted national discretion, usually give their exporters far more latitude than the United States government allows its exporters. Far from moving toward a common system, the June agreement opened the door to a wider discrepancy As a result, European companies like France's Alcatel and Germany's Siemens remain in a better position to do business with Eastern Europe than their U.S.-based competitors. This is particularly ironic, for the U.S. is the one great power that comes to Eastern Europe with relatively clean hands. The East Europeans are particular eager for a strong American commercial presence; many are concerned that political liberation from the Soviet Bloc will lead only to commercial dominance by Germany

Despite ostensible changes in U.S. policy, it is clear that Pentagon officials retain immense power to thwart liberalizations that have been agreed to in principle by their superiors.

The Pentagon agency in charge of export controls, the Defense Technology Security Administration (DTSA), resisted even this compromise. A high ranking official of DTSA, reminded by members of the sub-cabinet inter-agency group working out details of the agreement that it had been personally approved by President Bush, snapped, "He doesn't speak for DTSA!"[24] In addition to a broad assault on DTSA's view of national security, the liberalization exercise also represents a loss of turf; not only did the Commerce Department gain influence at the Pentagons expense, but the Core List review was handled by the Joint Chiefs of Staff and the National Security Council rather than DTSA.

Despite ostensible changes in U.S. policy it is clear that Pentagon officials retain immense power to thwart liberalizations that have been agreed to in principle by their superiors. Only a week after the Paris conference of June 8, a U.S.-German-Hungarian consortium building a factory to make plastic and rubber injection molding for consumer products applied to the Defense Department to import U.S.-made machine tools well within the tolerances agreed to at Paris. The application was rejected. Officials of the Pentagon, in inter-agency meetings, tend to refer to the Core List as "the embargo list"-a subtle but revealing distinction. America's official policy and that of its CoCom allies is that the Core List defines sensitive technologies and products, which require that export requests be considered case by case, depending on end uses and on adequacy of security measures. This is, of course, entirely different from an outright embargo. Further, as inter-agency discussions have proceeded, Pentagon officials have suggested that as the Core List was liberalized, more products might have to be moved to the even more tightly controlled U.S. Munitions List. Conceptions of national security that were built up over half a century will not vanish overnight.

The Cutting Edge

It is worthwhile to consider in detail how the export control system has influenced the competitiveness of U.S. industry in the three industries that were the subject of such intense negotiation at the high level meeting last June—computers, machine tools, and telecommunications. These technologies and products are noteworthy because they are emblematic of generic high technology-they have applications far removed from military purposes. The worldwide market for them will only increase. They are produced by EC nations, Japan, and advanced newly industrializing countries, as well as U.S.-based producers. Significantly in each of these areas American producers started out with a huge worldwide technological lead, in some respects thanks to spillovers from the U.S. military And in each area, that lead is fast eroding.

Computers, machine tools, and telecommunications are noteworthy because they are emblematic of generic high technology.

Computers

As noted, the U.S. government has considered the computer to be perhaps the quintessential "dual use" product. Computers have an almost infinite number of uses, one of which is designing and simulating the use of weapons. U.S. government anxiety is highest in the case of the highest-end machine: the supercomputer The term "supercomputer" is rapidly ceasing to have any precise meaning, so rapidly is the technology evolving. The term was first used in the late 1970s to describe machines that introduced a new architecture of "vector processing" that allowed a quantum increase in the simultaneous computational capacity of a single machine, and thereby made possible far more complex problem solving. The first such supercomputer was the Cray I. The Cray was designed in large part to meet the needs of the government's own weapons design laboratories at Los Alamos, Sandia, and Lawrence Livermore.

The U.S. government has considered the computer to be perhaps the quintessential "dual use" product.

An unclassified **1986** publication by the Department of Energy,[25] titled 'The Need for Supercomputers in Nuclear Weapons Design," begins with the observation that "The use of high-speed computers and mathematical models to simulate complex physical processes has been and continues to be the cornerstone of the nuclear weapons design program." The report notes that the development of supercomputers "has been driven relentlessly by the weapons program because of the unique severity of the limits of testing." Designing a nuclear weapon that works requires taking into account an immense number of variables, including temperatures of roughly 10 million degrees, extremely short amounts of time measured in millionths of a second, velocities in the range of four million miles per hour, as well as delivery vehicle variables involving questions of aerodynamics and ballistics. According to the DOE, a weapons designer needs to vary an enormous number of parameters, which require something like 8,000 hours of computer runs.

Control Data Corporation (maker of the first rudimentary supercomputer in the 1960s) and Cray both owe their existence in large part to the Atomic Energy Commission, and later DOE's need for ultra sophisticated computers to design nuclear warheads and missile systems. When ordinary (serial) computing reached its natural limits imposed by the speed of light, vector processing vastly increased computing capacity Super-computation also made possible a concept that came into military vogue known as tailored output, in which the idea was to vary the explosive power of nuclear weapons, doing the lowest amount of damage consistent with a particular military mission. The constraints of the nuclear test ban treaty caused weapons designers to rely on computers to simulate the effects of three dimensional blasts-again requiring billions of separate calculations. The Strategic Defense Initiative (Star Wars), with its reliance on laser weapons and other focused energy weapons, requires even greater computational power The 1986 DOE report estimates that a computer with 1,000 times the power of the Cray 1 will be required to understand the physical phenomena that underlie such weapons.[26]

Needless to say, if supercomputers are the crown jewels of nuclear weapons design, missile design, Star Wars, and so on, it logically follows that they would not be good things for "the other side" to get their hands on. From this premise has flowed the U.S. policy of keeping supercomputer exports very tightly controlled. There are, however, four distinct fallacies in this view *First,* supercomputers also have countless civilian applications; everything from banking to biomedical research to weather mapping, to the design of complex non-military systems. *Secondly,* the very closeness with which the U.S. government has protected supercomputer technology has driven other nations to design their own. Israel, precluded from buying a U.S.-made supercomputer for its national technical university, is now rapidly developing her own machine, as are India and Brazil. (Although "import substitution" as a trade policy is out of fashion among Administration economics, export controls have precisely this effect on newly industrializing countries.)

The very closeness with which the US. government has protected supercomputer technology has driven other nations to design their own.

Third, although supercomputers are very handy in designing advanced weapons, they are not required. Seymour Cray is fond of pointing out that he designed the Cray I on an Apple. For that matter, the mathematics of the very first atomic bomb were worked out on a slide rule. As Jack Worlton (a Fellow at Los Alamos National Laboratory) wrote in a recent paper that has been widely circulated in the export control community: "Most of the sophisticated American nuclear weapons developed in the mid-1970s were designed with computers that were approximately 1,000 to 100,000 less powerful than modern high performance computers. The computational power that was available to American weapons designers in the mid 1970s is available today to any country that can acquire an engineering work station."*'

Fourth, as Worlton suggests, this technology is anything but static. Conventionally, a supercomputer has been defined as a machine that will do 100 million floating point operations (calculations) per second, known as megaFLOPS, or MFLOPS. A Cray I, introduced in 1976, operates at 160 megaflops-slightly above the level proposed by the Administration to define supercomputers. (The current Administration would allow relatively free sales of supercomputers of below 150 MFLOPS, and would require the usual safeguards for higher levels for non CoCom countries, and for machines of 300 MFLOPS or higher to CoCom destinations.) However, there are now a wide variety of machines offered by different manufacturers, some with price tags below a million dollars, that exceed 1,000 megaflops. The Bulgarian Academy of Sciences has demonstrated a machine with a capacity of 500 megaflops. Intel currently sells a chip, the i860, available at mass market retailers, which all by itself has a computing capacity of 60 MFLOPS. Inserted in two PS-2 level personal computers operated in harness, the chip creates a supercomputer By 1993, Cray, Intel, and Japan's NEC are all expected to have machines with capacities in excess of 10,000 megaflops.[28]

It does not follow, however, that any nation able to buy a PC will suddenly become a nuclear power. Designing and fabricating weapons requires

more than a computer. Unfortunately, U.S. export control policy has proceeded as if having the computer were tantamount to having "the Bomb." As noted, the Pentagon as recently as1989 strenuously resisted decontrolling 286-level PC's to Eastern Europe. Under the June CoCom agreement, supercomputers will continue to require individual validated licenses, but other computers will be decontrolled if their processing data rate or PDR is less than 270 megabits per second. Machines with PDRs of up to 1,000 may be considered for export to the U.S.S.R cassby-case, depending on their proposed end use; Poland, Hungary, and Czechoslovakia could get machines up to 2,000 PDRs which would allow 486-level PCs and more powerful mainframes. However, the very use of the PDR as a technical standard is a reflection of how technology overtakes policy, for the processing data rate is not a meaningful way to measure the efficiency of vector processing machines (supercomputers), and the distinction between supercomputers and ordinary computers is rapidly collapsing as vector technology proliferates. Under the revised CoCom agreement of last June, midrange mainframe computers, such as Digitals VAX 800 or Control Data's Cyber 910, were meant to be decontrolled. However, as mainframes incorporate vector processing capabilities, they become redefined assupercomputers and subject once again to individual licensing.

As Japanese supercomputers become increasingly competitive, the marketing pitch of Japanese salesmen is invariably that the customer will encounter far less red tape if he buys Japanese.

Though this technology cannot be kept in a bottle, US. industry can. Before a supercomputer can be exported, the government requires not only an individual validated license, but an elaborate plan to safeguard who uses the machine and for what purposes. The government is particularly cautious when supercomputers are proposed to be shipped to Third World countries with a record of casual dealings in their own high-tech products, or who have not signed the nuclear non-proliferation treaty Sales do get made. Cray has sold supercomputers (with elaborate safeguard protocols) to the India National Weather Center and IBM sold a 3090 with vector processing to Petrobras in Brazil. But as Japanese supercomputers become increasingly competitive, the marketing pitch of Japanese salesmen is invariably that the customer will encounter far less red tape if he buys Japanese. Japan and the United States have entered into a secret agreement (whose very existence is classified) which commits them to identical control regimes in supercomputers. But the rules, as always, are subject to national interpretation. This roadblock to American sales of supercomputers is particularly unfortunate, since U.S.-made supercomputers continue to deliver more computing power for less cost than their Japanese rivals Yet as computing power keeps increasing, many customers will buy a slightly less desirable Japanese machine just to receive a lower level of export control complication.

Intel Corporation has proposed that the Department of Commerce redefine a supercomputer to reflect the reality that technology keeps evolving. Supercomputer exports would be unregulated within CoCom, except that sales would have to be reported for tracking purposes. Outside CoCom, a super-computer would be defined as one whose computing speed exceeded 25 percent of the fastest computer currently in commercial ser-

vice. Today, that would be about 500 MFLOPS. This would seem to make eminent sense; it would preserve U.S. control over the highest level machines as they evolved, and permit commercial sales of all others Unfortunately, the Pentagon and DOE continue to consider it risky to increase the proliferation of computers that exceed a benchmark established nearly two decades ago. This doesn't keep fast computers from being sold; it only denies the business to American companies.

There is a paradox in the government's relationship to the supercomputer industry, which serves as a metaphor for the larger problem. On the one hand, U.S. military interests incubated the industry And as noted so poignantly in the DOE paper on nuclear weapons, the governments military establishment depends on the survival of companies like Cray and Control Data. On the other hand, Cray and the others do not exist solely as captive contractors to government. Threequarters of their sales are to non-government customers. So if the government squeezes too tightly, it kills this golden technology even for military let alone commercial, ends. To put this in perspective, Cray, despite its early links to the military, is a relatively small entrepreneurial company with some 5,000 employees and sales of about $750 million. Its three main Japanese competitors are Hitachi (sales: $50 billion); NEC (sales: $32 billion); and Fujitsu (sales: $18 billion), each among the worlds 50 largest industrial corporations. A second paradox is that supercomputers happen to be a product which Japan has flagrantly protected. The Office of U.S. Trade Representative has struggled mightily to open Japanese markets to U.S. producers. So one branch of the government incubated the American supercomputer industry; another is valiantly attempting to reduce barriers to U.S. supercomputer exports; while a third is attempting to restrict exports.

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Machine Tools

In the past two decades, the venerable machine tool industry of industrial lathes, punches, and drill presses became a brand new, computerized ("numerically controlled') industry Fittingly enough, numerically controlled machine tools were invented and commercialized thanks to a series of Defense Department contracts beginning in 1949. The Air Force not only provided the funding to develop the first punch card NC system, which was used to make helicopter rotor blade airfoil patterns with greater accuracy than had been achieved with traditional machining techniques, but they also provided much of the working capital and assured the viability of the new NC machine tool industry by procuring a large share of the first generation of such machines, In 1955, NC became the standard specification for the Air Force's own machine tool stockpile.[29] The Pentagon also provided a very significant fraction of the R&D outlays for the development of more sophisticated machines, using multiple axes, as well as the software. All of this gave the American machine tool industry at least half a decade head start in this new, rapidly evolving technology

Remarkably, the basic CoCom list of technical specifications for ptvhibited machine tool exports was not revised between 1974 and 1990.

In the 1970s and 1980s, as the industries of other nations became more competitive, the technical sophistication of machines in wide commercial circulation continued to evolve. By 1980, Japan had surpassed the U.S. as the leading exporter of machine tools in general. Remarkably the basic CoCom list of technical specifications for prohibited machine tool exports was not revised between 1974 and 1990. (As noted, revision of the CoCom list requires unanimous consent, and the United States often vetoes pro posed liberalizations.) CoCom specifications for machine tool exports are based on machining tolerances and the number of axes which can be simultaneously controlled, which governs how sophisticated a shape the machine can contour Because in 1974 the Defense Department believed them to be approximately the state of Soviet technology, tools that can produce machine parts within plus or minus ten microns have been subject to export controls requiring individual validated licenses. But since then, five micron tolerances have gone from state-of-the-art to off-the-shelf, and machine tool producers literally no longer build tools with tolerances as crude as ten microns.

Since some of the nations allied to the United States administer their own export controls with a lighter hand, the Soviet Union is hardly denied all access to sophisticated machine tools; the system merely ensures that Japanese and German rather than U.S. producers get its business. The Soviet Union is the worlds third largest importer of machine tools. (It imported more than $1 billion worth in 1988. West Germany supplied products with a value of $568 million and Japan $122 million, while U.S. producers made sales totalling just $1.3 million.)[30] In fact, the Soviets have demonstrated machines at U.S. machine tool trade shows that American producers would be prohibited from exporting to them.[31] Reflecting on the military genesis of NC machine tools, one appreciates how the invention has come full circle. Our self-defeating "industrial policy" for advanced technology, conceived and then constrained by military logic, perfectly cancels itself out.

Machine tools are subject to national security export controls because they can be used to make weapons. Like computers, they can also be used for an almost infinite range of commercial purposes. Certain common products such as fuel injection systems for automobiles, beverage cans, xerography drums, fax machines, and camera mechanisms require machines with extremely fine tolerances, and of course the machines that build these machines require even finer tolerances. Unlike computers, the machine tools industry is one whose American producers have been severely hurt by imports in recent years, especially at the high end At the same time, very advanced machine tools represent a product where the U.S. could regain export markets-but of course it is precisely this end of the industry's product line that raises national security concerns in the Pentagon. The machine tool case is an epic example of a failure by the export control bureaucracy to keep up with the rapidly evolving technology In Congressional hearings on the Export Administration Act last Spring, the Pentagons witness was highly embarrassed when Subcommittee Chairman Sam Gejdenson called industry representatives out of the audience who flatly contradicted the Pentagons assumptions about prevailing machining tolerances.[32]

As a result of the Pentagons extreme caution about letting U.S. producers sell advanced machining technology U.S. producers have lost sales overseas that cumulatively could run to the billions of dollars. For example, in one recent (1988) case, Hardinge Bros, Inc., a machine tool manufacturer based in Elmira, NY, lost an order for seven industrial lathes to the Xiang Xiu Washing Machine Company in Shanghai. The license was blocked by the Pentagon because the machine was programmable in metric to a tolerance very slightly in excess of limits then acceptable to the Defense Department Hardinge appealed. In the meantime, the Beijing company decided to order from a German manufacturer instead. Hardinge's representative inquired why Germany, a CoCom member, did not impose the same constraints as the U.S. government No answer was forthcoming. This occurred after the company had gone to great lengths, with U.S. government encouragement, to develop a marketing base in China, including bringing customers' representatives to the U.S. for training, at Hardinge's expense. In January 1989 a longtime Hardinge customer in Brazil canceled a similar order, with the explanation, "[T]he American system takes too long-we can buy German." At that point Hardinge had 23 export license applications pending, the oldest of which had been under review for almost a year According to Clifford Holdridge, Hardinge's former manager of international sales and marketing, "I've lost hundreds of millions of dollars of export sales because of licensing delays, but I've never lost a license appeal." In other words, the bureaucracy eventually recognizes that the license ought to bepermitted—but often only after the damage is done.[33]

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In another recent case, the Moore Special Tool Co. of Bridgeport was denied a license by the Pentagon to ship machinery for making soft drink cans to Hungary The Pentagons reason for the denial was that the stated end use of the machine doesn't require the level of technology that the machine provides. Or as another DTSA official said in another case, "It's too

good for the bastards."[54] The Moore Company, like Cray Research, is another poignant example of a firm that is precisely the. sort of entrepreneurial creature America needs. Export sales account for 40 percent of total sales. A research lab in Shanghai was recently named for Wayne R. Moore, president of the family-owned company Yet, like Cray, Moore is also an example of a firm that the military establishment helped to develop technologies, some of which are now considered too sensitive to export freely The Department of Energy is a customer for highly classified Moore mirror-turning machines, with tolerances measured in angstroms, used by Lawrence Livermore and Rocky Flats to fabricate weapons. Once again, the military establishment functions as a technological patron in a fashion that is commercially perverse, almost like one of those novelty boxes which you turn on, only to have a hand come out of the box to turn the switch off

As long as the existing schema is in place, there is a risk that the process of keeping standards up to date will lag as it has in the past.

As noted, at the June CoCom meeting the Bush Administration agreed to a much finer set of tolerances for general distribution licenses for machine tools. Products will be decontrolled down to the plus or minus two to four micron level, depending on the type of machine tool and the number of axes that can be controlled independently The machine tool industry is relatively pleased that the Administration has agreed to bring the technical standards for export licensing up to a level that is almost consistent with commercial realities. Yet it also has reason to worry As long as the existing schema is in place, there is a risk that the process of keeping standards up to date will lag as it has in the past. There is a risk that the mentality which considers advanced technology "too good for the bastards" will continue to influence policy And there is a risk that our trading partners in Europe and Japan will continue to give priority to the commercial interests of their domestic producers, and administer export control regulations with their customary lighter touch.

Telecommunications

Until the 1980s, the U.S. telecommunications system, like that of most nations, existed in a sheltered market. For telecommunications competitiveness, deregulation has been a two-edged sword. On the one hand, deregulation has compelled the U.S. telecommunications industry to become more entrepreneurial; it has introduced a new degree of competitiveness both among U.S. producers and between U.S. producers and their foreign competitors. Characteristically, this market-opening has been asymmetrical. The U.S. deregulated telecommunications for ideological reasons and as the incidental byproduct of an antitrust suit against AT&T Deregulation was consummated without any reference to trade issues, and without seeking reciprocal access to foreign markets as a *quid pro* quo. This, of course, let foreign producers into the U.S. market, with no guarantee of a U.S. entree overseas.

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Nonetheless, foreign telecommunications monopolies are also gradually crumbling, in part because of the influence of the U.S.-inspired vogue for privatization and deregulation, and this does create new export opportunities for U.S. telecom producers, albeit at a pace that lags the opening of the U.S. market. The legacy of regulation and shelter produced an industry that is highly competitive in some sectors, and less competitive in others. The AT&T monopoly coupled with toll regulation allowed the costs of research and development to be passed along to telephone customers. This in turn allowed Bell Labs to operate as a product development laboratory second to none. Thanks to the economics of the industry, AT&T maximized its profits by steadily improving its overall system and lowering the costs of its operation so that it could attract ever greater numbers of customers. These immense capital costs were also absorbed in the rate base. This economic logic meant that the great thrust of product improvement came in the "hidden," capital-intensive, high-tech parts of the system: digital switching, optical fibre technology, related software, communications satellites, as well some end-user products such as cellular radios that involve complex systems technology The military interest in telecommunications also helped spawn US. leadership in such technologies as packet switching, microwave, and satellite technology For the most part, however, the regulated U.S. industry was slower to make advances in that end of the business where the products were highly pricecompetitive and looked more like consumer electronics goods—telephone receivers, answering devices, fax machines, etc.

As a result of this legacy U.S. telecom firms retain a'strong competitive position in the heavily capital intensive portion of the industry-the switching, networking, and wiring. As Western and Third World nations privatize their state-run telephone monopolies, and as formerly communist nations seek to have Western capital help modernize their antiquated telephone systems, U.S. firms are well positioned to compete. Once again, however, it is here that export controls pinch.

The U.S. government is resistant to the idea that non-CoCom nations should have stateof-the-art telephone systems. This resistance boils down to one concern-electronic eavesdropping. As noted, the National Security Agency operates on the premise that it needs to be able, as necessary to intercept any electronic communication that takes place in the world, but to defend highly sensitive U.S. government communications against interception by foreign powers.

The U.S. government is resistant to the idea that non-CoCom nations should have state-of-the-art telephone systems. This resistance boils down to one concern-electtvnic eavesdropping.

The need for electronic eavesdropping arises from two concerns: ordinary intelligence gathering, and the need to intercept what the defense community call the three C's—command, control, and communications. The NSA wants to intercept voice communications that give warnings of troop movements, as well as data transmissions ordering the firing of missiles The nations of the East Bloc have been notorious for having poor long distance telephone technology "Their computers are pretty good, their rockets are good, but the link between the computer control and the missile silo is two tin cans and a very long string,"[35] according to a knowledgeable telecommunications expert.

As long as the Cold War was hot, the US. government was intent on keeping East Bloc telecommunications technology as primitive as possible. Yet even in the CoCom high level meeting of last June, where the US. met allied demands for liberalization at least halfway in the dual-use sectors of computers and machine tools, there was virtually no American compromise on telecommunications. At the insistence of NSA and the Defense Department, the U.S. representatives insisted on technical parameters that limit Eastern European access to Western technology to levels well below state-of the-art, particularly in the key areas of optical fibre, digital switching, and related software. An even lower level of technology was retained for exports to the U.S.S.R..

Unlike computers or even machine toots, large telecommunications systems are not a sector in which customers are free to switch suppliers casually Whoever gets the contract to rewire the telephone system of Hungary or Roland is likely to do business there for a very long time. In effect, a one-time window of opportunity is closing. The bus, as it were, is leaving, and American companies may not be on it. As in other areas of export control, the companies of allied nations are held to the same limits in theory, but not always in practice. By the time the U.S. defense agencies are satisfied that the Cold War is truly over and that Czech rockets are no more likely to be launched against NATO troops than British ones, a business opportunity will have been irrevocably lost. As it happens, the emerging democracies of East Europe are extremely eager to bring in U.S. suppliers. American telephone systems justifiably enjoy an excellent reputation in Eastern Europe, and the East European governments are eager to buy American when they can to offset the emerging dominance of Germany 'The Germans built our telephone system fifty years ago, under the Nazis," a Hungarian minister told a U.S. trade official. "We are not ready for a return service call."[36]

The telephone systems of Eastern Europe are technically about fifty years behind those of the West. Throughout the region, there are waiting lists for telephone service ranging from eight to fourteen years on average. A senior Hungarian telecommunications official told a State Department Task Force on Telecommunications and Broadcasting in Eastern Europe, "[H]alf of Hungary is waiting for a telephone, the other half is waiting for a dial tone."[37] Hungary has entered into agreements with Alcatel (French), SEL (German), and Northern Telecom (Canadian) to provide various aspects of their new network. U.S. West and LM. Ericsson of Sweden have entered into an agreement with MagyarPosta to provide cellular radio service, although U.S. West is not permitted to expand beyond a single-cell site in Budapest. Since Sweden is not a CoCom member, Ericsson is permitted more latitude than U.S. West. Ericsson, for example can train the Hungarians in the use of certain technologies, but U.S. West cannot In Czechoslovakia, where the telephone system was installed by Siemens in the 1930s, the government is negotiating with a number of Western suppliers to obtain manufacturing technology for local production to modernize its phone system, including Siemens, Alcatel, Northern Telecom, and Ericsson. U.S. West and Bell Atlantic have both been involved in joint venture discussions with the Czech Post and Telecommunications ministry, but the Prague press carried reports of concerns about whether U.S. firms would be "reliable suppliers," given export control constraints.[38] The State Department task force report quotes one unnamed Western telecommunications company as estimating that "Half of their R&D effort is focused on working around CoCom."[39]

Perhaps the most far-reaching denial to date was the veto last June of a proposed joint venture inwlving US. West in the installation of a long distance trans-Siberian optical fibre line in the Soviet Union.

AT&T, as well as several of the former Bell system operating companies, have begun to explore joint ventures in East Europe and in the U.S.S.R. The current export control standards permit them to sell technology but below the level the Eastern Europeans want And given that this is a once-in-a-generation investment, the Eastern Europeans are not likely to be satisfied with 1970s technology when 1990s technology is available. This also rankles the other CoCom members. "You can phone Paris from Peking using modern Alcatel technology," said a French trade official indignantly on the eve of last June's CoCom meeting, "[B]ut not from Budapest."[40]

Perhaps the most far-reaching denial to date was the veto last June of a proposed joint venture involving U.S. West in the installation of a long distance trans-Siberian optical fibre line in the Soviet Union. (U.S. West is the "Baby Bell" company serving Rocky Mountain states.) A British firm, Cable & Wireless, had also been interested in the deal, and the final decision to withhold both U.S. and British participation was made by President Bush and Prime Minister Thatcher personally last June 5, a day after Soviet President Gorbachev departed the U.S. from his goodwill tour. According to very well placed sources, the National Security Agency wants to delay Soviet optical fibre capability Optical fibre cables are installed underground, and are far more difficult to tap than microwave communications, which are the current basis for much of the worlds telephone traffic. (According to U.S. Congressman Amory Houghton, formerly the chairman of Corning Glass, optical fibre systems can be intercepted-but it is more expensive to do so) At this writing, the Koreans, who have a growing capability in fiber

optics, have reportedly begun negotiations with the Soviets. U.S. telephone companies, of course, have long cooperated with the Pentagon and intelligence agencies. Many in the industry have argued that the U.S.S.R. will eventually get up-to-date optical fiber and digital switching technology, and that it would make more sense for the intelligence community to make certain that those who install it are American companies. But so far this argument has fallen on deaf ears.

Although US. technology is held in extremely high regard in Eastern Europe and the U.S.S.R., reliability of supply is just as important to these new customers as quality and price of technology.

The NSA has also resisted giving East Bloc nations access to the system known as ISDN Common Channel Signal System Seven, which uses digital switching in a highly efficient and difficult-to-intercept manner In older telephone systems, two distinct networks are required, one to signal that access is desired and verify that the receiver is available, the other to actually complete the communications link. Network facilities were tied up making connections. System Seven uses packet switching to allow bursts of data to go over the same line at the same time, allowing for much more efficient use of networks (andmaking communications harder to monitor). At the June CoCom meeting, Signalling System Seven was permitted for Hungary, Poland, and Czechoslovakia, pending acceptable end-use controls, but not for the U.S.S.R.. And some restrictions were maintained on inter-city optical fibre and the related software even for Eastern Europe.

Although U.S. technology is held in extremely high regard in Eastern Europe and the U.S.S.R., reliability of supply is just as important to these new customers as quality and price of technology Several U.S. firms are exploring joint ventures in Eastern Europe, and it remains to be seen how much these will be constrained by the remaining export control strictures. By the same token, in this highly competitive industry U.S. firms are unlikely to invest effort and money to cultivate markets that they will not be permitted to serve.

The Congress

The Export Administration Act expired on September 30, 1990. Legislation enacted by Congress (The Omnibus Export Amendments Act o1990) reauthorizing and liberalizing the system was pocket vetoed by President Bush on November 15, 1990. The bill was vetoed not because of substantive disagreements between the President and Congress over export control liberalization, but because of a separate chemical weapons bill that was added to the omnibus package. That bill would have compelled the Administration to impose one of several possible sanctions against nations using chemical weapons; it was opposed by the Administration both as "micromanagement" of foreign policy limiting executive branch discretion, and—more pointedly-as a not so oblique, after the fact, criticism of the Administrations pre-August 2, 1991 friendliness with Iraq.

Even with reform legislation, the Administration will retain a good deal of mom to define policy.

Despite the veto, the Administration has used an executive order to implement the intent of most of the export control legislation. The most important provisions are first, the creation of a license-free zone within CoCom—that is, products for export to CoCom member countries would not require individual validated licenses, This provision alone should eliminate an estimated 27,500 licenses per year as well as eliminate the requirement of re-export licensing from CoCom member nations. Secondly, this provision will create an expedited procedure for licensing decisions on those products and technologies where US. national policy diverges from that of other exporting nations, producing licensing decisions within thirty days in most cases. The bill also mandated a sunsetting of all export controls and annual indexation of technical performance standards, as well as judicial review of most of the export licensing system.

However, given the record of the executive branch, it is essential that Congress write new legislation, locking the liberalizations into law Since 79 members of the Senate urged the President not to pocket veto the bill, it is very likely that new legislation will be forthcoming, either with or without the President's signature.

Even with reform legislation, the Administration will retain a good deal of room to define policy The target date for a new, streamlined core list of controlled exports has already slipped from early January 1991 to April or May 1991. And beyond ordinary bureaucratic foot-dragging there is a real risk that the United States will continue its old habit of placing military security far ahead of economic security, and to that end bearing burdens not shared by free-riding allies who grudgingly accept U.S. leadership and then take advantage of it to pursue their own commercial goals. As the Persian Gulf crisis suggests, there are new hostile powers in the world, and the U.S. is still quickest to step into the breach. It took a good measure of arm-twisting to persuade NATO allies to provide even token forces in the Middle East. With the Pentagon export control bureaucracy frantically seeking a new rationale, the Iraqi invasion of Kuwait could not have come at a more opportune time. It is possible that the export control regime, rather than

being seriously liberalized, will simply be redirected towards new adversaries, along a North-South axis rather than an East-West one. There will certainly be voices within the Administration urging that course. Indeed, compared to Muammar Quadaffi and Saddam Hussein, Mikhail Gorbachev looks like the leader of a responsible, middle-aged, status quo power If high-tech products are too dangerous for Gorbachev, don't we need even higher fences to keep them away from Hussein?

If CoCom is truly to be a cordon sanitaire against terrorist regimes, then it must function as a single system. That means a stronger multilateral enforcement machinery, consistent standards among all CoCom member nations, and a license-free zone within CoCom.

We do, of course, need serious, multilateral measures to keep weapons technology-chemical, nuclear and conventional-out of the hands of outlaw regimes and terrorists. It is worth observing, of course, that many of Hussein's weapons were made in the West, as was his financial credit as long as the U.S. found him a useful foil against Iran. We do indeed need high fences around genuinely military products and technologies. But it is pointless to attempt to control the broad generic products of a high technology era, products which are increasingly available from non-U.S. suppliers.

The export control story is a piece of two bigger stories. It sheds useful light on both. The first has to do with the new pluralist era the world is entering. It is not practical for the U.S. to "bear any burden" single handedly, if indeed it ever was. The cost to U.S. industry is too high, and the asymmetry in national export control policies weakens the entire system. If CoCom is truly to be a *cordon sanitaire* against terrorist regimes, then it must function as a single system. That means a stronger multilateral enforcement machinery consistent standards among all CoCom member nations, and a license-free zone within CoCom.

The other story is the continuing one about the unexplored, unacknowledged relationship between the military goals and the economic well-being of the United States. In pursuing export controls, it is striking how military technology policy both nurtures and then thwarts technological competitive advantage. As long as the people at DARPA, who help firms develop the technologies, have no contact with the people at DTSA, who prevent them from being exploited commercially, U.S. policy will be literally self-defeating. Here, as in so many other areas of technology policy it would be helpful if the United States had one set of technology goals, and if one hand knew what the other was doing. That, in turn, requires us to embrace an explicit technology policy for the United States, and connect it both to our trade policy and to our several national security objectives, as well as our commercial objectives.

Recommendations

The export control system has outlived its original assumptions, and is now causing net harm to America's national well-being. The system needs to be radically overhauled.

1. With the exception of a very narrow core list of vey highly sensitive nuclear, chemical, and missile technologies, controls predicated on the idea of denying advanced dual-use technologies to democratizing former Soviet Bloc nations such as Poland, Czechoslovakia, and Hunga y should be abol-tied. In the case of the U.S.S.R., advanced technologies should be gradually deregulated as East-West arms control and internal reform of the Soviet economic and political system proceed, and as the U.S.S.R cooperates with CoCom to limit proliferation of advanced weapons technology

2. The rhetoric about "higher fence around fewer products" should be put into practice. Instead of separate, overlapping control regimes for munitions, nuclear non-proliferation, chemicals, missiles, and general dual-use products, there should be a single export control system and a single set of regulations, located in a single agency The Pentagon should be given a rigid time limit to raise objections to any export, and their veto power should be eliminated.

3. All the export control criteria and procedures of CoCom member nations should be harmonized. This will require strengthening of CoCom as a multilateral agency, and a delegation of greater authority to it by member nations. It is intolerable to have U.S. exporters subjected to different standards than those of their competitors. It makes no sense to have a common export control bureaucracy under the aegis of CoCom and then to have an inconsistent set of U.S. national controls.

4. The reduction of East-West controlled commodities to a much smaller "Core List" is to be welcomed and once CoCom's own machinery is strengthened, all exports within the CoCom area, with the exception of nuclear materials and explicit weapons, should be license-free.

5. Other nations should be urged to collaborate with CoCom, including the Soviet Union, the nations of Eastern Europe, and responsible nations of the Third World.

6. The Core List should be viewed as a "watch list," not an embargo list. Most remaining limitations on exports to destinations outside of the CoCom area should be based primarily on end use and on the adequacy of controls, not on the nature of the product, the technology, or the destination per se.

7. Stringent controls should be devised, under the multilateral auspices of CoCom, to assure the non-proliferation of nuclear weapons, missiles, chemical and biological weapons, and the instruments of terrorism to outlaw regimes. with the new East-West situation, the main threat to the peace

arises from nations that sponsor terrorism and regional aggression. The main risk of nuclear war arises from proliferation, not a NATO-Warsaw Pact exchange. And so the main axis of strategic export controls becomes North-South, rather than East-West. But this should not become an excuse for keeping the present system intact, only with different defined enemies.

8. With regard to exports of arms and technologies closely related to the production of weapons, CoCom should be strengthened. With the end of the Cold War, there is a glut of weapons production capacity and the risk of intensified arms sales. It is absurd that NATO allies should have an elaborate system for control of arguable "dual use" products, but at the same time pursue unilateral policies, sometimes at odds with each other, in the sale of weapons. CoCom member nations need a common policy on arms sales, and in general should drastically restrict arms sales to the Third World.

9. Congress should amend the Export Administration Act to assure a license-free CoCom zone, as well as providing that the provisions be se&x-ecuting and subject to judicial review: mandatory periodic revision of technical standards. The several export controls should be amalgamated and simplified, and the President's authority to impose unilateral export controls for foreign policy purposes should be curtailed rather than expanded.

10. Congress should **create** *a single Office of Strategic Trade Policy that would, at a minimum, coordinate all strategic export regulation, and perbaps other trade policy areas as well.* A more far reaching version of this idea would also include trade negotiations now handled by the U.S. Trade Representative, anti-dumping investigations now conducted by the U.S. International Trade Commission, technology transfer and offset agreements negotiated by the Pentagon, as well as strategic export controls now administered by several agencies. Other agencies concerned with technology policy and competitiveness, such as the National Science Foundation, the National Institute of Standards and Technology, DARPA, the White House Science Advisor, the Department of Energy's National Laboratories, NASA, etc., would have regular liaison and consultation with this new agency, so that the links between trade negotiation pursuant to the GATT, development of technologies, and strategic export controls, would be better acknowledged and appreciated.

In sum, America's remaining export control policies should be closely coordinated with a more explicit technology policy at the highest levels of government, so that tradeoffs between America's military and economic interests can be addressed explicitly As noted, this will require more than legislative or bureaucratic revisions. It will require a new way of thinking about America's interests in the world.

Endnotes

1 "Export Controls: Extent of DOD Influence on Licensing Decisions," Document GAO/NSIAD-89-155, June, 1989 (Washington DC: General Accounting Office), p. 22.

2 *Balancing the National Interest: US. National Security Export Controls and Global Economic Competition,* Allen Panel Report (Washington, DC: National Academy of Sciences, 1987), p. 107.

3 Ibid., p. *235.*

4 Michael Mastanduno, "CoCom and American Export Control Policy: Lessons from the Reagan Administration." Paper prepared for the Ford Foundation Project on East-West Trade and the Atlantic Alliance, June *4-6, 1989* (Paris), p. 17.

5 Ibid., p. *18.*

6 Confidential interview.

7 Steven B. Gould. "Foreign Nationals in U.S. Science and Engineering." In *Balancing the National Interest*, op. cit., p. 14.

8 Charles H. Ferguson. "High Technology Product Life Cycles, Export Controls, and International Markets." In *Balancing the National Interest*, op. cit., p. 80.

9 Kevin F. F. Quigley and William J. Long, 'Export Controls: Moving Beyond Economic Containment," *World Policy Journal,* Winter *1989-90,* pp. *169-70.*

10 *Balancing the National Interest*, op. cit., p. 121.

11 *Balancing the National Interest,* op. cit., p. *124.*

12 Ferguson, "High Technology Product .," op. cit., p. *79.*

13 Confidential interview

14 Confidential interview

15 Hearings before the House Subcommittee on International Economic Policy and Trade, November 17, 1989.

16 Confidential interview

17 Industry source.

[18] Industry source.

[19] Confidential interview

[20] Anthony J. Blinken. *Ally vs. Ally: America, Europe,* and *the Siberian Pipeline Crisis* (New York: Praeger Publishers, 1986), p. 3.

[21] Ibid., p. 124.

[22] Industry interview

[23] Mastanduno, "CoCom and American Export. . .," op. cit., pp. 8-9.

[24] Interview with anonymous working group member

[25] U.S. Department of Energy 'The Need for Supercomputers in Nuclear Weapons Design," January 1986, p. 1.

[26] Ibid., p. 15.

[27] Jack Worlton. "Some Myths About High Performance Computers and Their Role in the Design of Nuclear Weapons." Technical Report No. 32 (Los Alamos: Worlton and Associates), June 1990, p. 1.

[28] Source: Intel Corporation.

[29] Rachel Schmidt. "Civil and Military Spending: The Case of Numerically Controlled Machine Tools." Paper P-7471, (Santa Monica, CA The RAND Graduate School, 1988).

[30] Source: National Machine Tool Builders Association, March 14, 1990.

[31] Source: National Machine Tool Builders Association.

[32] Hearing before the House Subcommittee on International Economic Policy and Trade, March 8, 1990.

[33] Source: Clifford Holdridge and Hardinge company records.

[34] Machine tool industry source.

[35] Confidential interview

[36] Confidential interview

[37] "Eastern Europe: Please Stand By," Report of the Task Force on Broadcasting and Telecommunications in Eastern Europe, (Washington, DC: U.S. Department of State, 1990), p. 29.

[38] Interview with official of telecommunications company

[39] "Eastern Europe Please Stand By," op. cit., p. 19.

[40] Confidential interview.

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