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Strategic bundling: Information products, market power, and the future of globalization

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Strategic bundling:
Information products, market power, and the future of globalization.[1]

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Abstract: Strange argued that barriers to trade have fallen because increasing returns in product development and production: rising R&D costs, short product life cycles and low marginal costs of production raise the relative cost of producing for protected national markets. As an explanation for global (as opposed to regional) liberalization, Strange's argument requires that increasing returns be extreme. The class of products exhibiting the most extreme increasing returns is that of information products - goods such as general purpose computer software and digitized entertainment. Following Strange's reasoning, it might seem that the technological nature of information products is one of the drivers of global trade liberalization.

The trouble with this argument is that while the technological properties of information products are necessary for extreme increasing returns, they are not sufficient. Increasing returns in information products are cemented by business models which leverage small portfolios of intellectual property into the control of markets. Information products are, however, equally well suited to other business models in which increasing returns are slight and competitors are many. To continue with the software and entertainment examples above, these include models based on free software, and on disintermediated markets for digitized entertainment. At present, the institutional structures within which information products are made and sold, are contested. The outcome of these contests could result either in the maintenance of monopoly power and increasing returns, or a shift to far more competitive and decentralized market structures. If the latter occurs, the increasing returns imperative for global trade liberalization would be weakened.

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1. Introduction

Why have political barriers to international trade and investment fallen over the past fifty, and especially the past twenty five, years? One answer to this question is provided by Susan Strange (1992), in whose account trade barriers are beaten down by the growing bargaining power of multi-national corporations (MNCs); the source of the MNCs' power is, in turn, a set of new technologies and an environment of rapid technological change. I will argue that this supposed technological imperative for global liberalization of trade and investment is, to a significant degree, contingent on the institutional framework regulating the market power which is built around intellectual property rights (IPRs) in information products.

In Strange's theory, rapid technological change means high R&D costs, and this produces an increasing returns imperative for liberalization: high trade barriers become simply too costly. To reach the conclusion that this explains global liberalization, Strange implicitly assume that the magnitude of the increase in increasing returns is great enough to bring about liberalization on a global scale, rather than within regional trade blocs. It is likely that this is true for some products and not for others. When knowledge is tacit, or embedded in the production process, scale economies are attenuated. Strange's assumption would seem to be stronger in the case of information products, products where almost the entire cost consists of R&D and the marginal production (copying) cost is trivial. Such products include general purpose computer software, digitized movies and music (where the creation of the digitized dramatic or musical production plays the role of R&D), genetically modified seeds, and this journal.

One might conclude, then, that global trade liberalization is being pushed along by *technological* characteristics of information products, which lead to great scale economies. But the scale economies of information products are unlike those of the scale economies of a factory, in that they are not simply technological but depend also on maintaining commercial control of the copying process. At a first approximation, this would mean that Strange's mechanism depends on the enforcement of the IPRs pertaining to information products. That is true, but it only begins the story. The business models

adopted by Microsoft and the big Hollywood studios are not aimed at simply enforcing intellectual property rights, but at using those rights along with the control of strategic points in the distribution network, to create significant and lasting market power. I will refer to this type of business model as the "strategic bundling" of information products.

Strategic bundling is present in many industries, but is a particularly powerful generator of rents in information products. Rents, however, attract competitors. Some of those competitors enter the market by adopting business models which employ far less strategic bundling; these models display significantly reduced scale economies, and would likely lead to less centralized and more varied production, and a less central role for the US in information industries.

Just as the apparent scale economies of information products are institutional as much as technological phenomena, the contest between business models for information products is as much political as commercial. Competition authorities, trade representatives, courts and other state actors, weigh in; content producers at one end of the supply chain, and consumers at the other, both often represented by organs of civil society, play roles in shaping the institutional environment. The outcome of these contests will have profound implications for the shape of the world trading system.

The rest of the paper is organized as follows. Section Two deals with the role of productive knowledge in Strange's technologically-based theory of liberalization; it shows that Strange's argument for the causal role of high R&D costs, short product life cycles in global trade liberalization is not persuasive for many kinds of product, but holds for strategically bundled information products. Section Three locates information products in the literature on the varieties of capitalism, and notes their particular importance for the United States. Section Four shows that strategic bundling of information products is under serious threat. Section Five concludes.

2. Knowledge and intellectual property in "technological" explanations of trade liberalization

A very simple theory of technologically determined global liberalization would hold that distance-shrinking technologies such as modern information and communications technologies (ICTs), air travel and container freight, have somehow made globalization something which states cannot resist. It is hard to find any other causal mechanism in Castells' magisterial trilogy on the information age, despite the author's keen grasp of the use and development of information technology and of information flows (Castells 1996; Castells 1997; Castells 2000). So, for instance, capital controls have allegedly been made impractical by electronic funds transfers. It is not immediately obvious, however, that lower technological barriers to trade should be met by lower political barriers: why should we expect the two to be complements, and not substitutes? Moreover, the notion that economic integration moves forward, monotonically, with technological advance, is historically untenable.

As Hirst and Thompson (1999) point out, international financial markets were in some ways as integrated in 1914 as they were in 1980; there had been a marked retreat from integration between 1914 and 1945. While, by many measures, the 19th century wave of economic integration peaked just before the first world war, in terms of tariff protection its retreat began in the 1880s (Krasner 1976). This rise in tariff barriers - followed, a few decades later, by rising barriers to capital flows and by an overall reduction in trade - happened during a time of great improvements to distance-shrinking technology. If we consider the principal explanations for the rise of protectionism in this period, there is a strong case to be made that it actually happened not despite, but because of, these technological advances. One view is that it had to do with the requirements of stabilizing industrial markets with high fixed costs - the then-new markets of mass production (Piore and Sabel 1984). Another is that it was a response to changes in relative prices, partly because of emerging mass production but in particular because of reduced transport costs and the rise of the trans-oceanic grain trade (Alt and Gilligan 1994; Rogowski 1989). A third is the challenge to British hegemony posed by the growth of the United States and the unification of Germany

(Krasner 1976). All of these explanations are plausible and they are by no means mutually exclusive. If we regard them as three factors contributing to renewed protectionism, we note that only one of them (the third) is *not* a simple policy response to the consequences of technological change, with distance-shrinking a major element. In these explanations, technological change affects the interests various actors have in international trade and investment, and changes in the structure of the international economy come from the political decisions which result.

In the same spirit, Strange (1992) offers a technologically-driven theory which goes beyond simple distance shrinking. She explains the current period of international economic integration with a theory that starts with technological change, and proceeds from changes in the relative power of corporations and states.

Strange's mechanism

According to Strange, barriers to trade have fallen because multinational corporations have gained bargaining power, and diplomacy now becomes as much a matter between corporation and state as between state and state. MNCs want to be able to sell globally what they produce in one country, and they apply pressure to reduce trade barriers. In her account, there are three ultimate sources of this improved corporate bargaining power, all of them technological. First, improved transport and communications technologies reduce the relative cost of traded goods and services. Second, the global mass media feeds popular pressure for states to open up to global consumer markets (and also, though this is not my concern in the present paper, democracy). Third, higher R&D expenditures and shorter product life cycles (together with lower marginal production costs, which Strange does not mention but which are part of the same transformation of production systems, and only add force to her argument) generate increasing returns which raise the relative unit costs of protected national industries; achieving a scale of production which brings average costs down to politically acceptable levels requires access to both financial and consumer markets in North America,

Europe and Japan, and that access comes via multinational corporations. The first two factors are simple distance-shrinking, and subject to the objections raised above. The third, however, is something new. It offers a technological explanation for a qualitatively distinctive form of integration. I will call this 'Strange's mechanism'.

Let us look more closely at the argument behind Strange's mechanism. Notice, first, we do not need to treat R&D separately from product life cycles. The point is that an up-front cost (R&D) has risen, and that it must be amortized over a shorter expected product life. Marginal production costs, on the other hand, have fallen. This creates greatly increasing returns which will disappear within a short time, and an imperative to reach a very large market quickly: protected national markets which were once big enough, now look very small.

Knowledge in production: embeddedness

As an explanation for lower barriers to trade in goods and services, Strange's mechanism rests on the implicit assumption that productive knowledge is not separable from the production process. To the extent that knowledge can be separated from production, product development can occur in one place, and production in another; productive knowledge can cross national and organizational borders, unaccompanied by the actual goods and services. This may occur through commercial licensing (a form of trade in intellectual property), or through dissemination as non-proprietary information (as through scientific publications or free software).

It may be costly (or impossible) to separate productive knowledge from the production process, for two distinct reasons. One is that the knowledge may have an important sticky, or tacit, component, which makes it more valuable where it is produced than it would be after transfer in an enervated, purely explicit, form; call this *embeddedness.* The other is that inseparability may be a strategy for the appropriation of rents from knowledge which *could* be made separable from production, but which is deliberately tied to the production

process by technical, organizational, and / or legal means; call this *strategic bundling*.

When Strange speaks of rising R&D costs as a motive for lowering barriers to trade and investment, she is implicitly holding constant the degree of separability of knowledge and production. Increased separability could offset the barrier-lowering effect of rising R&D costs; on the other hand, if separability fell at the same time as R&D costs rose, the barrier-lowering effect would be amplified.

There is considerable argument about the direction of change in embeddedness. Short product life cycles and continuous improvement may mean that by the time knowledge is explicit it is also out of date; on the other hand, advances in information and communications technologies have made codification easier, and have made the explicit more accessible.

In some industries, there is good reason to believe that there has been a shift from the explicit toward the tacit, and therefore toward inherent embedding. Consider the automobile industry. In classical mass production systems, knowledge tended to be unbundled. Within organizations, the Taylorist separation of conception and execution saw to this; between organizations, contracting on the basis of blueprints provided by the customer, with no product development collaboration between firms (for a good account of this, see Womack et al 1990). This dis-embedding of knowledge facilitated import substitution industrialization (ISI): with designs licensed and turnkey plants purchased, production could be set up behind trade barriers. In the 1960s and 70s, Fiat did good business selling factories and designs to governments that wanted domestically owned automobile industries, while Ford, General Motors and others were happy to set up assembly plants in protected markets.

In modern automobile production systems, knowledge tends to be more embedded in production. Continuous improvement of the product, employee involvement in continuous improvement of the process, and collaboration between buyer and supplier on product development and design, do not generate the stable blueprints of Taylorism and turnkey plants. So, we see

companies nurtured in the ISI environment finding themselves thrust into global competition (to continue the automobile example, see Biggart and Guillen 1999; Miozzo 2000). Multinational corporations now tend to acquire and transfer technology not through arm's length market relationships, but internally and within relational networks (Archibugi and Iammarino 2002). Such embedding is not absolute: technical knowledge can still be licensed, but for such licenses to be useful they now require a buyer who has greater technological resources than would likely be found in a protected assembly plant in a small country.

Knowledge in production: codification and licensing

When productive knowledge is codified, there is no limit to increasing returns inherent in the technology or the organization of production: the same knowledge can be used over and over, world wide. For this potential of increasing returns to have a commercial reality, however, the company seeking to benefit from global markets must be able to control the production, distribution, and sale of the good. The set of feasible strategies for controlling a product's value chain depends not only on the production technology, but also on the nature of the distribution channels for that product, and the political and institutional conditions under which it is manufactured, distributed, and sold.

Thus, pharmaceuticals are sometimes produced for export, but also often licensed. In this way they are like the mass produced automobiles of old, although the ratio of information content to marginal production cost is probably higher for Prozac than for a Fiat 126. As a first approximation, ignoring the particular political and public health issues surrounding the products, licensing is a viable strategy because, although pharmaceutical formulae represent codified productive knowledge, there is more to making pills than copying the formula: actual factories are required for production. This not only puts a floor under the global increasing returns, but provides a physical and organizational site which can be identified for the purpose of collecting royalties.

But it would leave us with a very poor picture of the pharmaceutical commodity chain if we did not take account of the political context. For reasons that go beyond standard industrial development arguments, many governments have wanted to have their own pharmaceutical industries and to control pharmaceutical prices. In the past decade, the rules governing licensing of pharmaceutical formulae have changed in favor of large pharmaceutical companies. The TRIPs agreement puts an end to a country's ability to choose the term and coverage of patents, so that countries such as India which had not recognized patents on pharmaceutical formulae must now do so (Sell and May 2001); the US government, which was the leading champion of TRIPs, has also been aggressive in pursuing bilateral trade agreements which go beyond the TRIPs provisions (see, for instance, Drahos, et al. 2004); opposition to the extension of the rights of big pharma has centered on the terms of compulsory licensing for epidemic or endemic diseases in poor countries (Matthews 2004).

These changes in the global regulation of the pharmaceutical industry might be thought to provide an illustration of the argument made in this paper: the domain of big pharma's increasing returns, its reach into markets around the world, is extended by political, not technical means. Yet pharmaceuticals do not provide the best illustration for this argument. The institutional changes just discussed are changes at the margin: there have been some changes in rules which favor the big pharmaceutical companies and the rich countries, but the fundamental structure of pharmaceutical production, distribution, and even rent appropriation, has not changed much. Drugs have long been developed in the rich countries and sold, or produced under license, in many others; big pharma has long had international market power, and taken advantage of it, as with the fixing of prices for broad-spectrum antibiotics in many developing countries in the 1950s (Braithwaite 1984, pp. 176-182, cited in Drahos 2004).

What has changed in the pharmaceutical industry is the political framework in which the industry operates. Governments in many countries, including the US, have concluded that securing rents from codified knowledge is an important national objective. In the US, the Bayh-Dole act of 1980 led to a

steep rise in patenting by universities, and to cooperation between universities and industry (including the pharmaceutical industry) in proprietary research. This followed the conclusion, on the part of US policy makers, that foreign companies and governments were free riding by commercializing US research without payment (Coriat and Orsi 2002; Tyson 1992). Protecting IPRs may be seen as part of a knowledge economy strategy, based on the view that the way to be a rich country now and in the future is to specialize in what Reich (1991) calls 'symbol manipulation'. A potential weakness of this strategy is that over-reliance on knowledge might lead to a hollowed out economy, and that eventually production of knowledge would follow the production of goods to other countries (Florida and Kenney 1990). Although the knowledge economy vs. hollowing is often framed in terms of productive knowledge generally, much of it applies specifically to codified knowledge rather than embedded knowledge, since that is where both the promise of specialization, and the threats of hollowing, are the strongest.

A new feature on the landscape in recent decades, and one of the factors behind the emergence of the knowledge economy as a model, is the information product. In contrast with the case of pharmaceuticals, the changes in such industries as computer software and recorded entertainment were fundamental. Here, increasing returns are constrained only by global demand for the product and the company's control of the distribution channel; yet, the same technological characteristics which provide this opportunity make control of the channel problematic. What we see in these markets is that, while trade policy and intellectual property protection are important issues, they form just a part of the package of measures required for effective control of the distribution channel and ongoing collection of rents; at least as important are the positions taken by various state actors to establish the rules of competition (or lack of it) in these markets. All of these elements are important in strategic bundling business models.

Embedding, codification, and Strange's mechanism

How should our understanding of Strange's argument be changed by this taxonomy of embedding and codification? As follows: first, we should note that the reach of the barrier-lowering effect hypothesized by Strange depends on the extent of increasing returns. In cases where increasing returns are the product of the rapid development of embedded knowledge, it is not clear that an imperative for *larger* markets should necessarily mean *global* markets. Embedding is an issue when the continued improvement of products and processes goes on to a significant degree within the production process itself. Products with embedded knowledge have, in their nature, a higher ratio of marginal cost to fixed cost than do information products. Therefore, while a rise in the embedding of knowledge with production can explain why a country with a small automobile market (Argentina, say) would no longer find it practical to operate a protected automobile manufacturing industry, we have no reason to believe that protection for a great many industries is not still viable in large industrialized blocs such as NAFTA and the EU, and in the future within industrialized China, India, or other expanded regional formations.

When licensing is a viable option, as in pharmaceuticals, there is no reason to believe that rising R&D costs should lead to a reduction in barriers to trade; rather, they should lead to greater pressure from the companies owning rights to the formulae, for increases in the scope and enforcement of IPR, which is what we observe. But it still leaves us with the question of what drives global *trade* liberalization.

In the case of successfully bundled information products, Strange's mechanism should be an unambiguous force for global liberalization of trade: the increasing returns for Microsoft's Windows and Office software are so great that no country, and no regional bloc, is large enough to think that it might be better off in software autarky. Since trade in information products depends on the enforcement of IPR, the companies in these industries, too, press for more extensive IPR and stronger international IPR protection.

3. Information products and the varieties of capitalism

All industrial countries produce some mix of goods in which knowledge is embedded, and goods using knowledge which it is separable. The mix differs across countries. Comparing the American and German economies, Hall and Soskice (2001) find that the former specializes in products where knowledge is separable, the latter in products where knowledge is embedded. They argue that this difference in products grows out of differences in institutions: in the US ties between organizations and both their employees and their sources of finance are less durable than in Germany; American capitalism excels at the rapid mobilization and demobilization of resources, and at scaling up to produce a new product in volume from scratch. This is a strength familiar from the days of mass production, and it is equally evident in information products. Germany, with more patient capital and greater security of employment, tends to specialize in products which benefit from long term continuous improvement by a large, skilled, and stable team. The difference in emphasis is seen even in industries in which both Germany and the US would seem to specialize: for instance, German pharmaceutical and chemical companies focus their R&D more on platform technologies, to improve their production of a broad range of products, while their American counterparts tend to focus on formulae for particular products. Hall and Soskice label Germany a 'coordinated market economy' (CME), and the United States a 'liberal market economy' (LME).

Any generalization based on the institutions and industries of two countries, is bound to encounter difficulties when extended to the rest of the world. Nonetheless, the important institutional-industry complementarities of Hall and Soskice's CME model can be found in Japan and in some other northwest European countries besides Germany, while those of their LME model has strong parallels in the economies of English-speaking countries other than the US.

In the 1970s and 1980s, as Japan showed that it could make cars better than Detroit, and the Deutschmark ruled in Europe, many of the institutional characteristics of CMEs were seen as helping to overcome the limitations of Taylorist mass production, the latter most prominently associated with the

USA; Japanese management and manufacturing techniques became highly influential (Dore 1973; Ouchi 1981; Piore and Sabel 1984; Womack, et al. 1990). In the 1990s, the LMEs and their information industries enjoyed strong growth, while the leading CMEs found themselves in the doldrums. One explanation advanced for the more rapid growth of the LMEs in this period was that their institutions were better suited for information industries. Since information industries were seen as not only the locus of growth at that time, but the template for the economy to come, this was sometimes taken as evidence that the advantage had shifted back to the LMEs (see, for instance, Gilpin 1996).

Information products continue to be an area of relative strength for the United States. Figure 1 shows the growth of net royalties, license fees, and film and video rentals in the US balance of payments from 1986 to 2003. It should be recalled that these revenues were growing even as the overall US trade balance was sinking deep into deficit: they were swimming against the stream of an overvalued dollar (Obstfeld and Rogoff 2004).

In each year the different categories in Figure 1 are cumulative, so the total for any category is the area between the line identified with that category, and the next line down. The area between the top line in the figure and the second is the US surplus in film and video tape rental, which is to say the products of Hollywood. Between the second line and the third we have the US surplus on royalty and license fee payments between affiliated firms (that is, mostly, payments from overseas affiliates to US parent companies); these affiliate transactions, unfortunately, are not disaggregated. Finally, at the bottom, we have the US royalty and license surplus in transactions between non-affiliated firms. The US Bureau of Economic Analysis disaggregates these non-affiliated transactions into several categories, most of which are not broken out here[2]. The largest item in this category is broken out: general purpose software, which has had its own reporting category only since 1998.

[Figure 1 about here]

[2] These include franchise fees, payments for licensed industrial processes, for books, records and tapes, for trademarks, in addition to payments for the use of general purpose software.

The knowledge economy is not homogeneous, even across the rich industrial countries. The strategic bundling of information products is a specialty of the US, and to a lesser extent the other liberal market economies. This means that the failure of the strategic bundling model for information products would fall more heavily on US companies, and the US trading position, than those of other countries. That could have implications for the relative power of the US, and for its ability to exercise a leadership role in the international trading system; these considerations are beyond the scope of the present paper.

4. Contests over strategic bundling

If the strategic bundling of information products underpins the power of corporations to pry open protected markets, does this tell us anything about the future of the structure of trade? What I argue here is that bundling, as a strategy for extracting rents from in information products, is facing serious challenges. These come from a combination of action by states (in such varied roles as enforcer of competition, architect of industrial policy, and consumer), by other consumers, by content producers (artists, software developers…), and by companies which have developed business models that undermine strategic bundling.

What distinguishes strategic bundling from simple enforcement of IPR is the complementary use of those rights with other forms of market power, to secure control of a distribution system (in the cases of interest here, an international distribution system). In order to make this clear, it may help to illustrate the principle with the old economy example before proceeding to information products.

Brand management as strategic bundling: the old economy

The Coca Cola company owns two valuable pieces of intellectual property: the trademark on its eponymous soda pop, and the secret formula for the syrup on which that soft drink is based. That it has been able, for a century, to leverage this slender portfolio into a global rent collection system, is testimony

not just to the inimitable nature of that formula combined with the psychological power of its brand, but also to the way in which it aggressively controls the distribution system. A machine which vends Coke seldom carries the products of another company, and certainly doesn't carry any cut-price local competitors. What we find in that machine is a microcosm of the business model. The Coke brand sits in a line of other soft drinks, and vendors such as fast food chains, professional sports leagues, or school districts, are offered all-or-nothing contracts to carry that line (Coke, Fanta, Sprite, etc.) exclusively. Such exclusive deals are, of course, facilitated by a particular legal framework for contracting and a particular view of how competition laws should be enforced; it is not difficult to imagine a world in which competition authorities, in order to encourage consumer choice, price competition and/or opportunities for SMEs, forbad some or all of these exclusive deals.

The legal framework within which this combination of IP and distribution muscle is carried out, is subject to ongoing contests. To take just one example: in 2005, the owner of a small shop in Mexico won a victory against Coca Cola in that country's courts. The cola giant's Mexican affiliate apparently makes a routine (and illegal) practice of cutting off deliveries to small retailers that carry rival brands, such as the Peruvian brand Big Cola (Tuckman 2005). Since Coke (that sliver of intellectual property again) is Mexico's leading beverage, and the company has 70% of that country's soft drink market (Mireles Castillo 2004), the threat carries weight.

Coca Cola is the best known and longest lived example of what is a common business model. It is easy to find other examples, from ice cream bars ('Ice Cream Judgment' 2004) to beer (Doward 2002). The features of the business model are that companies which own leading brands make use of bottlenecks inherent in the distribution of their products - limited space in small shops, the frequent contact with customers necessary for the distribution of these particular products - together with some political influence, to carve out lasting positions of market power. It is this combination of IP with other factors to secure lasting market power, which distinguishes

strategic bundling from the simple collection of royalties on a copyright or patent.

While these old economy cases are good examples of strategic bundling, they are *not* good examples of Strange's mechanism. And, while Coca Cola is widely associated with globalization and American power, that association is largely symbolic. A few decades ago, under less liberal trading regimes, many countries shut out the likes of Coca Cola, with little or no cost to their national economies. While multinationals producing soft drinks, beer, bottled water, ice cream and such have undoubtedly benefited from the liberalization of trade and investment, their rent seeking could not do much to force open markets.

When a similar business model is applied to information products, however, they can play such a role.

Strategic bundling of general purpose software

We may classify computer software as either general purpose (also known as shrink-wrap) or custom. The former is a mass market product, while the latter is done to order (though custom software is usually a modified version of a pre-existing program, perhaps a general purpose one).

The principal forms of IPR protection for software, and the forms recognized under TRIPs, are copyright and trade secret. Given the increasing returns inherent in general purpose software (high up front cost, trivial marginal cost of production), one could imagine that, with the effective protection of its IPRs, a first mover might attain a powerful monopoly position. One would, however, be wrong. The methods used to write computer operating systems, word processors, spreadsheets, data base programs, web browsers and such are well known, and the tools needed to write them sit on countless desks. Good alternatives have usually been on the market for all such programs, and usually selling for much less than the market leader.

Like Coca Cola, successful proprietary software companies create market power by combining their small IPR portfolios with further steps to control the distribution channel. In the software case, this is done by maintaining control over the software's interaction both hardware, with other software, and with

formatted data. When this is done, established programs enjoy network externalities - we all need programs that work with other programs on our computers, with hardware, and with the documents our colleagues send us.

One might think of network externalities as growing from the technical properties of the software, in the sense that one program is not automatically compatible with another. This technological fact, however, seldom has anything to do with the more useful or innovative properties of the program: incompatibilities between programs are maintained deliberately, in order to control the market. In a one sense, secrecy about interfaces could be seen as a simple example of IPR protection - the interfaces are proprietary technical information. The interface protocols, however, are technologically trivial; the only reason for keeping them secret or placing legal restrictions on their use, is to protect the technologically important product - the bulk of the software package - from competition.

Once dominance has been established in one area, a software company may attempt to extend this by bundling their software with complementary products. In software, this bundling takes on both the standard marketing form of a package deal, and technical fixes involving superior compatibility, or even combining the code so that the products are inextricably bound. Microsoft, which leveraged a contract to provide MS-DOS to IBM into Windows, Office, and Explorer, provides the best example of these tactics (see, Windrum 2004), and will be used as an example throughout this section.

Consider three challenges faced by the proprietary / closed source business model: first, consumers and "pirates" who do not respect the property rights of the big software companies, and trade in illicit copies; second, free and open source (FOSS) software alternatives; and, third, the actions of competition authorities and major customers seeking to break lock-in.

The first of these is a straightforward question of IPR protection. It is not clear, however, that unauthorized copying is a real threat to the proprietary model: while it entails notional lost revenues, unauthorized copying also serves as a form of price discrimination which furthers the format / standards

lock-in by which the proprietary companies maintain their dominance. A company can establish dominance for its expensive software in a poor country by letting others give it away for free. Linux code is free, but because most Linux distributions require three CDs and Windows only one, users in China see Windows as the cheaper of the two (Orlowski 2004).

Competition from free software is a more serious threat to the companies doing strategic bundling. It is also more interesting here because free software business models lack the increasing returns properties of proprietary models.

Free software code is a global public good: programmers assign their copyrights in such a way that the code may be re-used for free, subject to certain restrictions. In a pure free software business model, as advocated by Stallman (1985), the commercial aspect of the software business is entirely service: customization, and support. Notice that customization and support of complex products fits with Hall and Soskice's description of relative strength of coordinated market economies. And this is, indeed, an area of the software business in which Germany is particularly strong, just as Germany is a leading developer and adopter of free software.

For Stallman, the rationale for free software is ethical, but as free software has become more widely used it has come to be understood as having other strengths.

Freed of secrecy and of objective of maintaining market control, free software lends itself to a distributed development process. Raymond (1998) likens making proprietary software to the design and construction of a cathedral, free (or, as he calls it, open source) software to a bazaar. While the bazaar metaphor overplays the market aspect of free software, and slights the organizational requirements of putting a complex program together (both in keeping with Raymond's libertarian leanings), it does provide an image to go with the fact that free software is typically developed on a far less centralized basis. One face of the decentralization organizational: free software projects typically involve several companies and/or independent individuals. Another is geographical: while Microsoft may trust its source code to a handful of known

software centers, some "offshore", contributors to free software projects may be found anywhere. The most popular (at this writing) version of Linux, Ubuntu, is a project based in South Africa, not heretofore an internationally known source of software. Still another facet of decentralization is the software architecture itself. Linux is a modular system, on the model of Unix: individuals or teams can work on different parts in relative autonomy, and alternative programs are often available to plug in to do the same task. Advocates of this system argue that the free sharing of information makes both product development and bug fixing much faster (Raymond 1998).

Organizational and architectural decentralization between them mean that free software does not require the concentration of resources that proprietary software does. Rapid and large-scale mobilization of financial and human resources is, as noted above, a particular strength of the US economy. The geographical decentralization makes free software appealing not only to poorer countries (Marson 2005; May 2006), but also industrial countries which lack a comparative advantage in proprietary general purpose software: free software is stronger in Europe than in the US; the Japanese, South Korean, and Chinese governments have encouraged collaboration in the production of an Asian variant of Linux, Asianux ('China, Japan, SKorea' 2006).

And yet, the sustainability of free software business models is problematic. Companies such as IBM and Nokia ('Nokia Steps Up Open Source Efforts' 2006) do put free software at the center of their strategies, but few doubt that they would be happy to revert to closed systems if that left them in control of their respective markets. The principal legal tool for preventing such opportunistic behavior is the license. Free software licenses differ, but a particular institutional innovation is found in the General Public License (GPL) of the Free Software Foundation. The GPL requires that any modified version of the GPL code, and any code incorporating elements of GPL code, be released under the same license. For a company which invests in developing software applications or services, use of GPL code entails a significant commitment to staying with a free software business model, because leaving the model would also mean leaving behind that code.

The GPL is used for many leading free software programs, including Linux. Yet software and computer service companies do, naturally, continue to seek ways to lock in rents. Many companies prefer licenses which do not require that future generations of the software be kept open: the MIT and Berkeley licenses (the latter used by Nokia, cited above) do this.

Another method of earning rent from something free is to "wrap" the free software in proprietary applications; to the extent the latter succeed the game of standards lock-in, the company is able to free ride on the free software base. So, Apple's OS X is a closed-source proprietary interface running on top of a free version of Unix, and IBM packages proprietary software along with the free.

A similar role is played by software patents. These are recognized in the US and in countries which have entered bilateral agreements with the US, but not in most of the world. A patent covers an idea, not a particular form of words, so it is easy in writing a software program to infringe a patent, perhaps without knowing it. This creates a problem for free software: given away by a large number of programmers, there may be nobody to sue for infringement but the users. This concern can lead users to prefer to obtain their free software from large companies, such as IBM, which can indemnify them against patent claims. Despite the combined efforts of IBM, Microsoft, and most other large software companies, however, software patents are not recognized in Europe (Mueller 2006).

While free software vendors contest the ground held by proprietary near-monopolies, then, the struggle to establish new corners of monopoly power continues in parallel. What business model prevails, how "free" it is and, of particular interest here, whether it exhibits extreme scale economies and is based in the United States, all remain to be seen. To a significant degree, the outcome will depend on the way in which states shape the rules of the contest. States affect this environment both through competition and trade policy, and public procurement decisions.

Regulatory attacks on Microsoft's monopoly began in the US. The settlement in US vs. Microsoft requires that the company license the protocols

necessary for Windows servers to interact with clients (such as desktop machines). The terms on which this information is provided, however, make it useless for free software developers (Orlowski 2006a). The European Commission appears to be going further (at this writing, a ruling is awaited on Microsoft's appeal), requiring information that will allow interoperability of non-Microsoft servers with Windows clients and Windows servers; the EC is taking seriously the needs of GPL software, as well (Orlowski 2006b). South Korea has also weighed in with anti-trust action against Microsoft ('Microsoft Faces Another Lawsuit' 2006). In both the European case and the Korean, the US Trade Representative has intervened on Microsoft's behalf, but to little apparent effect ('U.S. Wades In' 2005).

As consumers, some states have taken action on document formats. Proprietary formats can lock the state and its citizens in to particular software vendors, and because they can make continued access to today's documents dependent on a particular vendor's support for those formats in the future. The American state of Massachusetts came close, in 2005, to requiring that all public documents be produced in approved non-proprietary formats. This would have ruled out the use of Microsoft Office, because Microsoft refuses to provide for saving Office documents in a non-proprietary format. Microsoft has so far managed to stall implementation of that measure, but numerous national and local governments have now taken up the issue (Berkman Center for Internet and Society 2005).

The compatibility of computer hardware with free software has recently been addressed by the agency in Taiwan responsible for public sector procurement. It has recently ruled that all new government desktop computers must be compatible with the Linux operating system (Tan 2006). A desktop computer system includes many pieces of hardware, and for it to be compatible with an operating system the latter needs a bit of software called a device driver for each piece of hardware. What Taiwan's new policy effectively does is to restrict government purchasing to hardware for which the technical specifications required to write device drivers, have become public (either because the manufacturer disclosed them, or because the free software community reverse engineered them), and are freely available.

State actions in these three areas - disclosure of software-software interfaces, public document formats, and software-hardware interfaces - have the potential to end the great proprietary software monopolies. The intellectual property these companies are protecting is not software as such, but interface specifications. What is distinctive about this contest (and, I will argue below, other contests over the control of information products), is the extreme range of plausible outcomes: small changes in competition policy and public procurement could easily tip the world toward a free software model, or could shore up the proprietary software monopolies. The very high rents associated with proprietary software make this a fight which many find worth fighting.

Other contests, same rules

Many of the same issues arise in connection with such diverse products as recorded entertainment (film, video, music), seeds for genetically modified organisms (Pollack 2005), and academic publishing (Bergstrom 2001). In each case, we see large companies combining ownership of IPRs with control of a system of distribution. Let me consider briefly the case of film and video, because it is a case of an information product in which control of distribution channels is achieved without the help of standards and network externalities to achieve lock-in.

In the absence of standards lock-in, unauthorized copying is an unalloyed bad from the standpoint of the movie studios. Although it dips into their revenues, much like a tax, it does nothing to favor any alternative business model for making and distributing movies: it is a cost at the margin, and not of much interest to us here.

The distribution channels for recorded entertainment have important bottlenecks, and by using these a handful of large media companies manage to control most of the market. Movie screens, and broadcast television, even the number of shelf spaces in a video store, are limited; so is the mass media space devoted to publicity for films. The importance of such constraints is reflected in the fact that the reservation of a proportion of screens for

domestically produced movies has resulted in long-running trade disputes between the US and both France and South Korea (Bertolin 2006).

With an inexhaustible supply of artists wanting to sell their movies and a limited number of slots in the distribution system, a winner-take-all market is created: because securing some of the limited space in the mass media and the distribution channels brings the possibility of huge financial reward, it is worth making very large investments in production, publicity, and star performers (Frank and Cook 1995). For this reason, the limited capacity of the distribution channels favors companies - still called "studios", in homage to the days of vertically integrated movie production - which are able to mobilize and manage such investments (Storper 1989). The rapid mobilization, and demobilization, of financial and human resources is, as we have seen, an American specialty. Not surprisingly, we observe the disproportionate presence on the world's movie screens of big budget Hollywood blockbusters.

Costs of entry into movie production have fallen sharply in the past decade, due to digital video. At the same time, the distribution channels have widened. While cinema screens are still constrained, cable and satellite have multiplied TV channels many times, and broadband internet opens the possibility for further expansion; videotapes and DVDs, first in retail stores and now, in combination with Web ordering, by post. Overall, then, we see a broadening of the distribution channels for movies. As with software production, there are those who argue that the connectivity offered by the Web has made centralized control obsolete: end-to-end connections, artist-artist and artist-consumer, can be made, eliminating the rent collector and augmenting variety in the process (see, e.g., Benkler 2002).

Yet, as with software, the devil is in the regulatory details. Cable TV and telephone companies, which provide most broadband links, are struggling to gain control of the internet content they transmit within the US ('Is it the End for Net Neutrality?' 2006). In some cases (e.g., News International and ABC-Disney), these broadband providers are also movie studios, reflecting a strategy of vertical integration to control both content and distribution. The World Intellectual Property Organization's efforts to bring forth a treaty on internet offer another arena for the same contest (Love 2006).

As with software, the increasing returns enjoyed by the big production companies only exist in a suitable institutional environment. That is not to say that they have no technological basis: the trivial marginal cost of producing information products is significant, but this technological property lends itself both to monopoly control and to radically decentralized end-to-end models.

What model prevails depends largely on the specifics of the institutional environment. Therefore, there is no necessary reason why monopoly would not prevail in some information industries, and decentralized models in others: small changes in anti-trust enforcement could lead to competitive markets using largely free software, alongside big business control of movies and music. There is, however, a reason why these markets might well move together. The political, intellectual, and legal framing of the issues in the market for one information product can affect the framing, and hence the outcome, in other such markets. Many people who work in this area address the options regarding property and market structure in information products as one question across all such products: see, for instance, the books by Bollier (2002), and Lessig (2005). To the extent that such framing has power, what prevails in one industry has a better chance of prevailing in others.

5. Conclusion: Information Products and the Fragility of the Global Trading System

Sometimes, technologies lend themselves to particular market structures. Oil refineries have a certain minimum efficient scale, and petroleum is cheaper to transport in its un-refined state; in a smallish market, this can create what economists call a natural (which is to say, technologically determined) monopoly. That is not to say that the market structure for refined oil products is fully determined by the technology, but that the technology can place an upper limit on the number of producers in a given market.

Information products are unusual in that they lend themselves both to monopoly, and to atomistic competition. We live with this range of market structures every day: on the one hand, the Microsoft products which, in this era of consumer choice, are one choice we can't refuse; on the other, the

protocols for the World Wide Web, tools that were given over to the public domain for millions of software developers, service companies, and others to use and modify without charge. There is nothing in the technologies that says this shouldn't be the other way around - monopoly internet standards, and standard document formats which could be shifted freely between different word processors.

While technology does not determine the market structures for information products, the very indeterminacy of these market structures does have a technological basis. The digital code which is the substance of an information product provides extreme increasing returns if a company can maintain control of both the code and the distribution channel - an achievement I have called 'strategic bundling'. If this ambition to control is frustrated, however, a radically decentralized market structure may develop. In the case of software, this can mean that the code becomes simply a common material for developers and services companies to use; in the case of recorded entertainment, the intermediary - and with it, most of the rent - is cut out by direct artist-artist and artist-consumer links.

There are, today, ongoing contests over the structure of markets for information products. The outcome of the contests has the potential to affect the structure of the world trading system. Strategically bundled information products are, via Strange's mechanism, a force for *global* trade liberalization. When the market structures for the same products are decentralized, they provide little or no impetus for trade liberalization.

Unbundled information products can and do remain global products, but the global exchange of these products does not require much trade. Linux is usable everywhere, just like Windows; its development process is, if anything, more global. But with free software, most of the international exchange of information ceases to be *trade*, and so the desire to facilitate and benefit from that exchange should have little effect on trade barriers. The exchange of rights to recording of a song or a movie may be trade, with or without an intermediating monopoly, but without the large production budgets plus rent of those companies, the monetary value of the trade is much less.

To the extent that un-bundled business models prevail in markets for information products, the force of Strange's mechanism will be reduced. Strange's mechanism does also work through increasing returns for other, non-information, products, but its effect in these cases is not as far reaching: the extreme increasing returns to strategically bundled information products are not found in any other product. The lesser increasing returns in other industries would still be a force for trade liberalization. There is no reason, however, to believe that this liberalization would be global. It could equally well be confined to regional trade blocs.

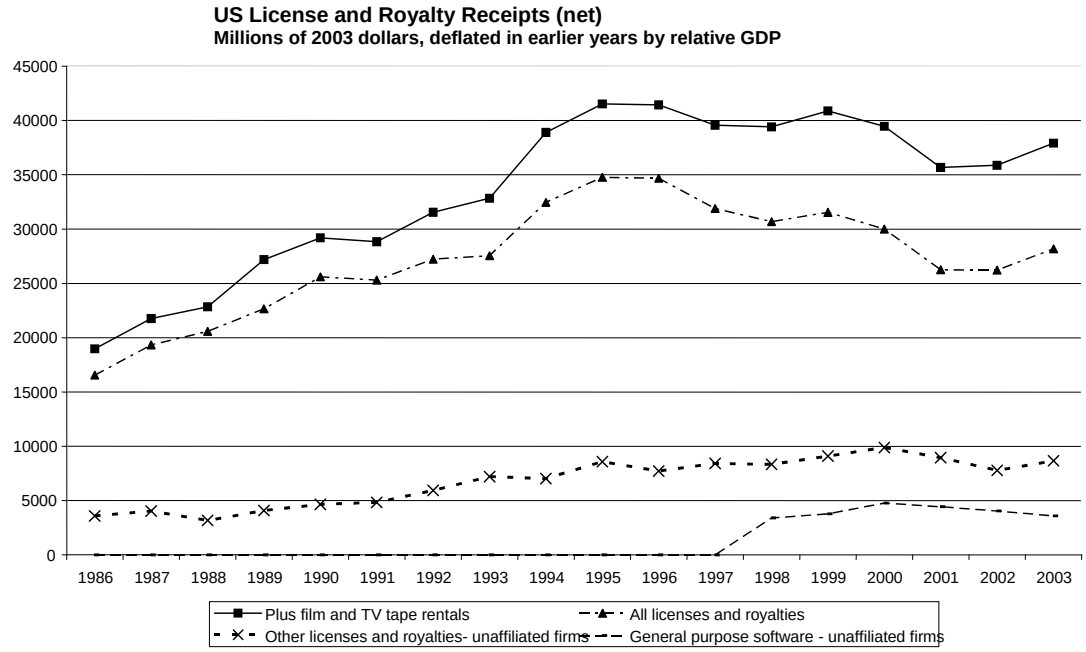

Figure 1

Source: (US Bureau of Economic Analysis 2005). All data from Table 4, Royalties and License Fees, 1986-2004, except Film and Television Tape Rental data. The latter are from Table 5, Other Private Services (1986-1991), and Table 8, Other Private Services by Identity of Transactors (1992-2004)

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