

Chapter 7: Defenses of Intellectual Monopoly

We have focused first on the many successful industries in which competition and innovation have gone and still go hand-in-hand, and documented next the many social evils that the very existence of intellectual monopoly, either in the form of patents or copyright, brings about. In chapter 6 we have provided a coherent theoretical framework that makes sense of the reported facts and clarifies the relevant economic and social issues at stake under the current debate. Yet we have also learned that, as a byproduct of the same theoretical framework we proposed, innovations of social value may fail to materialize under competition. This leaves open the possibility that intellectual monopoly might increase innovation. If intellectual monopoly delivers substantially more innovation than competition, it might be a worthwhile system, despite the many costs we have documented in Chapters 4 and 5. Hence the issue is worthy of further investigation, which we pursue next in two steps. In this chapter we examine the theoretical reasons – other than the indivisibility already discussed in chapter 6 – adduced to support the existence of intellectual monopoly. In Chapter 8 we report on the extent to which patents and copyrights increase the social rate of creation and innovation.

We are keenly aware that there are many who argue in favor of intellectual monopoly. They often provide logically correct reasons why, all other things equal, intellectual monopoly would deliver more innovation than competition. After all, a monopoly is a good thing to have: holding out the prospect of getting a monopoly as a reward for innovating should, all other things equal, increase the incentive to innovate. But the fact that an argument is logically correct does not mean it has practical importance for policy.

Consider the problem of automobiles and air pollution. When I drive my car, I do not have to pay you for the harm the poison in my exhaust does to your health. So naturally, people drive more than is socially desirable and there is too much air pollution. Economists refer to this as a negative externality, and we all agree it is a problem. Even conservative economists usually agree that government intervention of some sort is required.

We propose the following solution to the problem of automobile pollution: the government should grant us the exclusive right to sell automobiles. Naturally, as a monopolist, we will insist on charging a high price for automobiles, fewer automobiles will

be sold, there will be less driving, and so less pollution. The fact that this will make us filthy rich is of course beside the point; the sole purpose of this policy is to reduce air pollution. This is of course all logically correct – but so far we don't think anyone has had the chutzpah to suggest that this is a good solution to the problem of air pollution.

If someone were to make a serious suggestion along these lines, we would simply point out that this “solution” has actually been tried. In Eastern Europe, under the old communist governments, each country did in fact have a government monopoly over the production of automobiles. As the theory predicts, this did indeed result in expensive automobiles, fewer automobiles sold, and less driving. It is not so clear, however, that it actually resulted in less pollution. Sadly, the automobiles produced by the Eastern European monopolists were of such miserably bad quality that for each mile they were driven they created vastly more pollution than the automobiles driven in the competitive West. And, despite their absolute power, the monopolies of Eastern Europe managed to produce a lot more pollution per capita than the West.

Arguments in favor of intellectual monopoly often have a similar flavor. They may be logically correct, but they often defy common sense. Ed Felten suggests applying what he calls the pizzaright test. The pizzaright is the exclusive right to sell pizza and makes it illegal to make or serve pizza without a license from the pizzaright owner. We all recognize, of course, that this would be a terrible policy and that we should allow the market to decide who can make and sell pizza. The pizzaright test says that when evaluating an argument in favor of intellectual monopoly, if your argument serves equally well as an argument for a pizzaright, then your argument is defective – it proves too much. Whatever your argument is, it had better not apply to pizza.

Three things stand out in the case of arguments in favor of intellectual monopoly. First, all other things are never equal. A system of intellectual monopoly may well increase the amount of money that an innovator can make by selling his idea – but it also raises the cost of producing that idea. The innovator must pay all the other monopolists more to use their ideas in creating his own. The system also creates a variety of other costs – innovators must engage in costly patent searches to make sure they are not infringing existing patents – and the substantial legal and court fees earned by lawyers are all part of the cost of operating a system of intellectual monopoly. Because of all these costs, a system of

intellectual monopoly may well lead to less innovation than a competitive system. Second, monopoly is not widely viewed as the friend of innovation – the example of Eastern European monopolies being only the most extreme of many examples. So we may well wonder if creating monopolies is really a good way to increase innovation. Finally – the bottom line. If intellectual monopoly is a good idea then it *must be* because it increases innovation – and given all the costs we have documented – it must increase innovation substantially over the competitive system. As we shall see when we turn to the facts in the next chapter, there is no evidence it does so.

Private Property and Public Goods

A traditional argument in favor of intellectual monopoly is that the ownership of ideas is no different than the ownership of houses, cars and other forms of private property. Certainly we agree – and not all opponents of intellectual property do – that private property can be a good thing. As an example of what goes wrong without private property in land and houses, we previously pointed to the situation in Zimbabwe. To elaborate

Last Saturday morning, a war veteran named Wind, accompanied by a bunch of young men, arrived on my farm in the morning. He gave my tenants and their young children two days to get off the farm and out of the house as he says it now belongs to him. Wind then went over the road and issued a verbal eviction order to my neighbors and then to the family living in their cottage,' Buckle said. 'These eviction orders were all non-negotiable and backed up by threats of violence. One of the threats was to throw a 4-year-old deaf child into a silage pit. Wind and his men then went to the houses of all the people who live and work on these farms. All the men, women and children were also ordered out. Wind closed the trading store on my farm and said it was now his. He ordered that all the dairy cows on one of the farms and all the laying hens on the other farm were not to be moved as they now belong to him.

What are the consequences of the massive expropriation of private property that has been taking place in Zimbabwe for years? The following news item from the *Zimbabwe Independent* shows the economic devastation that occurs when there is no incentive to work your land because it may be seized by thugs at any moment

GDP to Decline By 11.5

The statistics released last week show that real GDP declined by 5% in 2000, 7.5% in 2001, and 11.9% in 2002. They are forecast to decline by a further 11.5% this year.

So, one may be tempted to conclude, if the incentive to work and develop your land depends on your exclusive right to it, should not exclusive ownership of your idea be granted to you to provide for the appropriate incentives to develop it? Unfortunately, this analogy between “idea” and “land” is not a good one.

Consider the exclusive right to sell cars. From a legal point of view there is nothing to prevent the government from giving me this as a property right. As with any property I could sell or license this right – I could authorize General Motors and Ford to sell cars in exchange for fees; I could sell my exclusive franchise to Donald Trump; I could create a shrink wrap agreement that anyone who purchased a car would have to agree to get off the road whenever I drove my car down the street. Pretty obviously this is a terrible idea – but the analogy between the exclusive right to sell cars and land is no different from the analogy between property of idea and property of land.

All property, then, is not created equal. There is good property – property of land and cars – leading to competition. And there is bad property – property of ideas – leading to monopoly. The difference between the two is not so difficult to see: granting me the exclusive right to sell cars give me a property right over customers. That is, it gives me the right to tell my customers that they cannot do business with someone else. Economists agree that this is a terrible idea. This is of course, exactly the right granted by intellectual “property.”

A critical confusion in the case of ideas is the difference between an abstract idea and a concrete copy of it. Owning an abstract idea means that you have the right to control all copies of that idea; owning a copy of an idea means that you have the right to control only the copy of that idea. We favor the latter, but not the former right of property. The geometric idea of a circle and Piccadilly Circle are not the same thing, and it does not follow that if ownership of the second is good, so is ownership of the first. This is not some metaphysical quibble about Plato being right and Berkeley being wrong, or about which came first the idea – the egg – or its implementation – the chicken. Quite the opposite, the

difference is practical, economically relevant and a matter of mere common sense.

Take for example, the idea of antigravity. Imagine that you have just figured out how to reverse gravity. An embodiment of this abstract idea now exists in your mind. It has economic value: you can use it to construct flying saucers or you can teach it to other people interested in travelling to Mars. From an economic viewpoint your knowledge of antigravity is as much a private good as the chair upon which you are sitting. In fact, your copy of antigravity is even more private than your chair. If you died without writing down or telling anyone of your idea – it would be as if your idea of antigravity had never been conceived, while your chair will probably survive you. If on the other hand, you communicate your idea to me, then my copy of the idea of antigravity leads an existence entirely independent of your copy. You teaching me how antigravity works is a production process through which your idea, your time, and my time produce as output my knowledge of antigravity. If you were to die, my copy of the idea of antigravity would continue to exist, and would be at least just as useful as it would have been had you remained alive. My copy of the idea of antigravity possesses, therefore, economic value. Similarly, your copy of the idea of antigravity also possesses economic value.

By way of contrast abstract disembodied ideas have no value. Borges makes this point clear in his short story *The Library of Babel*. “When it was proclaimed that the Library contained all books, the first impression was one of extravagant happiness.” But of course it is the embodied copies of ideas that have economic value, not their abstract existence, so “As was natural, this inordinate hope was followed by an excessive depression. The certitude that some shelf in some hexagon held precious books and that these precious books were inaccessible, seemed almost intolerable.” Abstract ideas not yet embodied in someone or something are like the books in the Library of Babel, socially useless because they are inaccessible. My working knowledge of antigravity, or a textbook explaining antigravity have economic value, while the abstract idea has no value.

This may sound like we are making up unrealistic examples to have some strawmen that can easily catch fire. Nothing further from truth. Consider the following discussion of some of the theoretical implications of the 1714-1773 saga of John Harrison, his clocks, and the Board of Longitude prize.

What Parliament had solicited was knowledge. What it got were four clocks, all different. Compare Harrison's clocks with the astronomical algorithm that the board had hoped for. Such an algorithm did, in fact, materialize. The so-called lunar method used observations of distance between the moon and the stars to infer longitude. The lunar method had the essential feature of a pure public good: the tables that linked the observations to longitude were costly to compile in the first place, involving countless calculations, but once this was done, anyone could use the template at only the additional cost of owning the tables. The knowledge was nonrival.

It was? A non-rival pure public good means we can all make use of the same knowledge without interfering with each other. Which knowledge here was non-rival? The clocks were not, and nor were the tables embodying the calculations. If I were to take your clock or your table of calculations, that would certainly make it difficult for you to make use of the same. It is true that the tables were eventually made public together with the template of how to build the clock. This, however, is a consequence of the existence of the prize set by Parliament and administered by the Board of Longitude. The tables were “sold to the public” in exchange for the 10,000 Pounds prize, or at least the promise of it as it took a while for the prize to be awarded to Harrison. Absent the prize, Harrison would have privately sold the tables to skippers most likely or ship-owners. To acquire usable knowledge the latter would have had to learn enough about astronomical laws, algebra, clock-making and so on to understand the tables and the template, and plus would have to pay the requested price to the owner of the tables – the owner, that is, of the embodied knowledge.

To us, this story sounds like spending real resources to produce and acquire copies of usable knowledge: where is the public good hiding? No *usable* non-rival knowledge ever came into existence. The only two things that came into existence after Harrison completed his R&D investment were (i) the first copy of the new usable knowledge about marine chronometers, embodied in his brain, his tables, his templates; (ii) a “copying” technology, which made replicas of such usable knowledge at a unit cost much lower than the one Harrison had to pay through his initial R&D investment. The example fits perfectly the theoretical model of competitive innovation we described in chapter 6. Contrary to the quoted text's assertion, there is absolutely no public good or

economically usable non-rivalrous knowledge, either here or elsewhere.

What does this have to do with property? A lot: because the usable knowledge is completely embodied in objects the inventor controls, and it is reproducible through a production process that she also controls, ordinary property in embodied objects is enough to allow for appropriation of value by the innovator via competitive rents. There is no obvious need for additional rights, in particular for monopolistic rights such as those afforded by patents.

Ordinary property such as land and cars can be sold with contracts that place limitations such as easements or covenants on the new owner; it can also be rented on a temporary basis with a variety of restrictions placed on the user. How is this different than the owner of an abstract idea placing restrictions on the users of that idea? As we said, there is good property – the kind that enhances competition – and there is bad property – the kind that leads to monopoly. The law generally distinguishes between the two when it comes to writing contracts. If I sell you a portion of my land, and create an easement whereby you allow my cattle to cross your land to get to the nearby stream, the law recognizes this as a legitimate interest on my part, and such a contract is easily enforced. If one car manufacturer sells another a part and requires that any car produced with that part must be sold at a very high price, that contract – promoting, as it does, monopoly and not competition – would not only not be enforced, it would be a violation of anti-trust law, and would probably result in a substantial fine. The easement allowing cattle to cross the land is good because it is instrumental to the creation of additional economic value – raising the cattle. The prohibition on making copies of a legally acquired book not only does not facilitate the creation of additional economic value but, in fact, prevents it. Property in copies of ideas is “good property,” enhancing competition. Property in abstract copies of ideas is “bad property,” leading to monopoly.

There is a more sophisticated version of the “intellectual property is like any other kind of property” argument, which is popular among economists, rather than lawyers and politicians. It asserts that without intellectual monopoly “ideas are non-rivalrous” so that once the first copy of an idea is produced it becomes a public good. A good is non-rivalrous, or a public good, if one person’s consumption does not limit the ability of others to consume it. For example, national defense is a public good. My enjoyment of the benefits of my country being defended does not

limit your ability to enjoy the same benefit, so national defense is non-rivalrous. Put a different way, national defense is a public good, because we all share equally in its benefits. Economists argue that some form of government intervention is needed for the provision of public goods: since you will benefit from my contribution to the public good, there is a tendency for you to “free ride” off of my contribution, and for me to undercontribute. This is sometimes called the “tragedy of the commons” – when something is commonly owned but privately enjoyed, everyone tries to consume without contributing. Ideas, it is argued, are non-rivalrous like public defense or the beauty of a sunset in Capri – your use of the fundamental theorem of calculus in no way interferes with my use of it. Ideas, it is argued, are prone to suffer the tragedy of the commons: everyone trying to use common ideas without ever contributing to the common pool. However, this same line of reasoning goes, ideas, unlike sunsets, are “excludable” meaning that we do not have to share ideas with other people if we do not choose to. We can therefore solve the problem of free-riding on ideas by “protecting” them with intellectual monopoly.

To make sense, the argument that ideas are a public good must refer to abstract ideas, because only abstract ideas are non-rivalrous. Once we recognize that the relevant economic entities over which property should be exercised are not abstract ideas but copies of ideas, our perspective on “intellectual property” changes. Copies of ideas are obviously both rivalrous and excludable – they are not a public good. To put this in perspective, it is obvious that my drinking from my cup of coffee does not affect your use of your cup of coffee. No one would go on to suggest from this fact that coffee is “non-rivalrous” or a “public good” and that special laws and subsidies are needed in the coffee market. It is true that there is legal protection for cups of coffee – if you drink my cup of coffee without my permission, this would be an act of theft, and you would be subject to various civil and criminal penalties. Economists regard these “good property rights” in the usual fashion as securing the fruits of labor, and providing incentive to care for valuable assets. But notice that less legal protection is needed for your copy of your idea than is needed for your cup of coffee – while it may be relatively easy for me to steal your cup of coffee by threat or when you are not looking, it is fairly difficult for me to learn your idea without your active assistance. Indeed, it would seem that the legal protection needed is no more than the legal right not to be subject to physical torture or coercion – a right that we enjoy (or according to recent U.S. legal developments,

perhaps not) regardless of the state of copyright and patent law. Be this as it may, there is no serious challenge to intellectual property in the sense of your right to determine to whom, under what circumstances and at what price you will transfer copies of your idea.

All of this brings us to what intellectual property law is really about – a reality that is often obscured by analogies to other types of property. Intellectual property law is not about your right to control your copy of your idea – this is a right that, as we have just pointed out, does not need a great deal of protection. What intellectual property law is really about is my right to control your copy of my idea.

To return to the Zimbabwean example, suppose that Wind instead of seizing Buckle's farm had purchased some unused land belonging to Buckle. If he then started his own farm on that land and entered into competition with Buckle, maybe imitating Buckle's selection of crops and farming techniques, Buckle might not much like that. But we would scarcely use derogatory words such as "pirate" to describe Wind's behavior in this case. Yet this is exactly what proponents of intellectual monopoly do. When I buy from you a copy of your idea and reproduce or improve it, I enter into competition with you. You might not much like that – but you still have the money I paid you for the price you set as well as your original copy of your idea which you are free to use, or sell, or do with as you please.

To summarize then: it is copies of ideas that have economic value. Copies of ideas should have the usual protection afforded to all kinds of property: they should not be taken away without permission, and the owner should have the legal right to sell them. However, intellectual property in the form of patents and copyrights is not about property rights in this sense. It is about the right to control other people's copies of ideas and by doing so establish a legal monopoly over all copies of an idea. Because it makes this fact transparent, we prefer the term "intellectual monopoly" to the usual term "intellectual property."

Economic Arguments for Intellectual Monopoly

Economists – ourselves included – think that it is important that the creators of ideas be compensated for their effort in adding to our stock of knowledge. While the economics literature generally acknowledges that intellectual property leads to undesirable "intellectual monopoly," it also argues that this might be a good thing – because creators of new ideas may not be

adequately compensated otherwise, and this is one way of providing additional compensation. As Schumpeter puts it “If one wants to induce firms to undertake R&D one must accept the creation of monopolies as a necessary evil.” This view is as commonly held among economists today as it was in the past. In their recent textbook Barro and Sala-i-Martin argue that

In order to motivate research, successful innovators have to be compensated in some manner. The basic problem is that the creation of a new idea or design ... is costly... It would be efficient ex post to make the existing discoveries freely available to all producers, but this practice fails to provide the ex ante incentives for further inventions. A tradeoff arises... between restrictions on the use of existing ideas and the rewards to inventive activity.

Fixed Cost and Constant Marginal Cost

The economic argument, then, for intellectual monopoly is that without it there will not be incentives to produce ideas. The traditional logic is one of fixed cost and constant marginal cost. The cost of innovation is a fixed cost – ideas are expensive to produce. Once discovered, ideas are distributed at a constant marginal cost. As we learn in Econ 1, perfect competition forces prices to marginal cost so profits are forced to zero. This means that the fixed cost of producing the idea cannot be recouped. Consequently, without intellectual monopoly, there will be no innovation.

The idea that monopoly is necessary for innovation forms the foundation for a wide variety of economic models, ranging from general equilibrium models of monopolistic competition to micro-models of patents and patent races. The original theoretical argument was sketched by Alwyn Young before the Second World War and developed in greater detail by Joseph Schumpeter right after the war. The first formal treatment of the idea that competitive markets are intrinsically incapable of handling innovations can be found in writings by Kenneth Arrow and subsequently Karl Shell, published in the early and middle 1960s. In the second half of the 1980s, Robert Lucas, Paul Romer and many followers used new analytical instruments to apply this point of view to the problem of economic development creating a theory now known as the “New Growth Theory.”

Leaving aside the, possibly too theoretical, observation that the logical argument works only if the marginal cost is truly constant and fails in the more generally accepted case in which it is increasing, the fixed cost plus constant marginal cost argument fails along two more substantive dimensions. First, as a matter of theory, perfect competition forces goods to be priced at marginal cost only in the absence of capacity constraints – and, as we just argued at length, the rents generated by capacity constraints along with other first-mover advantages can and do lead to thriving innovation. Pricing at marginal cost is a prediction for the long-run, which applies only once capacity constraints are no longer binding. Erecting a theory of economic growth on the flimsy assumption that productive capacity always builds costlessly and instantaneously seems like a risky proposition, at least in a world where scarcity still reigns supreme. Second, as a practical matter, in most industries and for most innovations the short run is what matters to make money; when the long run comes, your innovation has probably already given way to an even newer one. Focusing the attention of the theory on the long run equilibrium and bypassing the study of the short run dynamics when capacity constraints are binding, yields a formally elegant model with, unfortunately, little or no practical relevance. In spite of our dislike of “Keynesian” monetary economics, J.M. Keynes’ dictum, that “in the long-run we are all dead” does seem to apply to New Growth Theory.

There is an additional and important reason why the theoretical foundations of the new growth theory are shaky. A key element of the New Growth Theory is the assumption that after an imitator enters, price will be driven down to cost, and there will be no profits to pay for the original innovation. A moment of reflection shows that if there is any cost at all to imitation, then there will be no imitation, and the innovator will enjoy an unfettered monopoly. For the imitators correctly understand that if they were to enter, they would lose their fixed cost of imitation. That is, if we take seriously the argument as to why there should be no innovation without IP, we find that it means equally that there will be not be imitation without IP, thereby undermining the first argument.

Now, strictly speaking, in the New Growth Theory, it is assumed that imitation is in fact costless. Amazingly enough, this does not suffice to save their argument. For in this case imitators are indifferent to imitating – there being no profit in it. So there is a perfectly good equilibrium in which innovators get monopoly

profits and imitators choose not to enter. And there is also a – fairly implausible – equilibrium in which there is no innovation for fear that the imitators, although indifferent, will choose to enter. For some reason that completely escapes us, the scholars working in the New Growth Theory tradition take the least plausible equilibrium under the least plausible set of assumptions and act as though it is a dead certainty in the real world. Go, figure.

Unpriced Spillover Externalities

A variation on the fixed cost plus constant marginal cost theme is that ideas are subject to *unpriced spillover externalities* – technical jargon hiding a simple idea that is easily illustrated through the example of the wheelbarrow. After the wheelbarrow is invented, in order to make productive use of it by moving sand, dirt and dung around, it must be used in plain sight. Any passerby will see the wheelbarrow in use, and by doing so will get the idea of a wheelbarrow for free, thereby rushing home to build their own wheelbarrows. Hence, the valuable knowledge of the wheelbarrow is transmitted without the permission of, and without payment to, the inventor.

There is no point in denying that a number of valuable innovations are like the wheelbarrow; in these cases imitation is relatively cheap and, what is more important, imitation can be carried out without having to purchase a copy of the idea from the original innovator. If looking and studying what the other guy has done is enough to produce a good imitation, and very little compensation accrues to the innovator for the act of looking, then we say that there is an unpriced externality. Once you recognize that such cases exist, three questions become important (i) How widespread are they? That is: How many inventions are like the wheel? (ii) For those that are like the wheel, is the externality so large that, absent intellectual monopoly, the original innovator would have never invented the wheel? (iii) Finally, is intellectual monopoly the socially smart way of addressing this potential inefficiency?

Young, Schumpeter, Arrow and their more recent followers seem convinced that most ideas are like the idea of the wheelbarrow, spreading freely and costlessly. When we are reminded by our Mexican friends that the Mayas had the wheel but used it only for children's toys and never had the, additional, idea of using it also for carts, or when we learn that the "idea" of agriculture spread from the Fertile crescent at the amazing speed of roughly one kilometer per year, we tend to doubt that most ideas

spread as fast as many economic theorists theorize. Not to speak of the ability of making espresso coffee properly, which seems to still remain secluded within the boundary's of Italy, or of Napoli as a common friend of ours insistently and reasonably argues.

As for the other two questions, they either did not ask them or their answers were ambiguous. Arrow, for example, clearly thought that "yes" was the right answer to (ii), the question of the size of the externality, but that public support for research and innovation was the solution, thereby answering (iii) in the negative. These are indeed complex questions, which can be seriously addressed only with substantial patience; no quick and ready answer is available. We will now try to address questions (i) and (ii) here, while the very last chapter tentatively addresses (iii) and the intellectual property policies we believe would result in socially beneficial outcomes.

The imitative externality

It is certainly true that imitation is everywhere, from sport to business, from dancing to dressing, from driving to singing. In fact, imitation is at the heart of competitive behavior and of almost any kind of social interaction. Like the fixed cost cum marginal cost argument that, as we pointed out earlier, is so powerful an argument that it can be applied to any and every thing, imitation is so widespread that, when taken literally, it is also everywhere. By this token one should see unpriced externalities in every market where producers imitate each other, thereby concluding that all kinds of economic activities should be allowed some form of monopoly power. Restaurants imitate each other, as coffee shops, athletes, real estate agents, car salesmen, and even bricklayers do, but we would certainly find it crazy to attribute to a firm in each of these businesses a monopoly power on one technique or another. This suggests that equating imitation with unpriced externalities leads us into a dark night in which all cows are gray; this is not a pleasant situation, hence, we better turn on a few lights.

Although the view that, once discovered, ideas can be imitated for free by anybody is widespread, it is far from the truth. While it may occasionally be the case that an idea is acquired at no cost – ideas are generally difficult to communicate, and the resources for doing so are limited. It is rather ironic that a group of economists, who are also college professors and earn a substantial living teaching old ideas because their transmission is neither simple nor cheap, would argue otherwise in their scientific work. Most of the times imitation requires effort and, what is more

important, imitation requires purchasing either some products or some teaching services from the original innovator, meaning that most spillovers are priced.

While there are certainly informational spillovers as ideas move from person to person, it is hard to see why in most instances they are not priced. Although it is possible to imagine examples such as the wheelbarrow where an idea cannot be used without revealing the secret, relatively few ideas are of this type. For copyrightable creations such as books, music, plays, movies and art, unpriced spillovers obviously play little role. A book, a CD or a work of art must be purchased before it can be used, and the creator is free to make use of his creation in the privacy of his home without revealing the secret to the public at large. Similarly with movies or plays. In all cases, the creation must effectively be purchased before the “secret” is revealed.

In the case of patentable ideas such as the wheelbarrow, the idea of unpriced spillovers is more plausible. Yet there is no reason to believe that it is of practical importance. Indeed, there is a modern example of the wheelbarrow – that of Travelpro – the inventor of the modern wheeled roll-on suitcase with a retractable handle. Obviously such an idea can not both be useful and be secret – and once you see a wheeled roll-on suitcase it is not difficult to figure out how to make one of your own. Needless to say, Travelpro was quickly imitated – and you probably have never heard of them. Never-the-less – despite their inability to garner an intellectual monopoly over their invention – they found it worthwhile to innovate – and they still do a lucrative business today, claiming “425,000 Flight Crew Members Worldwide Choose Travelpro Luggage.”

Quantifying unpriced spillovers

The widespread belief in the free availability of ideas is sometime due to poor inspection of data and historical documents but, most often, it is the consequence of a common cognitive bias. Every day we are surrounded, one would say: bombarded, by references to and the effects of so many “ideas” that we often feel as if we knew them all or could know and use them all if we only wanted to. But that is just a pious illusion, as we should have all learned when our seven year old child asked for an explanation of how the chip in our wondrous cellular phone *really* worked. Most ideas, we may have heard about them, we may even know where to find a manual or an expert that could teach us about them, but we are very far from being able to put them into productive economic

usage. Take, for example, the famous idea $E = mc^2$. This is commonly known, in the sense that many people can quote the formula. But how many people actually know what it means, or can put it to any productive use? The two of us, for starters, have no idea of what to do with it.

Most productive ideas, these days especially but certainly since at least the times of the Renaissance, are much more complicated and less self-evident than the wheelbarrow or the wheeled suitcase. One does not learn the formula for a new drug by staring at the pill, and while the formula may be divined in a chemical lab, the procedure for producing it may not be. Billions of people have drunk billions of gallons of Coca Cola, but the famous formula is still a well kept secret. Even the steam engine invented by this book's designated scoundrel, James Watt, was not easy to copy: twenty or thirty years after it had been introduced purchasers still needed the expertise of Mr. Watt and his assistants to erect and operate it. More to the point, almost forty years after Honda and Toyota invaded the U.S. market, GM and Ford, not to speak of Fiat and Rover, are still incapable of producing cars with the same quality, reliability, and fuel consumption. Millions of books have described the recipe for "tortelloni di zucca" to millions of people around the world for decades, but we are sorry to inform you that those they make in the area between Mantova and Modena are still unbeatable, not to speak of those that the mother-in-law of one of us cooks, yearly, on December 24th.

The point should be clear by now: when one looks at the world of productive ideas, there is little prima-facie evidence of spillover externalities from economically valuable innovations. Which makes the fact that little justification for the assumption is given in the economics literature rather suspicious. If we take the role of devil's advocate in support of the spillover theory, the most likely culprit would seem to be employees moving from firm to firm, carrying trade secrets with them as they move. However, as Gary Becker astutely observed

Firms introducing innovations are alleged to be forced to share their knowledge with competitors through the bidding away of employees who are privy to their secrets. This may well be a common practice, but if employees benefit from access to salable information about secrets, they would be willing to work more cheaply than otherwise.

Plenty of supporting evidence from apprentices' wages to the practice of pricing the academic quality of a department into the salary of new assistant professors makes Becker's observation compelling.

The empirical justification for the idea of unpriced spillovers seems to come largely from the notion of agglomeration – that similar firms locate near each other to take advantage of positive externalities in the form of ideas that “are in the air.” But notice that firms would have incentive to locate nearby even if spillovers were priced, provided that information transfer from nearby firms is less costly than from distant firms. Did Silicon Valley form so that employees might overhear valuable ideas in bars, or because it made it relatively easy for firms to interact with one another contractually? Certainly, evidence supporting the idea that large unpriced spillovers takes place among innovating firms, is scarce at best. Ellison and Glaeser provide the most careful analysis, finding only very weak evidence that agglomeration is due to spillovers. Other studies find even weaker or no evidence for the allegedly pervasive unpriced spillovers. Acemoglu and Angrist, for example, estimate average schooling externalities at the U.S. state-level and find no evidence for significant externalities. Ciccone and Peri examine local labor markets to test if productivity increases with the average human capital of the workforce in the area where firms are located; their data reject the hypothesis. Castiglionesi and Ornaghi look carefully for external effects in a large panel of Spanish manufacturing firms data, and conclude they cannot find any. Most anecdotal evidence about industrial agglomeration, from Silicon Valley to the greenhouses of Almeria, suggests that firms do price informational and technological spillovers into the wages of their employees.

If unpriced spillovers are indeed important, it must be that ideas are so inexpensive to transmit that mere observation is enough to convey the essential core of the idea. Here the evidence is overwhelmingly against: there is a large literature on technology transfer strongly indicating that – even with the active help of the innovator – ideas are difficult and costly to transmit. Several examples of technology diffusion illustrate the point.

One of the earliest known examples of the diffusion of technology is the spread of agriculture during the neolithic period. Work by Cavalli-Sforza and others has documented that the average speed of diffusion of agriculture was of about one kilometer a year, over a period of many thousands of years. Transportation available at the time – walking – could carry the

ideas many thousands of kilometers per year, so there is a three order of magnitude difference between the rate at which ideas could physically move from one location to another, and the rate at which the idea actually got transmitted and became useful.

Of course, part of the reason for the slow diffusion of agriculture was the need to adopt crop strains to local circumstances, not merely the need to “get the idea of agriculture.” But the adaptation of ideas to local circumstances is important for most ideas – book printed in English, for example, are not of terrifically great value in China. As we argue elsewhere, competition, and not monopoly, generally provides the collaborative advantage that speeds diffusion. If copyright laws were enforced in China so that English books could not easily be pirated into Chinese translations, is it likely that this would increase the speed with which translations became available?

Another good example is that of 17th century silk production.

In 1607 Vittorio Zonca published in Padova his Nuovo Teatro di Machine et Edificii, which included, among numerous engraving of various contraptions, the description of an intricate water-powered machine for throwing silk in a large factory. Zonca’s book went into second edition in 1621 and a third in 1656...G. N. Clark has shown that a copy of the first edition of Zonca’s book had been on the open-access shelves of the Bodleian Library from at least as early as 1620.

Yet despite the fact that the “blueprint” for a silk factory was readily available, it was not until one hundred years later that “the English succeeded in building a mill for the throwing of silk.” This occurred only after “John Lombe, during two years of industrial espionage in Italy, found means to see this engine so often that he made himself a master of the whole invention and of all the different parts and motions.”

Other examples from the past also show the difficulties involved in transferring knowledge. There are many cases of individuals migrating to find out about technologies and inventions. To learn to work the dockyards, to make the pendulum clock or to make woollens you moved to Holland. To learn to cast ordnance, you moved to England. To make spectacles or to work glass, you moved to Venice.

Indeed, we find that knowledge is so embodied that craftsmen were bribed, and sometimes kidnapped to an area where their skills were lacking.

An inquiry by the Bergskollegium in the 1660s into the emigration of Swedish iron masters revealed that a number of workers sailed from Nykoping believing that they were being taken to some other part of Sweden. Instead they were brought to Lubeck, from there to Hamburg, and finally to France, where Colbert was determined to start an iron industry on the Swedish model.

Yet another example of the slow spread of knowledge is the use of double-entry bookkeeping. This was invented in Tuscany at the end of the 13th century, and widely used in Venice in the 14th century. It does not reach the Hanseatic League cities in Northern Europe until well into the 16th Century.

However, one does not have to turn to the Middle Ages to find examples of the difficulty in transferring ideas. *The Economist* of December 22, 2001 ran an amusing piece on the “search for a perfect cup” of espresso coffee. The point of the article is that, in spite of all its centuries of age and of the apparent simplicity of its very publicly available formula, most barmen in the world outside Italy have no idea of how to make a good espresso. What is especially interesting is the embodiment of information in espresso machines, in different varieties of coffee beans, and in different human beings.

Finally, let us go back from where we started and admit once again that very mild unpriced spillover externalities are endemic in everyday life. For example, when a beautifully dressed woman walks past one of the two of us, his utility is substantially increased, although there is no reason to believe that the woman gains from this admiration. Since beautifully dressed women cannot easily charge their male admirers, this is an unpriced spillover externality. To our knowledge, no public policy suggestion has been put forward that public monopolies should be awarded to solve this particular externality, nor many other similar minor externalities we encounter every day.

Secrecy and Patents

A common argument in favor of patent law is that in order to get a patent you must reveal the secret of your invention. Are patent laws a cure for trade-secrecy? Granting a legal monopoly in

exchange for revealing the “secret” of the innovation is one way to make innovations more widely available in the long run. However, as a number of economists have pointed out, in the simplest case this argument fails.

Suppose that each innovation can be kept secret for some period of time, with the actual length varying from innovation to innovation, and that the length of legal patent protection is 20 years. Then the innovator will choose secrecy in those cases where it is possible to keep the secret for longer than 20 years, and choose patent protection in those cases where the secret can be kept only for less than 20 years. In this case, patent protection has a socially damaging effect. Secrets that can be kept for more than 20 years are still kept for the maximum length of time, while those that without patent would have been monopolized for a shorter time, are now monopolized for 20 years. Indeed, it is important to realize that outside the pharmaceutical industry, where the regulatory system effectively forces revelation, trade-secrecy is considerably more important than patent. Repeatedly, in surveys of R&D lab and company managers only 23%-35% indicate that patents are effective as a means of appropriating returns. By way of contrast, 51% argue that trade-secrecy is effective.

Although in the simplest case, patent law does not impact on trade-secrecy, in cases where it is possible to expend real resources in making secrets less accessible, the innovator faces a real trade-off between private rent-seeking through secrecy and public rent-seeking through patents. This is true also in the case of copyright, as publicly enforced copyright is potentially an alternative to socially undesirable methods such as encryption and Digital Rights Management designed to limit reproduction. There is a small literature in economics on this trade-off.

One issue is how information that changes rival firm beliefs may work to the advantage of the firm releasing the information. Okuno-Fujiwara et al put focus on the fact the innovators may have strategic reasons to reveal secrets as well as to keep them: by revealing secrets they may induce R&D from competitors that they will benefit from in turn. Ponce considers the possibility that under existing patent law, by disclosing a secret, a rival might be prevented from patenting the idea. Boldrin and Levine show that an innovator who does not have the option of using a legal monopoly will invest less in productive capacity than an innovator who has access to patents, as less capacity increases profitability after the secret is lost.

However, patents, which are meant to reduce secrecy, may lead to the opposite result. If imitation is possible early in the life-cycle of the industry, an innovator has little reason to enforce a patent, as there is no reason to restrict capacity when industry capacity is low anyway. For this reason, an innovator with the option of a legal monopoly may have greater incentive for secrecy than one without – to make sure that imitation cannot take place until it is profitable for him to make use of the patent. By way of contrast, we have pointed out that under competition there is a strong incentive to make public small intermediate steps – by doing so competitors are encouraged to make additional advances that the original innovator will benefit from. If instead there is a race for a patent, the incentive is to keep intermediate results secret so as to keep competitors from winning the race.

In fact there is much evidence that secrecy and legal monopoly are complementary rather than alternatives. Despite copyright, producers of books, music and movies have aggressively attempted to encrypt their work with Digital Rights Management (DRM), not only encrypting DVDs, but even going so far as to encrypt CDs using methods that are incompatible with many CD players and in some cases, physically damaging to computers. Similarly, in the field of patents, we have the Wright brothers, who for a decade locked their patented airplane in a barn so as to avoid revealing the secret of flight.

There is evidence that the possibility of legal monopoly does have an impact on the direction of R&D, if not on the amount of R&D. Recent research by Moser on countries with and without patents in the 19th century shows that those countries without patents did not innovate less, but tended to focus innovation in areas where secrecy is relatively easy, such as food processing and scientific instruments. Whether such innovations are more or less socially desirable than other innovations is difficult to say, as Moser stresses in her work.

While replacing secrecy with legal monopoly may have some impact on the direction of innovation, there is little reason to believe that it actually succeeds in making important secrets public and easily accessible to other innovators. For most innovations, it is the details that matter, not the rather vague descriptions required in patent applications. Take for example, the controversial Amazon one-click patent, U.S. Patent 5,960,411. The actual idea is rather trivial, and there are a variety of ways in which one-click purchase can be implemented by computer, any one of which can be implemented by a competent programmer given a modest

investment of time and effort. For the record, here is the detailed description of the invention from the patent application:

The present invention provides a method and system for single-action ordering of items in a client/server environment. The single-action ordering system of the present invention reduces the number of purchaser interactions needed to place an order and reduces the amount of sensitive information that is transmitted between a client system and a server system. In one embodiment, the server system assigns a unique client identifier to each client system. The server system also stores purchaser-specific order information for various potential purchasers. The purchaser-specific order information may have been collected from a previous order placed by the purchaser. The server system maps each client identifier to a purchaser that may use that client system to place an order. The server system may map the client identifiers to the purchaser who last placed an order using that client system. When a purchaser wants to place an order, the purchaser uses a client system to send the request for information describing the item to be ordered along with its client identifier. The server system determines whether the client identifier for that client system is mapped to a purchaser. If so mapped, the server system determines whether single-action ordering is enabled for that purchaser at that client system. If enabled, the server system sends the requested information (e.g., via a Web page) to the client computer system along with an indication of the single action to perform to place the order for the item. When single-action ordering is enabled, the purchaser need only perform a single action (e.g., click a mouse button) to order the item. When the purchaser performs that single action, the client system notifies the server system. The server system then completes the order by adding the purchaser-specific order information for the purchaser that is mapped to that client identifier to the item order information (e.g., product identifier and quantity). Thus, once the description of an item is displayed, the purchaser need only take a single action to place the order to purchase that item. Also, since the client identifier identifies purchaser-specific order information already stored at the server system, there is no need for such

sensitive information to be transmitted via the Internet or other communications medium.

As can be seen, the “secret” that is revealed is, if anything, less informative than the simple observation that the purchaser buys something by means of a single click. Information that might actually be of use to a computer programmer – for example the source code to the specific implementation used by Amazon – is not provided as part of the patent, nor is it required to be. Certainly it is hard to argue that the social cost of giving Amazon a monopoly over purchasing by clicking a single button is somehow offset by the social benefit of the information revealed in the patent application.

Schumpeterian Good Monopoly

Although originally not a mainstream view in economics, the Schumpeterian view is now close to becoming an orthodoxy in most circles. Schumpeter celebrates monopoly as the ultimate accomplishment of capitalism. He argues that in a world in which intellectual property holders are monopolists, competition is a dynamic process that is implemented via the process of “creative destruction.” This idea remains widespread today; for example, Aghion and Howitt in 1992 developed a formal model based on Schumpeterian ideas. The critical idea is that competition is not in the market but for the market; while competition may be good at a given point in time as it induces “static efficiency,” monopoly is good in the long run, these theorists argue, because it brings about “dynamic efficiency”, that is, innovation. The innovative winner takes all the market for a while, but threat of drastic innovation is strong enough to force dominant firms to continue innovating and to make monopolized markets effectively contestable. The idea is that innovations are frequent, so that the monopolist is only temporary. Only monopolists that innovate as fast or faster than potential competitors remain viable, hence the system is capable of generating a very high rate of innovation.

An example of how this might take place is given by Evans and Schmalensee. They examine four cases of this “frequent policing” of monopolistic positions. The 1990 leader in word processing, WordPerfect, is overtaken by Microsoft Word in 1997. The 1988 leader of spreadsheets Lotus 1-2-3 is overtaken by Microsoft Excel by 1997. The 1989 leader in personal finance, Managing your Money, is overtaken by Quicken by 1996. The

1990 leader in desktop publishing, Adobe Pagemaker, is overtaken by QuarkXPress by 1997.

There are, however, three features of this data that deserve note.

- Two of the four initial leaders are overtaken by the big monopoly, Microsoft, and since then there has been no further overtaking. When the initial leaders are overtaken, they are far from being monopolists, either *de facto* or *de jure*.
- It takes about 7 years for the first lead to change hands and, as far as we can tell, infinity for the second leader to be overtaken.
- All the reported examples of dynamic competition, either in the software industry or elsewhere, pertain to the early stages of a new industry, when intellectual property protection is low and imitation and competition are high.

As we have repeatedly insisted, once the industry matures and intellectual property rights are obtained, monopolies tend to become very long lasting. When was the last time that someone overtook the Hollywood studios or the Big Five in the movie and music industry? How long would have we waited for someone to overtake AT&T and free the telecommunication industry, if its monopoly had not been torn apart by an anti-trust action? More generally, we ask the reader to perform the following mental exercise: how many industries can he/she mention where the mechanism described in the Schumpeterian model has been at work, with innovators frequently supplanting the incumbent monopolist, becoming a monopolist in turn to be killed shortly after by yet another innovator?

The basic Schumpeterian argument is oblivious to the fact that once monopolies get established, rather than allow themselves to be swept away by competition, they generally engage in rent-seeking behavior – using their size and political clout to get the government to protect their market position. How, for example, does the expenditure of money on lobbyists by drug-companies who are fighting for extensions of their patents figure into the Schumpeterian picture?

Although Schumpeter's arguments were widely and broadly expounded in the industrial organization and growth literature forty to fifty years ago, they were swept away by the hard facts of the 1960s and 1970s when the monopolized sectors of the US economy stagnated without innovating, while growth and innovation were flowing from small-size firms, and everybody agreed that "small is beautiful". Regrettably, they have made a coming back under the cover of "intellectual property is good for

innovation”: as usual, nothing is particularly new under the sun, at least in the land of economic fallacies. Even Schumpeter himself admitted

It is certainly as conceivable that an all-pervading cartel system might sabotage all progress as it is that it might realize, with smaller social and private costs, all that perfect competition is supposed to realize.

The “Idea” Economy

It is often suggested that “ideas” are becoming increasingly important as a component of the economy. Pundits and academics alike theorize about the “new economy”, the “weightless economy,” the “global information economy”, and so forth. They cast images of a world where machines, beside reproducing themselves, produce all kind of material goods and services as well, while humans engage in creative activities and in the exchange of ideas. Although this sounds fascinating, like every utopia it is mostly a pipedream: any reader of Karl Marx’s *Grundrisse* would recognize his description of communism to match closely that of an “idea” economy. The question is, which kind of institutional arrangements are advocated for travel to these gardens of utopia, and are the flowers of such gardens as enchanting as their advocates tell us?

Our suspicions are raised by the fact that, customarily, the visionary preacher of the idea economy is also a staunch supporter of intellectual monopoly, and of ever stronger and stricter intellectual monopoly laws. This seems to have the implication either that, eventually, we must reach a state where copyright and patents, and the loss of freedom they entail, becomes ubiquitous, or we must somehow move beyond “capitalism” to some sort of socialistic world in which we no longer attempt to profit from our individual enterprises, but rather all agree to produce for some sort of common good, or perhaps even just for our own good with the hope that this somehow turns out to be the common good as well.

An example of this “modern” perspective can be found in DeLong and Froomkin’s “deconstruct[ion of] Adam Smith’s case for the market system.” To summarize their argument: excluding people from using an idea is difficult because digital data is too easy to copy, and in any case, digital goods are non-rivalrous, meaning that it is not a good idea from a social point of view to try, given that copies are so cheap. Then they argue that the value of

digital goods is less apparent to the consumer than that of traditional goods. They conclude from this analysis that we are facing a massive market failure, and look for remedies.

The reason why digital goods are complex goods about which consumers are badly informed seems to us more an assertion than a proven fact. Why a video game or a cellular phone service is any more complex than a recent BMW we do not know. Is a digital book more complex than a regular book? Music in MP3 format more complex than a CD? Is purchasing underwear on line from Victoria's Secret riskier than doing it by telephone from a catalog? As one starts to think at concrete examples, it is easy to realize that the additional complexity of digital goods with respect to the usual ones is just empty rhetoric. When our two children were, respectively, nineteen and fifteen years old, neither of them seemed to have much of a problem at purchasing digital or non-digital goods on line. In fact, they did so much more easily and efficiently than by going to the local mall (among other things, because neither of them was yet allowed to drive around town). They seemed to be able to read the instructions on line equally as well as on the piece of paper that comes with regularly wrapped goods.

As to the issue of whether digital data is too easy to copy: Is it true that technological change – the Internet revolution – will lower the costs of copying and distributing ideas so much that competitive rents are no longer significant?

In a dynamic world in which capacity expands over time, such as that studied by Boldrin and Levine or Quah, ideas may eventually become freely available to everyone. But time elapses before this happens, and in the interim, the idea sells for a positive price, with the rents going to the original innovator. What is the implication of technological change for these rents? Do competitive rents drop to zero, so that without strengthened intellectual monopoly, ideas will cease to be produced?

First notice that for patentable ideas, this discussion is largely moot. The time required to transmit a blueprint, or engineering diagram lies not in the difference between several days it might take to deliver by mail, versus several seconds by email, but rather in the amount of time it takes for the receiver to read and understand the technical specifications. Indeed, in the case of many patentable ideas, the cost of redistribution may well be increasing over time. Certainly the idea of how to build a wheel is much easier to communicate than the idea of how to build an atomic bomb. Basically inventions range from the trivial, such as the idea

of a “single click” to buy an item on the Internet, to the complex, such as the Karmarkar algorithm for solving linear programming problems. Trivial ideas are cheap to communicate, but of course they are also cheap to create. Complex ideas are expensive to create, but they are also difficult to communicate, so they are scarce and will command a substantial premium for a long period of time. In both cases the cost of producing the ideas and the competitive rents are commensurate, and some ideas will be produced without intellectual monopoly, while perhaps others will not.

In the case of copyrightable creations, it can be argued that technological change – computers and the Internet – are greatly lowering the cost of reproduction, and so the conventional model in which ideas trade instantly at zero price is relevant. However, it is cost relative to the amount of competitive rent that matters. If indeed the Internet is reducing competitive rents, bear in mind that the same computer technology is reducing the cost of producing copyrightable creations. Take music, for example. Music editing capabilities that required millions of dollars of studio equipment ten years ago, now require an investment in computer equipment of thousands of dollars. And long before the Internet swamps the markets with music and movies, authors will be able to create movies on their home computers with no greater difficulty than writing a book – and entirely without the assistance of actors, cinematographers, and all the other people that contribute to the high cost of movie making.

Moreover, improving transmission and reproduction technology may increase, rather than decrease, competitive rents earned by the innovator. Simply put, the creator of the idea in competitive equilibrium can claim the present value of all revenue generated by the idea. Whether price falling to zero implies revenue falling to zero depends on the elasticity of demand, the mathematics of infinity times zero is complicated at times and this is one of them. If, in fact, demand is elastic, then price falling to zero implies (because so many more units are sold) revenue increasing to infinity. So in this case, improved reproduction technology would increase rather than decrease the rents accruing to the competitive innovator.

The Global Economy

One often finds the argument that the increasingly freer trade, the growth of many Asian economies, and the lowering of transportation costs are creating a dangerous mix for our economic

stability. In particular, it is argued, our ideas and products are increasingly being “unrightfully copied”, and this requires some kind of serious intervention by our governments. In other words, globalization is risky for our innovators, and we need to strengthen intellectual property protection and force emerging countries to do the same we do. Free markets and free trade, we are lectured, are becoming a threat to our economic well being, and Adam Smith’s and Ricardo’s views that competition and comparative advantages will make all of us better off are too naive to be believed, and certainly not applicable to this complex and globalized economy.

In fact, as the economy expands, Adam Smith and David Ricardo, far from becoming irrelevant as DeLong and Froomkin assert, become more relevant than ever, the rationale for intellectual monopoly fades away, and we may look forward to a future in which we earn our living by trading ideas and creations – but without the intervention of government enforced intellectual monopolies. As the size of the market expands, both competitive rents and the profit from first mover advantage will generally increase proportionally – meaning that most economically useful ideas will be produced even in the absence of intellectual monopoly.

The consequences of increasing market size are discussed extensively in technical work by the two of us and other researchers. Notice, first, an important common sense fact: When the Indian and Chinese markets open up for, say, music or drugs produced in the USA or the EU, no matter how much “piracy” there is over there, at least some slices of those markets are going to “legitimate” producers. Before India and China opened to trade, those same producers would have had to field the fixed costs of their innovations with the proceedings from sales in much smaller markets. Hence, even if “we” get, say, only 10% of the new markets (a ridiculously low number), that is still a lot more revenue, hence: profits, than we would have had without globalization. This, by itself, suggests that the equalization of globalization with the need for stronger intellectual property laws is just plain and simple rent-seeking propaganda from existing monopolies.

There is a second, maybe more subtle but certainly not less relevant argument. As market size increases, two things happen. More consumers are added for all those ideas you are already producing or you would have produced in any case. Let us call these “good” ideas since they were good enough to be profitable even when the market was pretty small. Also, additional ideas from

the new guys getting into the game become available. Let us call these “marginal” ideas, since if they had been good ideas they would have been introduced even when the market was small. Now, lowering intellectual property protection decreases the monopoly distortions for all consumers of the “good” ideas. With a larger market, many more consumers benefit from the greater usefulness and availability of all these “good” ideas. Second, lowering intellectual property protection makes it harder for “marginal” ideas to make it into the market. But in a larger market, more of these “marginal” ideas are going to be produced anyway, as there are more consumers to pay for the cost of inventing them.

So the bottom line is that as the size of the market increases, by lowering intellectual property protection, you can get a lot more use out of “good” ideas at the cost of not getting quite as many “marginal” ideas as you would have. If expanding the market meant only a few new people coming in, and there were lots of valuable “marginal” ideas to be produced if only they could earn a few pennies more, then maybe lowering intellectual property protection would not be such a good idea. Try, however, adding up China and India to your market, then tell us if that gives you “a few people”. If you also think that the world is full of great marginal ideas that would be produced if only they earned a few dollars more, then go ahead and insist we trade with China and India only after they adopt our ever-increasing intellectual property terms. We looked at data, and we looked at theory, and then we looked at data again; we discovered that China and India are a lot of people, and that the great marginal ideas that do not get produced just because they do not make those few extra bucks are quite rare, at best. Hence, we concluded, we are a lot better off with a lower intellectual property protection when the market size increases, not viceversa.

Based on a more technical analysis, we argue that a simple rule of thumb that allows for some additional marginal ideas to be created while reducing the overall monopoly distortion is to reduce the length of term in proportion to the scale of the market. This simple rule of thumb would be that if the size of market grows by 4%, the length of protection should be cut by 1%.

Take for example the WTO. The G7 nations account for about 2/3rds of world GDP. Adding the 1/3 from the rest of the world would increase the size of the market of about fifty percent. If we think of the intellectual property changes in the WTO as extending the protection that exists in the G7 to the rest of the world, this suggests a reduction in the length of term by about

1/12th. Similarly, as the world economy grows, copyright and patent terms should be reduced. If the world economy grows at a rate of 2% a year, our simple rule of thumb would be to reduce protection terms by 0.5% per year. Unfortunately, in the case of copyright, terms have been moving in the wrong direction; they have grown by a factor of about four, while world GDP has grown by nearly two orders of magnitude. Hence, if the copyright term of 28 years at the beginning of the 20th century was socially optimal, the current term should be about a year, rather than the current term of approximately 100 years!

Notice that the conventional wisdom is quite different. As Hal Varian says

one prominent feature of information goods is that they have large fixed costs of production and small variable costs of reproduction. Cost-based pricing makes little sense in this context; value-based pricing is much more appropriate.

In fact technological change is reducing the fixed cost for many creations, especially in music and movies, and value-based pricing here means a higher, and hence more distortionary price. As the economy expands, there is less need for these price distortions, and we may hope that intellectual monopoly will eventually join Communism on the scrap heap of history.

The Public Domain and the Commons

We are almost done with using our mallet to smash shiny myths, but an important one is still standing, which is quite popular among legal scholars and, more generally, people working in the law and economics tradition. This is the myth that ideas in the public domain are like common pastures. Because of this, it is argued, the public domain suffers from congestion and overuse, and intellectual property rights are necessary to provide appropriate incentives to “maintain” existing works.

One reason for rights in ordinary property is indeed to prevent congestion and overuse. For example, if a pasture is public, I do not take account of the negative effect my grazing sheep have on the availability of grass for your sheep. Because roads are public, I do not consider that my driving on the road makes it more difficult for you to get to work. Because the ocean is public, I do not consider that catching fish leaves fewer for you.

This is the “tragedy of the commons” and in each case it means that the pasture, road or ocean will be overused.

Is the public domain for ideas like a common? Does my using ideas in the public domain have an adverse effect on your ability to use them? Certainly common sense suggests

there can be no overgrazing of intellectual property...because intellectual property is not destroyed or even diminished by consumption.

That I might make use of an idea does not make you less able to use it. Indeed it seems obvious that welfare is increased when more people become cognizant of a useful idea, whereas overall productive capacity is not increased when more sheep try to eat from the same square foot of pasture.

Congress and the Supreme Court apparently do not agree, and recently Landes and Posner have also claimed that

Recognition of an 'overgrazing' problem in copyrightable works has lagged.

In fact it has not, because there is no coherent theory or evidence pointing to such a problem.

The overgrazing argument holds that just as by grazing my cows on your grass I reduce the grass available for your cows, so by selling copies of an idea, I reduce the profitability to you of selling the same idea. Notice first that the analogy with the cow and the grass has already been broken by its own proponents: they do not argue, as the analogy requires, that by selling my copies of an idea I reduce the availability of that same idea, or any other idea for that matter, to you. They claim, instead, that I am reducing your profitability in selling other copies of the same idea, and thereby lies the fallacy. To see the fallacy, consider applying the “reduced profitability argument” to the case of food. If my restaurant sells Ricardo a large meal, he is not likely to go across the street to your restaurant and buy another; my selling him a large meal does not prevent you from using your food, but it does prevent you from selling it to Ricardo. So too with ideas. If I sell Ricardo a copy of my Bible, I do not prevent you from making copies of your Bible, but I will reduce your profit because Ricardo will not buy from you. By way of contrast, by taking fish from the sea I am not merely taking your customers, I am taking an economically useful good or service.

Economists refer to the former as a “pecuniary” externality, and the latter as a “technological” externality. Pecuniary externalities are a good thing – the incentive to steal customers is an essential part of the normal and efficient functioning of the competitive system. Technological externalities are a bad thing, leading to overuse. Hence, ideas in the public domain are like fish in the common pond only if, because they are in the public domain and because of people making copies of them, they generate technological externalities. Do they?

Precious few examples of what the externalities might be that involve ideas. Landes and Posner express concern about Mickey Mouse because “If because copyright had expired anyone were free to incorporate the Mickey Mouse character in a book, movie, song, etc., the value of the character might plummet.” The value for whom? It cannot be the social value of the Mickey Mouse character that plummets – this increases when more people have access. Rather it is the market price of copies of the Mickey Mouse character that plummets. As Landes and Posner admit, “If this came about only...as the ordinary consequence of an increase in output, aggregate value would actually increase.” They then assert “however, the public might rapidly tire of Mickey Mouse.” But this is in fact the ordinary consequence of an increase in output. If I eat a large meal, I am less hungry – the value to me of a meal is diminished, and restaurants will find I am not willing to pay them much money. No externality is involved: as more of a good is consumed, the more tired people become of it. For there to be an externality, it would have to be the case that my consumption of copies of Mickey Mouse from the public domain made you more tired of it – an improbability, to say the least.

Landes and Posner continue on to quote from a book on Disney marketing

To avoid overkill, Disney manages its character portfolio with care. It has hundreds of characters on its books, many of them just waiting to be called out of retirement...Disney practices good husbandry of its characters and extends the life of its brands by not overexposing them...They avoid debasing the currency.

This is of course exactly how we would expect a monopolist to behave. If Disney were to be given a monopoly on food, we can be sure they would practice “good husbandry” of food, most likely leaving us all on the edge of starvation. This would be good for

Disney, since we would all be willing to pay a high price for food. But the losses to the rest of us would far outweigh the gain to Disney. It is a relief to know that, after all, Mickey Mouse is not such an essential ingredient of the American diet.

Landes and Posner also express concern that Mickey Mouse's "image might also be blurred or even tarnished, as some authors portrayed him as a Casanova, others as catmeat, others as an animal rights advocate, still others as the henpecked husband of Minnie." Since in common parlance calling something "Mickey Mouse" is not intended as a compliment, one might wonder how Mickey Mouse's reputation could be more tarnished than it is. Regardless, bear in mind that the only thing that matters are copies of the idea of Mickey Mouse. If Mickey Mouse falls into the public domain, someone might well use his or her copy of the idea of Mickey Mouse to produce, say, a pornographic film starring Mickey Mouse. But would this tarnish the copies of the idea of Mickey Mouse in the minds of millions of 6-year-old children? It is hard to see how: ordinarily children of this age are not allowed to see pornographic films. Presumably those people that choose to see the film are those who benefit from this portrayal of Mickey Mouse. How does their doing so interfere in any way with anyone else's enjoyment of their vision of Mickey Mouse?

To understand the distinction between a pecuniary and technological externality more clearly, consider the case of music. By and large, my listening to my copy of my music does not interfere with you listening to your copy of your music – there is no externality. But if I play my music very loudly, it may in fact interfere with your enjoyment. One solution to this very real technological externality would be to give a monopoly on the sale of stereo equipment to the Disney Corporation. As a good monopolist, they would limit the supply and raise the price of stereos. As a result, I would not be able to afford such powerful equipment, and would be forced to play my music less loudly, thereby reducing the externality. Mild negative externalities are common in everyday life. One "solution" is the creation of monopolies that will limit supply of the ingredients used to produce externalities. But most of us understand that this "cure" is worse than the disease. Cars are major generators of negative externalities, from air to noise pollution, but, as we argued in the introduction to this chapter, nobody has yet advocated solving the problem by creating a world monopoly on cars.

A more pernicious idea is that in the absence of intellectual property there would be inadequate incentive to promote ideas. For example

Consider an old movie on which copyright had expired that a studio wanted to issue in a colorized version...Promoting the colorized version might increase the demand for the black and white version, a close substitute...the studio would have to take into account, in deciding whether to colorize, the increase in demand for the black and white version.

But in all competitive markets producers lack incentives to promote the industry. Individual wheat producers do not have much incentive to promote the healthy virtues of wheat, fisherman do not have much incentive to promote the healthy virtues of fish, and so on. That is why promotional campaign for milk, cereals, and fish are usually carried out by some industry-wide association, and not by individual firms. It is hard to see why the problem with old movies, books and music is different, either qualitatively or quantitatively, from the one in these other competitive markets. Yet, quite rightly, no one argues that we need grant wheat or fish monopolies to solve the “problem” of under promotion.

It is worth reflecting briefly on promotional activities in competitive industries. Surely information about, say the health benefits of fish, is useful to consumers; equally surely no individual fisherman has much incentive to provide this information. Is this some form of market failure? No – in a private ownership economy consumers will have to pay for useful information rather than having it provided for free by producers. And pay they do – doctors, health advisors, magazine publishers all provide this type of information for a fee. There is no evidence that competitive markets under provide product information. Rather in the case of monopolist, because the value of the product mostly goes to the monopolist rather than the consumer, the consumer has little incentive to acquire information, while the monopolist has a lot of incentive to see that the consumer has access to it. So we expect different arrangement for information provision (“promotion”) in competitive and non-competitive markets. In the former, the consumer pays and competitive providers generate information. In the latter, firms will subsidize the provision of information. Of course the monopolist, unlike the competitive providers, will have no incentive to provide accurate

information. We rarely see Disney advertising that, however true it might be, their new Mickey Mouse movie is a real dog, and we should go see the old Mickey Mouse movie instead.

Notes

Ed Felten's pizzairights are discussed on his blog in [2005]. The story of Wind is quoted from WorldnetDaily [2002]. The report on Zimbabwean growth is from the Zimbabwe Independent [2003].

The quote from Schumpeter about monopoly as a necessary evil is from [1943]. The extended quotation on the need to compensate innovators is from Barro and Sala-i-Martin [1999].

A number of authors are references in the brief overview of the history of economic research on innovation. The conventional notion that ideas are a non-rivalrous public good is a major theme of Romer's work [1986, 1990], and is reflected also in Lucas [1988]. Variations on this theme in the setting of monopolistic competition can be found in the work of Grossman and Helpman [1991]. These ideas build on the earlier ideas of Alwyn Young [1928], and especially the post-war work of Kenneth Arrow [1962], further developed by Karl Shell [1966, 1967].

To give credit where it belongs, we should point out that Arrow's original argument was meant to lead to the conclusion that R&D, because it produced a public good (the non-rivalrous knowledge) ought to be financed by public expenditure. There is nothing in Arrow's seminal paper, nor in his subsequent writings on this topic, suggesting that he had in mind intellectual monopoly as a solution to the allocational inefficiency that he – in our view incorrectly – detected in the production of knowledge. In fact, he has always been at the forefront among economists arguing that continuous strengthening of IP protection is not good for social welfare. It is quite ironic that a theoretical model built to support public intervention ended up becoming a tool for the defense of private monopolies.

There is also an extensive microeconomics literature on patents generally beginning with the assumption that innovation will not take place without a patent, and inquires into the optimal length and breadth of patent protection. Good examples can be found in the work of Gilbert and Shapiro [1990], or Gallini and Scotchmer [2001]. In many cases the assumption that patents are necessary for innovation is not intended as an empirical principle, but arises from the fact that studying optimal patents in a world where it would be better not to have patents at all is not terribly interesting.

The embodiment controversy is interesting, but rather academic in nature. The interested reader should consult

Greenwood and Jovanovic [1990] for a recent survey and an assessment of where things stand. The quotation about the Board of Longitude story is from Chapter 2 of Scotchmer [2004], an otherwise excellent and extremely useful textbook on various aspects of the economics of innovation. While Scotchmer does take the standard model as her point of departure for a large part of the book, in various parts her careful analysis comes quite close to some of the theoretical and policy positions we propose here. We quoted out of Suzanne's textbook because it is an excellent and otherwise very coherent one; similar, but much more confused arguments, do abound in the literature.

Evidence on the importance of spillovers can be found in Acemoglu and Angrist [2000], Castiglionesi and Ornaghi [2004], Krugman [1980], Ciccone, and Peri [2002], and Ellison and Glaeser [1997, 1999]. The quote from Becker is from his [1971] textbook. The quotes from Cipolla are from [1976] p. 154 and [1972], and the *Economist Magazine* from June 23, p. 46 [2001]. The work of Cavalli-Sforza can be found in Cavalli-Sforza [1996]. Ivan P'ng showed us the wheeled suitcase example.

We complain extensively about the schizophrenic way in which academic economists, and their alumni in business, politics and the media, keep treating information and its transmission. The following quotation from the textbook from Hirshleifer and Riley [1992] p. 276 shows we are not alone in stressing the very costly nature of information transmission. What remains puzzling is the little use economists are willing to make of this fact.

Only rarely does mere "disclosure" suffice to convey a message; something more active is typically required of both sender and receiver. Teachers work hard preparing lectures and textbooks; students grind away trying to understand them. In our earlier analysis we treated information as a transparently valuable but fugitive commodity, always liable to escape unless closely guarded. But of at least equal importance are types of information whose nature and value are not transparent, that are hard to transmit even to desirous users, and hard for them to absorb even when offered freely.

Information revelation in the strategic patent process is studied by Anton and Yao [2000], Battacharya and Ritter [1983], Horstmann, MacDonald and Slivinski [1985], Okuno-Fujiwara et al [1990] and Ponce [2003]. We discuss the effect of secrecy on

capacity choice in Boldrin and Levine [2004]. The text of the “one-click” patent is from the U.S. Patent Office. The R&D surveys referred to are Levin et al [1987] and Cohen and Walsh [1998].

Schumpeter’s celebration of monopoly and relevant quote can be found in his [1943] work. A modern elaboration is in Aghion and Howitt [1992]. The Evans and Schmalensee article is [2001].

Karl Marx’s description of communism can be found in Marx [1939]. The DeLong and Froomkin article is [1999]. Our work on market size is [2005], and the Hal Varian quote is from [1997].

At the time we first wrote this chapter, we privately estimated it would be a decade before the quality of “home” produced movies caught up to the studio variety. However, this estimate has subsequently turned out to be off by ten years. The production quality of the movie *Star Wreck* available on line from www.starwreck.com is comparable to a \$200 million special effect blockbuster from the studios. Since they thank six sponsors, one for “lend[ing] us a Pinnacle DV500 editing [sic] card” that retails for about \$800, we can safely assume they didn’t spend \$200 million making this movie. To quote from their website:

Q: Damn, you must be very rich when you can afford a film like this...Huge sets, studios, actors and render farms!

A: What sets? The bridge sets are all virtual. The on-location shoots were made at locations that didn't cost any money (schools, public places etc). The "bluescreen studio" is actually a small piece of blue linoleum in Samuli's living room...

For Samuli this is a somewhat costly hobby, but as a movie it's still very close to a zero budget. The most expensive part of the production has been keeping the computer equipment up to date.

The photograph of their “render farm” – a computer stuck in the corner of a rather small apartment kitchen gives the flavor of the production cost.

The Disney marketing quotation is from Karjala [1998] and cited in Landes and Posner [2003].

Landes and Posner’s discussion of overgrazing and maintenance can be found on pp. 222-234 of [2003].

On availability of products in the public domain see also Karjala [2004] and our own analysis earlier in this book.