Patent Rights and Economic Freedom: Friend or Foe?

Walter G. Park
American University

The purpose of this paper is to examine the relationship between patent rights and economic freedom. Are patent rights associated with a higher or lower level of economic freedom? What does this association or relationship depend on? How do patent rights affect the functioning of markets? How might patent systems be reformed so as to be more conducive to economic freedom?

These questions are of interest in light of the changes in patent laws that are occurring around the world as nations reform patent systems in accordance to international agreements[1] and in response to new technological developments in computer software, the internet, biotechnology, and others. The concern is that strengthening of patent systems comes at a cost of reduced market competition and prices raised above marginal costs, among other things. To the extent that patent rights reduce economic freedom, technological progress can be slowed. The issue is whether technological progress requires making markets less free.

There has been very little research on this topic,[2] particularly empirical analysis. This paper uses empirical measures of economic freedom and patent protection to examine their relationship. The purpose is not so much to draw strong conclusions about causality as

---

[1] For example, the World Trade Organization's *Trade-Related Intellectual Property Rights Agreement (TRIPs)*.
[2] With the exception of Bethune (1993), though his focus is on copyrights - not patents.

to pave the way for more research and analysis. The subject of the relationship between economic freedom and patent rights is controversial, yet has not been formally investigated, despite the availability of data. Is it necessary that patent rights vary inversely with economic freedom? This paper argues that this is not the case: the two are found to be complements rather than substitutes.

The paper is organized as follows: the next section discusses what patent rights are and what they are not. There are several misconceptions about patent rights which lead to a misunderstanding of how they affect markets. The section following it provides the empirical analysis. The analysis centers around correlations between measured levels of economic freedom and patent rights, including some tests of sensitivity to alternative measures of economic freedom and to third factor influences. The last section summarizes the results and provides some thoughts on where reforms in patent systems are needed. The importance of this last discussion is in suggesting where economic freedom could be adversely affected by inefficiencies in the patent system, thereby shifting the focus away from whether intellectual property rights should be granted, i.e., the "why" to the manner in which such property rights are granted, i.e., the "how."

Patent rights: some misconceptions

First, it is important to recognize that patent rights are one of several kinds of intellectual property rights (IPRs). It is not uncommon in the literature to find the terms 'patent rights' and 'IPRs' erroneously used interchangeably. There are different kinds of intellectual property rights, such as copyrights, trademark rights, geographic indications, industrial designs, that perform different functions. The focus in this paper is on patent rights, which typically protect inventions, or ideas that produce a "technical effect."

The logic of patent protection is discussed extensively in the literature.[3] It is therefore best here to clarify only a few points. First, in the absence of a patent system, markets for ideas would be 'missing' due to the public good nature of knowledge. A patent system therefore creates a market which would otherwise not exist. The patent right provides three essential ways for patent owners to profit from their inventions: the first is the exclusive rights to manufacture or use their inventions; the second is the right to license others to manufacture or use the invention; and the third is to sue for damages if infringement occurs.

The market in question, however, will not be perfectly competitive, given that the patent owner has exclusive rights to the invention. There is no free entry and exit of other suppliers to drive prices down to marginal costs. Without positive economic profits, however, inventors might not otherwise be able to recoup their upfront fixed research and development (R&D) costs, given how relatively cheaply the output can be reproduced by imitators. Hence the classic tradeoff between technology creation and diffusion: patent systems must provide on the one hand adequate incentives for technology creation and on the other hand opportunities for competitive, efficient diffusion. Thus dynamic efficiency, a positive long run rate of innovation, is achieved at the expense of static inefficiency, non-competitive pricing and supply.

Unfortunately, this characterization of the patent system often creates some misconceptions. The first is that patents create monopolies, in the traditional sense of a single firm in an industry. Rather, the patent gives the holder the *right to exclude* others from using the new idea commercially; it does not allow the holder to exclude other firms from the industry in which it serves. A more appropriate paradigm would be that of a monopolistic competitive industry, as Romer (1990) models innovation, where there are many agents in an

---

[3] See, for example, Kaufer (1989).

industry, each producing a differentiated innovation. Indeed, it is relatively infrequent for an agent to have patent rights over an entire product - for example, a cell phone, television, or motor vehicle. Most inventors own patent rights to pieces that make up a product or a process of production, for example, technological components. Exceptions exist of course; for example, pharmaceutical firms do often own patents to an entire product, such as Prozac and Claritin. In such industries, there is likely to be free entry and exit in the sense that these differentiated inventions compete with one another by addressing similar problems in different ways. They may also compete against old goods. Consumers, for example, may not upgrade to the new technology if the price gap does not justify the quality difference.

The exclusive right is temporary. In most jurisdictions, the maximum length of protection is twenty years from the date of filing a patent application. But most patent lives are much less than that because the patent owners must renew their patent rights at particular time intervals (e.g., every year, other year, five years, etc. depending on the jurisdiction). The patent right lapses unless it is renewed with fees paid. In practice, most patent rights are not renewed beyond ten years from the date of application because of such factors as technological obsolescence and falling market value (Cornelli and Schankerman, 1999).[4]

A second misconception is that the tradeoff is between technology creation and knowledge diffusion; rather it is between the former and the diffusion (or supply) of output embodying the new knowledge. Patents do not restrict the diffusion of knowledge; rather, they help diffuse it because, in exchange for patent protection, inventors must

---

[4] Pharmaceutical patents, however, can last more than 20 years, since some drug manufacturers receive extensions. They argue that it takes considerable time to obtain marketing approval from drug regulatory agencies--say 8 years--time which otherwise reduces their effective patent life.

publicly disclose their new knowledge. In some countries, the disclosure occurs 18 months after an inventor files for a patent, and in other countries, the disclosure occurs after - and only if - the patent is granted. For this reason, it is inaccurate to suggest that patents restrict access to knowledge. On the contrary, patent databases exist all over the world for researchers and practitioners to access. The databases are filled with detailed technical information (including drawings) about previous patents, and the information is supplied both publicly by patent offices and privately by firms that specialize in database services. Because of the internet, access to patent information is much easier and cheaper than it used to be.

A third misconception is that patent protection may impede future scientific research because, even though technical information is fully disclosed, the fact is that only a few (patent owners) have the right to use it. This view comes from a failure to distinguish between basic R&D and applied R&D. Of course granting protection very broadly to basic scientific knowledge can impact negatively on future research. After all, basic research is the foundation for applied research as well as for future basic research. Applied research can also generate future knowledge externalities, but to a lesser extent than basic research. However, in actuality, basic scientific discoveries, theoretical concepts, and mathematical principles are not patentable anyway. It is the commercially or industrially applicable ideas developed out of that research or knowledge that are patentable.[5]

---

[5] This is not to say that no strategic abuses of patent rights occur. Firms may file numerous patents around a technology just to pre-empt rivals from developing competing technologies. Such patents are known as 'blocking' patents. However, this concern is a "red herring." It is not about patent laws per se but about firm behavior. Abuses can occur with a variety of business strategies, such as advertising, vertical restraints, R&D, etc. Such practices are typically a matter for, and governed by, *competition policy laws*, which lie outside the scope of this paper.

A fourth misconception relates to the use of the term 'imitation' in the literature on innovation versus imitation (Helpman, 1993; Segerstrom, 1991). Innovation is regarded as an activity that generates new knowledge while imitation is an activity that helps diffuse that knowledge. Given scarce resources, it is often suggested that there exists a tradeoff between innovation and imitation. Both are ways for nations to acquire technology. As far as stimulating economic development and/or maximizing social welfare is concerned, it is argued that there exists some "optimal" mixture of innovation and imitation. This mixture varies upon country characteristics and preferences. Hence, to enable the optimal level of imitation, the strength of patent protection needs to be adjusted accordingly. Aside from the ethical and moral issues of treating 'imitation' on a par with innovation (which will be taken up below), a definitional issue arises. What is meant by imitation? This is not always clear in the debate. In some respects, the innovation versus imitation dichotomy is a false one. That is, one cannot have innovation without imitation; what makes a work original, whether it is an invention, song, or economics journal article, is not the whole of the work but the value added part. There will always be some part of past knowledge incorporated in the work. Moreover, imitation (to some people) is the very essence of learning, such as the way people learn their alphabets and periodic tables.

The real issue is not innovation versus imitation but rather innovation versus infringement - the misappropriation of someone else's idea or creation, or the exploitation, or free-riding off, of someone else's effort. Of course it is cheaper to infringe than to innovate - to take someone else's output rather than to buy one's own - but is this the most conducive to economic development or social welfare? Should infringement or theft be characterized as part of an alternative economic development model? This is the implied inference in the innovation versus imitation, a.k.a. infringement, debate with moral and ethical implications. The wrong ethical message is sent in suggesting that the acquisition of technological capacity can occur through

89

infringement. Of course it can, but it is an inefficient strategy of economic development. A general mood of disrespect for law and order is not conducive to market development. What is likely to occur - and often is overlooked - is an inward shift in society's production possibilities frontier, rather than a movement along a fixed frontier as the mixture of innovation and infringement in society is varied.

Some practical issues should also be considered. If individuals or firms, say, in a developing nation have the capacity to infringe, they typically have the capacity to innovate. While duplicating cassette tapes or video tapes is a simple task, certain other activities like reverse engineering a patented technology requires some technical sophistication. Thus developing nations, such as Brazil, India, or China, that succeed in producing and distributing patent-infringing goods usually reveal a capacity to innovate but also reveal an environment where the relative economic rewards of infringement are greater than that from innovation, probably because the punishment is too weak and/or the protection afforded innovative works too slow. In other words, the net social gain from innovation may be positive, but the private incentives to infringe are greater than those to innovate. Another practical factor is that the patent-infringing sectors are not always competitive, but oligopolistic. Several studies find that weaker patent protection does not necessarily result in lower prices (Sherwood, 2000).

To summarize the discussion thus far, patent protection exists to create and facilitate a market for innovation. Many of the concerns about the effects of patent protection on monopoly power, knowledge diffusion, future research, and technological acquisition, transfer, and development are misconceptions. The next section turns to some empirical observations on how patent rights and economic freedom relate.

Patent rights and economic freedom

The availability of data on both patent rights and economic freedom permits an investigation of how the two measures relate across countries. Many researchers have exploited the data separately to study the effects on economic development, growth, trade, and other variables, but have not studied the interrelationship between the two. Given the importance of both to the functioning of markets, it would be useful to fill this void in the literature. The objective here is not to provide a comprehensive analysis, but to help initiate further inquiry.

A detailed description of the economic freedom index can be found in Gwartney and Lawson (2000), and a detailed description of the patent rights index can be found in Ginarte and Park (1997) and Park, Vijaya, and Wagh (2000). The patent rights index is a measure of the strength of patent protection, not the quality of patent regimes. (It is possible that stronger need not imply better, from a social welfare point of view. The welfare effects are the subject of much controversial debate.) The patent rights index is also largely a measure of the statutory level of protection. However, even then, statutes, or laws on the books, are found to play a role - even if a 'signaling role'. Specifically, strong laws provide signals to inventors of the system's willingness and capacity to enforce patent rights. Ex-post failures to enforce rights diminish the credibility and reputation of the legal authorities, as information on deviations from statutory protection becomes widely known and incorporated by market participants. Secondly, the statutory measures of protection tend to be highly correlated with measures of enforcement based on experiences and expert opinion, as obtained through surveys of firms (see Mansfield (1994), Park (2001a), and Sherwood (1997).

The index of patent rights for each country varies from zero to five, with higher values indicating stronger levels of protection. The index contains five categories, each of which is scored from zero to one. The score reflects the percentage or fraction of legal features in that category that are available in the country. The five categories are: (i) coverage,

91

(ii) membership in international treaties, (iii) restrictions, (iv) enforcement mechanisms, and (v) duration of protection. Briefly, coverage refers to the type of inventions that are patentable; membership in international treaties refers to whether a country is a signatory to some of the key international agreements in patent law; restrictions refer to whether limitations on the exercise of exclusive rights exist (such as compulsory licensing); enforcement deals with the different legal mechanisms for enforcing patent rights; and duration refers to the maximum length of protection.

Descriptive Statistics and Correlations

Tables 1 and 2 show the values of the economic freedom and patent rights index for 99 countries for the years 1980 and 1995. In Table 1, the countries are sorted in ascending order of Gross Domestic Product (GDP) per person (averaged 1988-1992), and are placed into three groups (low income, medium, and high income).[6] In Table 2, the countries are sorted in ascending order of growth rate during the sample period, and are placed into three groups (slow growth, medium, and fast growth).[7] In each table, and for each subgroup of countries, the following sample statistics are provided: means, standard deviations, skewness, and coefficients of variation.[8] Table 3 provides measures of

---

[6] The GDP per capita figures are in real 1985 PPP U.S. dollars. The source is Summers et. al. (1996), Penn World Tables, Version 5.6a. The reason the GDP per capita figures are averaged is to smooth out business cycles. The data in Summers et. al. (1996) go up to 1992.

[7] The growth rate refers to the average annual growth rate of GDP per capita (in real 1985 U.S. dollars) during the period 1975-1992.

[8] The coefficient of variation is the standard deviation divided by the mean, and measures the relative variability in the data. The skewness helps measure the extent to which the data are concentrated above or below the mean:

Skewness = (Mean - Median)/Standard Deviation

A negative skew indicates that the sample is concentrated near the *top* of the distribution (e.g. in a large class of students, most students earn A's while few earn C's); a positive skew indicates that the sample is concentrated near the *bottom* of the distribution (say, where most students earn C's and few earn A's).

92

Table 1

Economic Freedom and Patent Rights, Grouped by Income (GDP per capita)

LOW-INCOME	PAT80	PAT95	ECON80	ECON95	GDPC
Chad	2.71	2.71		5.28	409
Malawi	3.04	3.24	4.16	4.09	516
Niger	2.24	2.57	5.14	4.04	521
Mali	1.90	2.57	5.45	5.43	525
Tanzania	2.90	2.90	4.21	4.89	534
Myanmar	0.00	0.00	2.63	2.23	536
Uganda	2.57	2.90	2.64	4.86	548
Burundi	2.86	2.86	3.31	3.64	554
C. Africa Rep.	2.57	2.57	5.24	4.60	563
Togo	2.24	2.57	4.12	5.11	611
Madagascar	1.86	2.27	3.98	4.44	657
Rwanda	2.52	2.86	3.62	3.91	751
Haiti	3.19	3.19	5.24	5.59	842
Sierra Leone	2.52	2.52	4.17	3.77	874
Ghana	2.90	2.07	1.95	6.00	881
Kenya	2.57	2.90	4.58	5.73	909
Benin	2.52	2.86	5.29	4.87	946
Nigeria	3.05	3.05	3.07	3.42	981
Senegal	2.24	2.57	4.88	3.71	1144

93

Table 1 (cont.)

LOW-INCOME	PAT80	PAT95	ECON80	ECON95	GDPC
Zimbabwe	2.90	2.90	4.29	5.42	1170
Cameroon	2.57	2.57	5.08	5.30	1211
Guyana	1.42	1.42	4.15	5.19	1230
Cote d'Ivoire	2.52	2.52	4.75	5.46	1246
India	1.62	1.51	4.39	4.49	1247
Nicaragua	0.92	0.92	3.70	5.55	1349
China		1.55	3.21	5.09	1375
Honduras	1.76	2.10	5.43	7.20	1395
Pakistan	1.99	1.99	3.46	5.26	1398
Bangladesh	1.99	2.32	2.88	4.22	1409
Pap. New Guinea	0.00	0.00	4.63	5.92	1546
Bolivia	1.98	2.31	4.12	7.71	1682
Philippines	2.67	2.67	5.03	7.21	1712
El Salvador	2.19	2.86	3.70	7.86	1843
Mean	2.22	2.51	4.14	5.07	1004
Std Dev	0.76	0.72	0.90	1.21	407
Skewness	-1.57	0.19	-0.48	0.38	0.29
Coef of Variation	0.34	0.28	0.22	0.24	0.41

94

Table 1 (cont.)

MEDIUM-INCOME	PAT80	PAT95	ECON80	ECON95	GDPC
Egypt	1.99	1.99	4.03	5.34	1899
Indonesia	0.33	1.24	5.15	6.83	1935
Romania		2.71		4.23	2066
Paraguay	1.80	2.80	6.06	7.40	2096
Sri Lanka	2.79	3.12	4.30	6.23	2112
Guatemala	1.08	1.08	6.46	7.89	2157
Morocco	2.38	2.38	3.87	6.21	2171
Dominican Republic	2.41	2.41	5.42	6.04	2253
Peru	1.02	2.71	3.34	7.19	2284
Botswana	1.90	1.90	4.99	6.13	2304
Jamaica	2.86	2.86	3.91	6.98	2490
Algeria	3.38	3.38	4.37	3.35	2766
Ecuador	1.54	2.71	5.86	6.70	2808
Tunisia	1.90	1.90	4.45	5.42	2877
Panama	2.41	3.52	6.66	8.16	2984
Jordan	1.86	2.19	5.38	5.83	3141
South Africa	3.57	3.57	6.00	5.99	3241
Colombia	1.12	2.57	4.50	5.30	3299
Iran	2.38	2.38	3.35	4.27	3411
Costa Rica	1.94	1.80	5.43	7.12	3462
Thailand	1.85	2.24	5.81	7.34	3500
Turkey	1.80	1.80	3.57	6.24	3609

Table 1 (cont.)

MEDIUM-INCOME	PAT80	PAT95	ECON80	ECON95	GDPC
Gabon	2.57	2.57	3.57	5.32	3678
Fiji	2.01	2.01	5.16	6.02	3739
Syria	2.46	2.46	3.67	3.52	3946
Brazil	1.85	3.05	4.21	5.02	4082
Poland		2.90		6.28	4082
Chile	2.41	3.07	6.00	7.93	4410
Uruguay	2.26	2.60	6.22	6.90	4783
Argentina	2.26	3.19	4.66	7.52	4987
Malaysia	2.57	2.85	7.03	7.44	5085
Hungary		3.37	4.52	6.88	5219
Mexico	1.40	2.86	5.07	7.01	5803
Mean	2.07	2.30	4.94	6.24	3293
Std Dev	0.67	1.05	1.03	1.20	1058
Skewness	-0.21	-0.51	0.20	-0.71	0.60
Coef of Variation	0.32	0.46	0.21	0.19	0.32

HIGH-INCOME	PAT80	PAT95	ECON80	ECON95	GDPC
Mauritius	2.89	2.89	4.53	7.49	5873
Bulgaria		2.57		5.08	6055
Malta	1.89	1.89	5.06	6.73	6373

96

Table 1 (cont.)

HIGH-INCOME	PAT80	PAT95	ECON80	ECON95	GDPC
South Korea	3.28	4.20	5.78	6.96	6406
Venezuela	1.35	2.90	6.97	4.19	6488
Greece	2.46	2.65	5.66	7.19	6666
Portugal	1.98	2.98	5.64	7.92	6688
Trinidad & Tobago	3.01	3.35	4.80	6.84	7977
Cyprus	2.24	2.24	5.74	6.29	8278
Ireland	2.99	3.32	6.58	8.58	8946
Israel	3.57	3.57	3.59	5.85	9339
Spain	3.29	4.05	6.15	7.96	9430
New Zealand	3.32	3.86	6.38	8.97	11439
Singapore	2.57	3.90	8.04	9.36	11.592
Italy	3.71	4.19	5.56	7.22	12395
Austria	3.81	4.57	6.67	7.64	12545
Netherlands	4.24	4.38	7.75	8.42	12837
United Kingdom	3.57	3.57	6.60	8.72	12994
Belgium	3.38	3.90	7.84	8.17	13050
Iceland	2.12	2.45	5.34	7.86	13259
Finland	2.95	4.19	6.91	7.93	13265
France	3.90	4.05	6.31	7.88	13719
Denmark	3.62	4.05	6.49	8.00	13850
Germany	3.86	3.86	7.69	8.02	14218

97

Table 1 (cont.)

	PAT80	PAT95	ECON80	ECON95	GDPC
Japan	3.94	3.94	7.48	8.06	14247
Sweden	3.47	4.24	6.10	7.87	14440
Australia	3.23	3.86	7.37	8.39	14543
Norway	3.29	3.90	6.03	7.86	14954
Hong Kong	2.24	2.57	9.65	9.73	15030
Switzerland	3.80	3.91	8.32	8.28	16161
Luxembourg	3.05	3.05	8.87	8.30	16180
Canada	2.76	3.57	7.90	8.04	16937
United States	4.19	4.86	8.35	8.74	17880
Mean	3.12	3.56	6.63	7.71	11639
Std Dev	0.71	0.71	1.32	1.12	3562
Skewness	-0.62	-0.57	0.07	-1.25	-0.28
Coef of Variation	0.23	0.20	0.20	0.15	0.31

ALL COUNTRIES	PAT80	PAT95	ECON80	ECON95	GDPC
Mean	2.48	2.81	5.24	6.34	5312
Std Dev	0.85	0.88	1.51	1.60	5054
Skewness	-0.41	-0.42	0.50	-0.21	1.01
Coef of Variation	0.34	0.31	0.29	0.25	0.95

Notes:
PAT_ - Index of Patent Rights in Year 1980 or 1995
ECON_ - Index of Economic Freedom in Year 1980 or 1995
GDPC - GDP per capita in real 1985 U.S. PPP dollars (Average of 1988-1992)

98

Table 2

Economic Freedom and Patent Rights, Grouped by Growth Rate

SLOWEST	PAT80	PAT95	ECON80	ECON95	GROWTH
Guyana	1.42	1.42	4.15	5.19	-4.536
Nicaragua	0.92	0.92	3.70	5.55	-4.320
Cote d'Ivoire	2.52	2.52	4.75	5.46	-3.853
Iran	2.38	2.38	3.35	4.27	-3.467
Gabon	2.57	2.57	3.57	5.32	-3.427
Chad	2.71	2.71		5.28	-3.077
Madagascar	1.86	2.27	3.98	4.44	-3.015
Nigeria	3.05	3.05	3.07	3.42	-2.797
Sierra Leone	2.52	2.52	4.17	3.77	-2.169
C. African Rep.	2.57	2.57	5.24	4.60	-2.161
Peru	1.02	2.71	3.34	7.19	-2.084
Niger	2.24	2.57	5.14	4.04	-1.722
Argentina	2.26	2.57	4.66	7.52	-1.633
Trinidad & Tobago	3.01	3.19	4.80	6.84	-1.601
Venezuela	1.35	2.90	6.97	4.19	-1.528
Poland		2.90		6.28	-1.315
El Salvador	2.19	2.86	3.70	7.86	-1.283
Bolivia	1.98	2.31	4.12	7.71	-1.258
Pap. New Guinea	0.00	0.00	4.63	5.92	-1.239
Guatemala	1.08	1.08	6.46	7.89	-1.115
Haiti	3.19	3.19	5.24	5.59	-0.851
Togo	2.24	2.57	4.12	5.11	-0.812

99

Table 2 (cont.)

SLOWEST	PAT80	PAT95	ECON80	ECON95	GROWTH
Benin	2.52	2.86	5.29	4.87	-0.793
Ghana	2.90	2.07	1.95	6.00	-0.536
Uganda	2.57	2.90	2.64	4.86	-0.514
Jamaica	2.86	2.86	3.91	6.98	-0.494
Ecuador	1.54	2.71	5.86	6.70	-0.477
South Africa	3.57	3.57	6.00	5.99	-0.464
Costa Rica	1.94	1.80	5.43	7.12	-0.337
Honduras	1.76	2.10	5.43	7.20	-0.316
Zimbabwe	2.90	2.90	4.29	5.42	-0.263
Syria	2.46	2.46	3.67	3.52	-0.256
Philippines	2.67	2.67	5.03	7.21	-0.213
Mean	2.21	2.47	4.47	5.74	-1.63
Std Dev	0.76	0.72	1.09	1.30	1.25
Skewness	-0.90	-.165	0.04	0.01	-0.85
Coef of Variation	0.34	0.29	0.24	0.23	-0.77

MEDIUM	PAT80	PAT95	ECON80	ECON95	GROWTH
Malawi	3.04	3.24	4.16	4.09	-0.189
Panama	2.41	3.52	6.66	8.16	-0.038
Senegal	2.24	2.57	4.88	3.71	0.002
Mali	1.90	2.57	5.45	5.43	0.245
Kenya	2.57	2.90	4.58	5.73	0.341

100

Table 2 (cont.)

MEDIUM	PAT80	PAT95	ECON80	ECON95	GROWTH
Uruguay	2.26	2.60	6.22	6.90	0.350
Brazil	1.85	3.05	4.21	5.02	0.360
Tanzania	2.90	2.90	4.21	4.89	0.410
Paraguay	1.80	2.80	6.06	7.40	0.412
Figi	2.01	2.01	5.16	6.02	0.456
Dominican Republic	2.41	2.41	5.42	6.04	0.528
Algeria	3.38	3.38	4.37	3.35	0.559
Hungary		3.37	4.52	6.88	0.631
Rwanda	2.52	2.86	3.62	3.91	0.701
Mexico	1.40	2.86	5.07	7.01	0.754
Jordan	1.86	2.19	5.38	5.83	0.804
New Zealand	3.32	3.86	6.38	8.97	0.820
Burundi	2.86	2.86	3.31	3.64	1.197
Myanmar	0.00	0.00	2.63	2.23	1.252
Netherlands	4.24	4.38	7.75	8.42	1.292
Greece	2.46	2.65	5.66	7.19	1.388
Sweden	3.47	4.24	6.10	7.87	1.457
United States	4.19	4.86	8.35	8.74	1.480
Colombia	1.12	2.57	4.50	5.30	1.521
Switzerland	3.80	3.91	8.32	8.28	1.536
Turkey	1.80	1.80	3.57	6.24	1.550
Australia	3.23	3.86	7.37	8.39	1.558

101

Table 2 (cont.)

MEDIUM	PAT80	PAT95	ECON80	ECON95	GROWTH
Morocco	2.38	2.38	3.87	6.21	1.569
France	3.90	4.05	6.31	7.88	1.664
Cameroon	2.57	2.57	5.09	5.30	1.696
Israel	3.57	3.57	3.59	5.85	1.798
Denmark	3.62	4.05	6.49	8.00	1.823
Belgium	3.38	3.90	7.84	8.17	1.835
Mean	2.64	3.05	5.37	6.27	0.96
Std Dev	0.93	0.90	1.47	1.75	0.61
Skewness	-0.48	-0.81	0.39	-0.39	-0.16
Coef of Variation	0.35	0.30	0.27	0.28	0.63

FASTEST	PAT80	PAT95	ECON80	ECON95	GROWTH
Canada	2.76	3.57	7.90	8.04	1.886
Tunisia	1.90	1.90	4.45	5.42	1.907
Germany	3.86	3.86	7.69	8.02	1.930
Spain	3.29	4.05	6.15	7.96	1.972
Austria	3.81	4.57	6.67	7.64	2.009
Egypt	1.99	1.99	4.03	5.34	2.154
United Kingdom	3.57	3.57	6.60	8.72	2.180
Chile	2.41	3.07	6.00	7.93	2.183
Iceland	2.12	2.45	5.34	7.86	2.215
Italy	3.71	4.19	5.56	7.22	2.335
Finland	2.95	4.19	6.91	7.93	2.389
Norway	3.29	3.90	6.03	7.86	2.458

102

Table 2 (cont.)

FASTEST	PAT80	PAT95	ECON80	ECON95	GROWTH
Bangladesh	1.99	2.32	2.88	4.22	2.639
Pakistan	1.99	1.99	3.46	5.26	2.662
Ireland	2.99	3.32	6.58	8.58	2.728
Luxemborg	3.05	3.05	8.87	8.30	2.875
Portugal	1.98	2.98	5.64	7.92	2.897
Mauritius	2.89	2.89	4.53	7.49	2.915
Botswana	1.90	1.90	4.99	6.13	3.003
Sri Lanka	2.79	3.12	4.30	6.23	3.016
Romania		2.71		4.23	3.034
India	1.62	1.51	4.39	4.49	3.091
Bulgaria		2.57		5.08	3.466
Japan	3.94	3.94	7.48	8.06	3.495
Malaysia	2.57	2.85	7.03	7.44	3.750
Malta	1.89	1.89	5.06	6.73	3.980
China		1.55	3.21	5.09	4.122
Indonisia	0.33	1.24	5.15	6.83	4.566
Thailand	1.85	2.24	5.81	7.34	4.659
Cyprus	2.24	2.24	5.74	6.29	5.001
Singapore	2.57	3.90	8.04	9.36	5.096
Hong Kong	2.24	2.57	9.65	9.73	5.851
South Korea	3.28	4.20	5.78	6.96	6.452
Mean	2.59	2.92	5.87	7.02	3.18
Std Dev	0.80	0.91	1.59	1.44	1.18
Skewness	-0.35	0.03	0.29	-0.41	1.16
Coef of Variation	0.31	0.31	0.27	0.21	0.37

103

Table 2 (cont.)

ALL COUNTRIES	PAT80	PAT95	ECON80	ECON95	GROWTH
Mean	2.48	2.81	5.24	6.34	0.84
Std Dev	0.85	0.88	1.51	1.60	2.23
Skewness	-0.41	-0.42	0.50	-0.21	-0.12
Coef of Variation	0.34	0.31	0.29	0.25	2.67

Notes:

GROWTH - Average Annual Growth Rate of Real GDP percapita (in real 1985 PPP U.S. dollars) 1975-1992

For all other variables, see Notes to Table 1.

104

Table 3. Correlation Between Economic Freedom and Patent Rights

A. Simple Correlations:

	1980	No. of Observ.	1995	No. of Observ.
All countries	0.396	93	0.477	99
By Income Level:				
Low	0.0.79	31	0.074	33
Medium	-0.020	30	-0.015	33
High	0.169	32	0.375	33
By Growth Rate:				
Slowest	-0.169	31	-0.086	33
Medium	0.587	32	0.675	33
Fastest	0.443	30	0.591	33

B. Regression Analysis:

Regression Equation: $\quad\quad\quad\quad$ Econ__ $= a + \beta$ Pat__ $+$ error

Estimates of β (T-*Statistic*) by year and associated R-squared:

	1980	R^2	1995	R^2
All countries	0.244 *(4.11)*	0.157	0.264 *(5.34)*	0.227
By Income Level:				
Low	0.067 *(0.43)*	0.006	0.048 *(0.41)*	0.006
Medium	-0.013 *0-0.11)*	0.0004	-0.007 *(-0.08)*	0.0002
High	0.090 *(0.94)*	0.029	0.239 *(2.25)*	0.14
By Growth Rate:				
Slowest	-0.119 *(-0.93)*	0.029	-0.048 *(-0.48)*	0.008
Medium	0.367	0.344	0.349 *(5.09)*	0.456
Fastest	0.230 *(2.61)*	0.196	0.372 *(4.08)*	0.349

Notes: These are the same grouping of countries (by income level or growth rate) used in previous tables. In Part B, the coefficient estimates of the constant a are not reported; only the slope β and its t-statistic (in parentheses). The number of observations in each regression would be the same as indicated in part A. Econ__ and Pat__ are the respective indexes in year 1980 or 1995. The results are qualitatively the same if the LHS and RHS variables are switched.

the simple correlation between patent rights and economic freedom, and the level of statistical significance of those correlations based on regression analyses.

The focus of this section is on the correlation between patent rights and economic freedom, but the distributional characteristics of each index and the trends in each index are worth examining first. Generally the richer economies have higher levels of patent protection and economic freedom. The fastest growing economies do not, however, have the highest average levels of patent rights and economic freedom. The fastest growing economies are the smaller, medium income countries that are largely growing faster because they have a smaller stock of accumulated capital, i.e., less diminishing returns have set in.

The gap or variation in patent rights and economic freedom across countries has generally decreased over the period (judging by the coefficients of variation) for the sample as a whole. The reduction in the variability of economic freedom is more prominent, suggesting a greater 'catch-up' in levels of economic freedom than in patent rights. The variation in economic freedom is lowest among high-income countries. The variation in patent rights is greatest among medium-income countries. This group is interesting because the countries it consists of are likely to be at the stage of development where crucial choices must be made between innovation and imitation. Thus it should not be too surprising to find a greater mixture of countries that pursue either the innovation route, and defend patent rights relatively strongly, or the imitation route, and provide patent rights relatively weakly.

According to the skewness estimates, countries are concentrated at relatively high levels of patent rights. That is, most countries are providing levels of protection above the mean (both in 1980 and 1995). However, in terms of economic freedom, most countries had levels below the mean in 1980 and above the mean in 1995, which is

106

consistent with the earlier observation that there has been greater growth and catching up in economic freedom levels.[9]

For the sample as a whole, economic freedom and patent rights are positively correlated with a correlation coefficient of 0.396 in 1980 and 0.477 in 1995 - see Table 3. Of course, this indicates nothing about the direction of causality. But what is interesting is that the correlation between the two indexes varies by country grouping. For instance, if countries are grouped according to income, the correlation is negative for the medium-income group. However, as Part B of Table 3 indicates, these correlations by income group are not statistically significant. This conclusion is based on running regressions of the economic freedom index on the patent rights index.[10] In this two-variable regression, the estimated coefficients mirror the simple correlations. In Table 3, part B, only the estimated slopes, t-statistics, and goodness-of-fit are reported. For all countries pooled, the correlation between patent rights and economic freedom is positive and statistically significant at conventional levels. This is the case in 1980 and in 1995. But when the sample is grouped by income level, the within-group correlations between the two indexes, whether positive or negative, are weak, except in the case of high-income countries in 1995.

However, when the sample is grouped by growth rates, the within-group correlation between economic freedom and patent rights is positive and statistically significant for both the fast-growth economies and medium-growth economies. This is shown in both Parts A and B of Table 3. For the slow-growth countries, the measured correlation is negative but not statistically significant. Thus for countries with medium

---

[9] Within income-groups, however, economic freedom is skewed positively; that is, a few countries in each group have levels of economic freedom well above the within-group average.

[10] If the regression is reversed -- i.e. patent rights are regressed on economic freedom -- the results are qualitatively similar.

to fast GDP growth rates during the sample period, patent rights and economic freedom co-vary positively.

Why the two different ways of grouping countries (either by income level or by growth rate) produce different results is of interest. First, the two ways of grouping do not perfectly overlap: a number of low and medium income countries are among the fastest growing economies.[11] Secondly, the co-movement of patent rights and economic freedom must have more to do with economic expansion than with levels of economic development - that is, with factors such as savings, investment rates, human capital accumulation, and so forth, rather than with perhaps the more complex, heterogeneous circumstances or historical processes which brought economies to their current state.[12]

Thus, though more rigorous study is desired, the results seem to suggest that in regions where economic freedom and patent protection go together, countries grow faster. Again this says nothing about causality, about which further research is needed, particularly theoretical analyses to guide the empirical research. The exercise thus far has been 'measurement without theory'. In any event, one possibility is that economic growth, by expanding national production possibility frontiers, relaxes resource constraints and enables countries to "afford" an expansion in both patent rights and economic freedom. The other, reverse possibility is that an increase in both patent rights and economic freedom together stimulate economic growth. That is, as determinants of growth, the two contribute as complementary factors. Patent rights,

---

[11] This is consistent with the "convergence" literature which finds that *conditional* on human capital, and other factors, the growth rate is inversely related to the level of economic development (see Mankiw et. al. (1992).

[12] Indeed, in Park (2001b), it is pointed out that both economic freedom and patent rights are 'flow' variables - as opposed to stocks. That is, they represent levels in specific time periods, not the cumulative levels since some earlier time period. Hence, it may not be surprising that these flow variables are related to flow measures like growth rates.

108

for example, may protect inventors from the misappropriation of their results, while economic freedom may enable them to better market their inventions, raise capital, and so forth.

The complementarity between patent rights and economic freedom might also account for why in slow growing economies, the correlation between economic freedom and patent rights is not significant. In general, the slow-growth economies tend not to invest in *both* economic freedom and patent rights, if at all.

Sensitivity Analyses

Thus far, economic freedom and patent rights are found to vary positively, at least among countries with positive growth rates during the sample period. This section is devoted to examining the sensitivity of this result to (a) alternative measures of economic freedom and (b) third factor influences. The idea behind the latter is that the observed correlations between economic freedom and patent rights may be spurious if there exist other variables ('third factors') that drive both economic freedom and patent rights.

First, consider two alternative measures of economic freedom: the first is the *Heritage Foundation* Index of Economic Freedom (henceforth denoted by HERIT) and the second is the *Freedom House* Index of Economic Freedom (henceforth denoted by FH). All three indexes (including the Gwartney and Lawson index, denoted by ECON) are independently assessed measures of economic freedom. Though there are some overlapping components, somewhat different factors are also incorporated (O'Driscoll, 2001; Messick, 1996). Thus far this paper focused on the Gwartney and Lawson index instead of the *Freedom House* version because the former contains more observations, and instead of the Heritage Foundation index because the Gwartney and Lawson measure goes back farther in time. Table 4, part A presents

Table 4. Alternative Measures of Economic Freedom

A. Correlations among the indexes of economic freedom

	ECON	HERIT		FH	
ECON	1				
HERIT	0.862	1			
FH	0.810	0.722		1	
	Mean	Std. Dev		Skew	Coef. Of Variation
HERIT	0.362	0.096		1.68	0.25
FH	11.03	3.966		-0.76	0.37

B. Correlation between HERIT and the index of patent rights (PAT):

	Correlation Coefficient	No. of Observations
All countries	0.552*	91
By Income Level:		
Low	0.263	27
Medium	0.045	33
High	0.169**	29
By Growth Rate:		
Slowest	0.163	29
Medium	0.730*	31
Fastest	0.482*	31

C. Correlation between FH and the index of patent rights (PAT):

	Correlation Coefficient	No. of Observations
All countries	0.713*	60
By Income Level:		
Low	0.506*	14
Medium	0.449*	20
High	0.422*	26
By Growth Rate:		
Slowest	0.112	15
Medium	0.872*	21
High	0.735*	24

Notes: These are the same group of countries (by income level or growth rate) used in previous tables. HERIT denotes the Heritage Foundation Index of Economic Freedom in 1996. (Values for 1996 were used instead of values for 1995 since the sample size is very limited for 1995.) Moreover, the inverse of the original Heritage Foundation Index is used so that higher values could indicate greater levels of cocnomic freedom. FH denotes the Freedom House Index of Economic Freedom 1995-1996. ECON, as before, denotes the Gwartney and Lawson Index of Economic Freedom. In the correlation tables, *denotes statistical significance at conventional levels, ** at the 12% level of significance. As show in Table 3, the statistical significance is based on t-statistics of a bivariate regression (not reported) between the patent rights index and the index of economic freedom.

110

some sample statistics. There is indeed a high correlation among all three indexes of economic freedom (HERIT, FH, and ECON).[13] The main differences are that the FH measure has greater variability and the HERIT measure is positively skewed (so that a greater proportion of countries are below the mean).

Part B of Table 4 repeats the analysis in Table 3 for the HERIT index. The patent rights index and the *Heritage Foundation* index of economic freedom are also positively correlated for all countries pooled. This correlation coefficient is significant at conventional levels. This is based again on the results of a bivariate regression, the results of which are not reported to avoid cluttering up the table. By income group the correlation remains positive but is not significant at conventional levels. The correlation is significant at the 12% level for the top-third of countries. However, when countries are grouped according to their growth rates (of GDP per capita), the Heritage Foundation measure and the patent rights index are positively and significantly correlated among the medium - to fastest-growth economies.

Part C of Table 4 repeats the analysis with the *Freedom House* measure. Nearly the same pattern emerges. For all countries pooled and for almost all sub-groups, a positive and significant correlation exists between patent rights and economic freedom. The exception is the slowest-growth group where the correlation is positive but not significant at conventional levels. Thus these results support, rather than contradict, the findings in Table 3.

The next test is to determine whether the correlation between economic freedom and patent rights remains positive even after netting out the influences of third factors. For this, the analysis returns to the

---

[13] Note that the inverse of the original *Heritage Foundation* index is used so that higher values could indicate greater levels of economic freedom. Moreover, the 1996 values of HERIT are considered because the 1995 data are quite sparse. Of the observations that are available, small differences exist between the index values of those two years.

Gwartney and Lawson index (ECON), and pools the 1980 and 1995 samples. The aim here is to examine partial correlations. That is, to run regressions of each index (i.e. economic freedom index (ECON) and the patent rights index (PAT)) on several independent variables, and then to compute the correlation between the residuals from each regression. The residuals have the interpretation of being that part of the index (whether ECON or PAT) that is not explained by those independent variables. Hence the partial correlation between ECON and PAT gives the correlation between the two indexes net of the influences from other variables.

The issue then is the selection of independent variables to be used. Thus far limited empirical work has been done on the determinants of economic freedom and patent rights. Ginarte and Park (1997), for example, study the determinants of patent rights, such as a country's level of economic development, political freedom, government policy, and degree of openness to international trade. Other studies, such as Alesina and Wacziarg (1997), Bhalla (1994), and Gwartney et. al. (1998) investigate the interrelationships among economic freedom, political freedom, economic development, openness, and government size. Of course, it is likely that there are endogenous interactions among all these variables. Moreover, there is simply no received structural model that identifies the linkages. But given the mutual interdependence – or interrelatedness – among these variables, it is conceivable that these variables would appear in a reduced form equation for economic freedom and patent rights.[14]

Part A of Table 5 shows the results of regressing each index (of economic freedom and patent rights) on GDP per capita, which is used as a proxy for the level of economic development, share of government spending in GDP, which is used to proxy for government size, index of

---

[14] To avoid simultaneity between the indexes and these other (RHS) variables, lagged (five year averaged) values of these other variables are used.

Table 5. Partial Correlation Between Economic Freedom and Patent Rights

A. Regressions

Dependent Variable

	ECON	PAT
Constant	1.528*	0.470
	(0.304)	(0.419)
Political	0.092*	0.050
Freedom Index	(0.031)	(0.043)
Govt. Spending	-0.097*	0.001
as a % of GDP	(0.046)	(0.063)
Openness	0.222*	0.034
Index	(0.038)	(0.052)
Lagged GDP	0.056*	0.103*
per capita	(0.025)	(0.035)
Adj. R-squared	0.55	0.21
No. of Observ.	177	177

B. Correlation between residuals of above two equations:

Overall:	0.171*

By Growth Rate Group:

Slowest	0.036
Medium	0.459*
Fastest	0.061

C. Summary Statistics

	Mean	Std. Dev.	Min.	Max.
Political Freedom Index	3.44	2.11	1	7
Openness	0.45	0.49	0	1
Govt. Spending as a % of GDP	18.1	7.76	4.6	42.5

Note: Estimation is by ordinary least squares, pooling the 1980 and 1995 samples. All variables, except the Openness Index and the constant, are logged. Standard errors are in parentheses and * denotes stastically signficiant at convential levels. The political freedom index was inverted (so that higher values would indicate greater freedom). Lagged GDP refers to the average of the five years preceding.

113

openness to international trade, and index of political freedom.[15] Part C of Table 5 displays the descriptive statistics behind the additional variables. As the regression results show, levels of economic freedom are inversely related to government size and positively related to per capita GDP, political freedom, and openness to trade – and all statistically significantly. Patent rights are also positively related to these variables, but only GDP per capita is statistically significantly at conventional levels. Thus, if GDP per capita rises, the levels of both economic freedom and patent rights would rise, giving the appearance of a positive correlation between them.

However, as part B of Table 5 shows, the residuals from these two reduced-form regressions are positively correlated and statistically significant. For the sample as a whole, the correlation coefficient is 0.171. This indicates that even after netting out third factor influences, both patent rights and economic freedom are correlated. When the sample is broken down by growth-rate groups, the correlation is also positive and statistically significant for the medium-growth economies. This group consists of a number of OECD (industrialized) economies, such as the U.S. The partial correlation between patent rights and economic freedom is positive for the other two groups, but is not statistically significant at conventional levels.

To summarize, the positive correlation between patent rights and economic freedom does not disappear once third factor influences are controlled for. Thus the evidence overall is favorable to the view that economic freedom and patent rights move together across countries. There is no finding here of any statistically significant *negative* association between economic freedom and patent protection. Of course, some of the positive co-variation between patent rights and economic freedom is driven by per capita GDP, but the latter may also be determined in turn by the level of patent rights and economic freedom (through the

---

[15] The equation is estimated by OLS in log-linear form. The openness index is a 0-1 dummy, and is not logged.

stimulation of investment and innovation). Thus, all three factors (patent rights, economic freedom, and economic development) are likely to interact endogenously. Future work could try to ascertain the underlying structural model that generates these co-variations.

Future of Patent Rights

Debate will continue as to whether patent protection undermines free markets or enhances them. The traditional view that markets depend for their smooth functioning on the clear delineation and enforcement of property rights is considered by some not to extend to intellectual creations or output. This paper has responded to this claim in two ways. First, it presented many misconceptions about patent rights. For instance, patent rights do not extend to knowledge but to the products or services based on that knowledge. The knowledge is still available for others to exploit, but not to market, the same products or services for which others have acquired a temporary exclusive right. Secondly, the paper has provided an empirical look at the relationship between patent rights and economic freedom. To the extent that the two indexes are reliable, in measuring what they are supposed to measure, the evidence does not suggest that the two are at odds. In fact, patent rights are found to be positively associated with economic freedom, particularly in regions experiencing positive growth rates. This would not have been observed in the data if patent rights largely distorted and restricted markets. The result also holds under different measures of economic freedom and even after controlling for other variables.

Nonetheless, the remainder of this paper provides some thoughts on patent reform, since there is still room for improvements in the patent system - improvements towards making patent rights more conducive to economic freedom. For the ensuing discussion, it is necessary to shift attention away from how patent rights affect markets to what goes on within patent systems (i.e. the internal factors).

The transactions costs of obtaining patent protection are high. Typically, to apply for patent rights, patent applicants must pay various official fees, such as application fees, search and examination fees and taxes, legal fees, and if applicants seek global protection, translation fees. The fees are considered high in the sense that many of these costs are redundant and unnecessary burdens (Park, 1999). For example, official fees are high because patent office surpluses (that is, their net incomes) are transferred to national treasuries - surpluses that could otherwise be passed on to inventors in the form of lower fees or be used to hire more examiners and thereby process patents more expeditiously. The official fees are also high because nations conduct duplicative searches and examinations to determine if an invention is novel, non-obvious, and industrially applicable; they do not always accept the search and examination results of foreign offices - though this situation is being improved by electronic networking. The legal fees are high because patent applicants must hire a patent attorney or agent for even routine things like filing applications, paying renewal fees, and filing translations. Legal fees are also high because inventors must hire a local legal professional in every country in which they wish to obtain patent protection. Foreign legal representation is rarely permitted. Moreover, with high entry barriers into the profession, the supply of patent attorneys and agents is quite restricted, especially in Japan. Finally translation costs are high because every jurisdiction insists on a translation of the patent in order for it to have legal force even when many researchers, scientists, and inventors are fluent in English. Moreover, translations are handled by the law firms on the grounds that the patent is as much a legal document as it is a scientific document, and must be precisely worded. For many patent law firms, translation work is the main source of income. Thus relaxing the translation requirement will mean a loss of business for them. There are just a sample of factors that contribute to the transactions costs of obtaining a patent, and of where there is scope for reform. These transactions costs reduce the ability of inventors to obtain property rights for their ideas.

116

There is also a long queue for those waiting for patent protection. The average time to process patent applications has increased over time while the average time an examiner spends on each application has decreased over time. This raises concerns about examination quality and the implications for errors; that is, granting protection too broadly or too narrowly. Again, the problem can be traced to some internal workings of patent systems, such as resource allocation problems. The patent offices are public enterprises. They do not price their services competitively; for example, they do not charge fees according to the marginal costs of services. They charge the same fees to all patent applicants. Thus fees do not vary with the complexity of inventions or with the length of time it takes to process applications. The U.S. patent office, for instance, does not recover costs from the unsuccessful applicants or from the roughly 40% of applicants who simply abandon their applications.[16] Patent examination time and resources are scarce, yet applicants under the current system have no incentive to economize on their use of those resources. Correcting this failure should help improve the allocation of resources for examining and processing applications.

To conclude, the effect of increased transactions costs and burdens on patent system resources will be diminish patent rights, not strengthen them. Strong patent laws are not very useful if it is too costly for individuals to acquire their patent rights. In other words, property rights must not only exist and be enforced, but also be accessible. Thus, to the extent that patent rights and economic freedom are positively related, the efficiency of markets may be reduced not because of a strengthening of patent rights but because of a decrease in effective patent rights.

---

[16] See U.S. GAO (1997).

References

Alesina, Alberto and Wacziarg, Roman. 1997. Openness, country size, and government. National Bureau of Economic Research Working Paper No. 6024.

Bethune, John J. 1993. Towards an Austrian view of copyright. *Studies in Economic Analysis*, Vol. 15, No. 1, pp. 51-71.

Bhalla, Surjit S. 1994. Freedom and economic growth: a virtuous cycle? In Axel Hadenius, ed. *Democracy's Victory and Crisis*. Cambridge University Press.

Cornelli, Francesca and Schankerman, Mark. 1999. Patent renewal and R&D incentives. *Rand Journal of Economics*, Vol. 50, No. 2, pp. 197-213.

Freedom House. 2001. Freedom in the World: Annual Survey of Political Rights and Civil Liberties 2000-2001. Freedom House, New York.

Ginarte, Juan Carlos and Park, Walter G. 1997. Determinants of patent rights: a cross-national study. *Research Policy*, Vol. 26, pp. 283-301.

Gwartney, James and Lawson, Robert (with Dexter Samida). 2000. *Economic Freedom of the World: 2000 Annual Report*. Vancouver, B.C.: The Fraser Institute.

Gwartney, James, Holcombe, Randall, and Lawson, Robert. 1998. The scope of government and the wealth of nations. *CATO Journal*, Vol. 18, No. 2, pp. 163-190. Cato Institute: Washington, DC.

118

Helpman, Elhanen. 1993. Innovation, Imitation, and Intellectual Property Rights. *Econometrica*, Vol. 61, No. 6, pp. 1247-1280. Blackwell Publishers: Cambridge, MA.

Kaufer, Eric. 1989. *The Economics of the Patent System*. Harwood Academic Publishers, New York.

Mankiw, G., Romer, D., and Weil, D.1992. A contribution to the empirics of economic growth. *Quarterly Journal of Economics*, Vol. 107, pp. 407-437.

Mansfield, Edwin. 1994. *Intellectual Property Protection, Foreign Direct Investment, and Technology Transfer*. International Finance Corporation, Discussion Paper No. 19, Washington, D.C.

Messick, Richard, ed. 1996. *World Survey of Economic Freedom*. Freedom House, New York.

O'Driscoll, Gerald Jr., Holmes, Kim, and O'Grady, Mary, eds. 2001. *Index of Economic Freedom*. Heritage Foundation, Washington, D.C.

Park, Walter G. 1999. Highlights and perspectives on patent cost containment. *Proceedings of the Fourth International Symposium on Reducing Patent Costs*. American Intellectual Property Law Association (AIPLA) and the Federation Internationale des Conseils en Propriete Industrielle (FICPI), Hague, Netherlands, July 1999.

Park, Walter G., Vijaya, Ramya, and Wagh, Smita. 2000. Patent rights: an update. Unpublished.

Park, Walter G. 2001a. Intellectual property and patent regimes. Chapter 4 in Gwartney, James and Lawson, Robert, eds. *Economic Freedom of the World: 2001 Annual Report.* Vancouver, B.C.: The Fraser Institute, pp. 95-112.

Park, Walter G. 2001b. Do intellectual property rights stimulate R&D and productivity growth? Evidence from Cross-National and Manufacturing Industry Data. Forthcoming *Industry Canada* Conference Volume on *Intellectual Property and Innovation in the Knowledge-Based Economy.*

Romer, Paul. 1990. Endogenous technological change. *Journal of Political Economy*, Vol. 98, No. 5, pp. S71-S102. University of Chicago Press: Chicago, IL.

Sachs, Jeffery D. and Warner, Andrew. 1995. Economic Convergence and Economic Policies. Brookings Papers on Economic Activity, Vol. 1, pp. 1 - 95. Brookings Institute.

Segerstrom, Paul S. 1991. Innovation, imitation, and economic growth. *Journal of Political Economy*, Vol. 99, No. 4, pp. 807-827. University of Chicago Press: Chicago IL

Sherwood, Robert M. 1997. Intellectual property systems and investment stimulation: the rating of systems in eighteen developing countries. *IDEA: The Journal of Law and Technology*, Vol. 37, No. 2, pp. 261-370. Franklin Pierce Law Center: Concord, New Hampshire.

Sherwood, Robert M. 2000. The TRIPS agreement: benefits and costs for developing countries. *International Journal of Technology Management*, Vol. 19, No. 112, pp. 57-76. Inderscience Enterprises Limited: London.

120

Summers, Robert, Heston, Alan, Nuxoll, Daniel, and Aten, Bettina. 1996. *Penn World Tables, Mark 5.6a*, National Bureau of Economic Research, Cambridge, MA.

U.S. General Accounting Office. 1997. *Intellectual Property: Fees Are Not Always Commensurate With the Costs of Services*. GAO/RCED-97-113, Washington, D.C.