International Patent Applications

How do Patent Systems, Markets, and Economic Composition Impact Resident and Non-Resident Patent Applications around the World?

JEL Classification: O340 - Intellectual Property Rights

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Abstract

Prior research has suggested a significant, positive relationship between the strength of the patent system in a given developed country and determinants of that country's GDP growth, namely total factor productivity and factor accumulation. The same relationship has been found to be either insignificant or inverse when examining poorer countries. This paper examines that relationship more closely by analyzing a possible intermediate step between patent system strength and factors of growth. Specifically, the strength of the patent system may impact determinants of GDP growth indirectly via the innovation it engenders.

Moreover, such innovation may be caused by more factors than the strength of the patent system alone, namely, the appeal of the market in a country and its relative level of manufacturing. This report seeks to shed light on these relationships and to expand on previous literature by examining both resident and non-resident patent applications (proxies for innovation) as well as conducting analyses for more and narrower stages of development than prior studies.

My results suggest that precedent GDP growth is a strong positive determinant of innovation growth in a country when that innovation comes from abroad, while it tends to slow the rate of domestic innovation. Manufacturing appears to be a boon for attracting applications in general. The results further suggest that resident patent applications per capita respond favorably to signing treaties, while non-resident applications respond in the opposite way. Signing treaties seems also to have a slight negative effect on the growth rate in applications per capita, regardless of the source of the innovation. Finally, some results may suggest that signing international patent treaties reflect the law of diminishing marginal returns.

Introduction

To encourage the production and commercialization of ideas and processes for social benefit, most industrialized nations have developed systems of intellectual property rights (IPRs). In the U.S. we know these as patents, trademarks, and copyrights, each of which protects a different type of intellectual property. The holders of these rights are granted a government sanctioned monopoly, for a limited period of time, on whatever commercial benefit comes from their intellectual property. Modern economic theory explains that the promise of monopoly profits entices inventors, artists, and the like to produce new ideas, develop new processes, and create new works, that would otherwise have been easily copied. Hence, intellectual property rights provide incentive for innovation and artistic creation.

One of the greatest benefits to society of intellectual property, specifically patents, is the role it plays in advancing technology and enhancing productivity, two key factors in the pace of economic development. Many papers, some of which I will summarize later, have already examined the impact of patents and patent systems on economic growth. Interestingly, some conclude that stronger patent rights are significant in explaining growth for countries in late stages of development, but less so for countries at earlier stages. This may suggest that a strong patent system in a given country will not necessarily lead to the research and development that stimulates growth. This paper examines the link between the patent system and innovation, suggesting that more factors influence research and development than the strength of the patent system alone. Using patent applications per capita as a proxy for innovation, my research seeks to establish clear links between innovation in a given country and various attributes of that country, while segmenting results into more developmental stages than prior studies.

Using two distinct parametric regression approaches, I will examine the impact of economic composition, market attractiveness, and measures of patent system strength on resident and non-resident patent applications/capita. Specifically, I will test to see if countries with a larger proportion of manufacturing comprising GDP receive more patent applications since innovators may seek to patent their ideas in the places most conducive to producing them. I will also test to see if innovators seek to patent in markets that are attractive for the sale, and not just the production, of their inventions. Population growth and GDP per capita are used as proxies for market attractiveness. Finally, I will test to see if the patent system itself can entice innovators to patent in a given country. Attributes of the legal system in general as well as participation in patent treaties are used to describe patent system strength. From the analysis I will offer an explanation for how market attractiveness, economic composition, and various features of the patent system affect patent applications in countries around the world. I will also discuss how these effects vary according to level of GDP per capita.

Literature Review

Elhanan Helpman (Helpman 1993) studied the theoretical relationship among innovation, imitation, and IPRs using a dynamic general equilibrium framework. The paper elucidates the arguments for and against strengthening IPR protection in developing countries. While increased strength should encourage innovation that will benefit all countries, some argue that "tighter intellectual property rights only strengthen the monopoly power of large companies that are based in industrial countries, to the detriment of the less developed countries." This discrepancy is rampant throughout existing research.

The literature suggests there are many determinants of innovation that are more significant for developing economies than intellectual property rights. For example, Patricia Schneider (2004) finds that high technology imports are significant in explaining innovation. She also finds that foreign technology has a stronger impact on GDP growth per capita than domestic technology. Perhaps most relevant is her finding that IPRs do affect the innovation rate, but that this effect is more significant for developed countries. In fact, some of her regressions show IPRs having a negative significant impact on innovation, a relationship explained in other studies.

Specifically, Edwin Lai (1997) found that the impact of IPR protection on product innovation depends on the channel through which production is transferred from developed to developing countries. He finds that if imitation is the dominant channel, then IPR protection actually has a negative impact on global product innovation. This owes to the presence of two countervailing forces. Lengthening patent duration increases the return to innovation, while the added production increases the demand for inputs, raising the cost of production, resulting in negative returns to innovation. As it turns out, the second effect dominates when imitation is the dominant channel of production transfer, resulting in a negative relationship between IPR protection and innovation. Lai also finds that if foreign direct investment into developing countries by multinational firms is the dominant channel, the exact opposite effect occurs. In other words, when imitation is not the dominant channel, improving IPRs has the effect we generally expect. Strangely, Schneider's empirical results show that foreign direct investment's effects are inconclusive.

Walter Park and Juan Carlos Ginarte (1997) conduct a very interesting examination by comparing IPR protection to growth, first directly and then indirectly via its impact on factors of production. Using a sample of developed and developing countries, they find that while property rights in general are significant for growth, IPRs specifically are not. Also, R&D has a larger impact on growth for the top half of the sample than the bottom half, while general property rights have a larger impact on the poorer half. Among the richer half, physical capital is less significant and human capital more important.

Concerning investment decisions, Park and Ginarte find that IPR protection is a significant determinant of physical and R&D capital accumulation, even after controlling for the level of property rights protection in general. When splitting the sample for the investment decision regressions, they find that IPRs explain only the physical and research capital decisions of the richer half. They suggest that the variable's insignificance for the lower half may be a result of imitative R&D in these countries. They point out, however, that if all or most of R&D were imitative, the variable would be strongly negative, but it is instead only weakly positive.

They also suggest that as countries switch from imitative to innovative R&D, they should be more interested in promoting stronger IPR protection, and that the returns to improving protection depend on the intensity of innovative R&D activity. Internationally, more advanced countries (who have a vested interest in global IPRs) should support the development of an R&D base in lesser developed nations, since that activity provides incentive to further improve IPR protection.

Thompson and Rushing (1999) examine the effect of patent protection on economic growth via its impact on total factor productivity. Consistent with prior research and theory, they find a positive relationship between productivity and patent protection among wealthier countries. More importantly, the authors acknowledge a chain of intermediate steps between IPRs and growth. "This chain of events includes the establishment and enforcement of IPRs that create the incentives leading to entrepreneurial pursuits (R&D, investment, innovations). The enhanced entrepreneurial activity results in increased capital accumulation and productivity with positive impacts on the rate of economic growth."

Theoretical Framework for Empirical Analysis

Thompson and Rushing 1999 is the best jumping off point for my research. Overall, it seems everyone else is using an index of patent protection. I could have looked at the way this index level of protection impacts patent applications, but instead I tried to isolate the various factors of overall patent system strength, namely, the presence of laws and their effectiveness. More surprisingly, past research seems to tie the strength of the patent system to factors of economic growth either directly or through a nebulous indirect mechanism. I suggest that this relationship is not so simple, and as such should not be overlooked. Specifically, I hypothesize it is the innovation and its commercialization, not merely the strength of the patent system that protects it, that influences productivity and factor accumulation, which lead to economic growth.

Past research has shown the positive relationship between patent system strength to be present only among wealthy countries, while the same relationship is either negative or not significant among developing nations. Since this link may skip a key step, I hope to shed some light on the probable "location" of this indeterminacy. I suggest patent applications, which are a proxy for new innovation,[1] are a function of patent system strength as well as market attractiveness, economic composition, and other variables. The mere notion that innovation would be based on more variables than patent system strength alone suggests that any analysis excluding those variables could be improved.

Patent system strength ought to be a function of both the presence/extent of protection and the features of the court system that enforce that protection. For this reason, my analysis includes variables meant to proxy both aspects of patent system strength. For a rational utility maximizer, innovation should be a function of the expected returns to innovation. Two estimates might be

$$E\,(\pi_{patent}) = p(\textit{application granted}) * [\textit{monopoly profit for life of patent or product} - E\,(\textit{cost to litigate})] - \textit{R\&D Cost} - \textit{application cost}$$

and

$$E\,(\pi_{trade\ secret}) = [\sum_{t=1}^{n} p(\textit{secret is kept time}\ t) * (\textit{monopoly profit in time}\ t)] - \textit{R\&D Cost}$$

I assume the cost to litigate a patent is a function of the explicit costs as well as implicit costs such as time. Monopoly profit should be a function of both the input and output markets for the good or service, or more simply, the market in general. R&D cost should be a function of existing R&D stock and the R&D input (human capital) market. These assumptions lead me to include some measure of market attractiveness, court cost, and human capital in my analysis.

Interview with Dorothy Nee

I interviewed Dorothy Nee in order to assess the appropriateness of my model and validate the logic behind it. She is the daughter of Han Nee, who invented and patented the silvery film we find on the back of most DVD's. The family company, Target Technology Company, LLC, holds a number of patents in the United States as well as Australia, China, and Taiwan, with patents pending elsewhere. Dorothy explained the headaches associated with patenting outside the United States as well as the primary motivation for doing so. Licensing the invention to suppliers has made the company the market leader, with upwards of 75% of the world DVD

[1] This innovation is that which would not otherwise have occurred without the presence of the patent system. The presence of trade secrets that do not later become patented would result in underestimation of innovation. However, trade secrets that are later patented represent old innovation, and would result in overestimation of innovation.

market. However, when one company neglected to fully report revenues, consequently not fully paying royalties, litigation began.

For the past eight years, Target Technology Company (TTC) has been in constant litigation through suits and countersuits, highlighting a key factor of international patent law I originally overlooked. While patenting in another country allows the patent holder to defend his or her patent, it means that suits can be brought against the holder as well. In fact, the large U.S. supplier with which Dorothy's father has been wrestling began the countersuit process in Australia, where TTC could not afford the high cost of travel and litigation. The ability to defend a patent, a quintessential factor of the patent's value, depends not only on the strength of the patent system, but also on the funds available for litigation. For the Nees, it has been an uphill battle. Smaller companies can easily be decimated by just one expensive lawsuit.

Dorothy also highlighted two other ingredients in the patent formula I might otherwise have overlooked. First, the countries in which TTC has patents are not necessarily the ones where the end product is sold. Whereas a high level of general market attractiveness in a country might encourage patents in that country, the attractiveness of the immediate market may be more important. For semi reflective DVD film, that means markets where DVD's are produced, not just sold. The same might be true for patents in general, since manufacturing is the next step toward the consumer. It may follow, then, that countries with a large manufacturing and industrial base would receive more patent applications.

Indeed it seems that profit potential, either by way of lower production cost or higher price, plays a more crucial role than the general strength of the patent system. Dorothy explained, "We won't file a patent in Nigeria, even if they have a great patent system," because there is no economic incentive to hold a patent there. This follows logically from basic theory on intellectual property.

The second ingredient I missed is culture. Dorothy suggested that some countries may be more culturally likely to infringe on patents. In other words, even if the system exists, some countries may simply be disinclined to honor it. This predisposition toward infringement may persist if a given country's body of patent law is paltry, generally unfavorable toward the patent holder, or ignored (as might be the case in countries with corrupt legal systems). It may also occur if potential holders of patents are unwilling to litigate, a possible consequence of the above factors as well as lengthy or costly patent enforcement. Some measure of the strength of precedent, corruptness of the legal system, the length of the process, and/or the cost of litigation should be included in the model if possible.

Data Sources

I took data from the World Intellectual Property Organization (www.WIPO.org), which administers a large number of international treaties and agreements on intellectual property. The organization is the foremost resource for international data on patents and other intellectual property rights. Most data not directly related to intellectual property came from the United Nations Common Database of the United Nations Statistics Division (unstats.un.org) or the World Bank's database of World Development Indicators (www.worldbank.org). Legal formality index data came from the Lex Mundi Project (Djankov et. al., 2002), economic country classifications came from the United Nations Conference on Trade and Development (www.unctad.org), and data on business investment perceptions came from the World Bank International Finance Corporation's World Business Environment Survey (www.ifc.org/ifcext/economics.nsf/Content/ic-wbes).

Data Collection and Processing

I began the process of data collection by downloading raw numbers from the various sources listed above. I then copied and imported into Excel the relevant sets of data. Cleaning the data required trimming excess spaces and ensuring that each set included the same 235 countries, in the same order, from 1977 to 2006. In many cases, data was not available for a number of countries and/or years. This problem was compounded by the fact that, from 1977 to 2006, some of the countries had sprung either into or out of existence. These problems with data consistency result in diminishing data set size as I include more variables into my model.

Once all data sets were cleaned, I used a number of nested lookup functions to allow for interactivity in the Excel file. Specifically, this allowed me to input any year in the range and retrieve the complete data from all sets for all countries in an easy to read format. I then copied these values into a comma delimited file for import into the econometric program STATA, which I used to analyze the data.

Methodology One

This approach employs standard ordinary least squares regression to explain both resident and non-resident patent applications per capita[2] (*respatcap* and *nonrespatcap*, respectively). To explain the variation in patent applications, my first model uses the following independent variables: GDP per capita (*gdpcap*), weighted sum of treaties signed (*treaties*), population growth over the prior year (*popgrowth*), legal formality (*lex*), manufacturing as a percentage of GDP (*mfg*), speed of court processes (*cquick*), affordability of courts (*cafford*), enforceability of court decisions (*cenforce*), overall corruption (*corrupt*), scholarly journal articles per capita (*journalcap*), and year (*year*). The *treaties* variable uses the following weights based on my subjective assessment of the treaty's relative importance: 2 for the Patent Cooperation Treaty and the Paris Convention, 0.5 each for signing and enforcing the Patent Law Treaty, and 1 for every other treaty. See ***Figure 1*** for descriptions of each treaty.

This equation summarizes my main regression:

$$\boldsymbol{x}\,patcap \approx \alpha + \beta_1\,gdpcap + \beta_2\,treaties + \beta_3\,popgrowth + \beta_4\,lex + \beta_5\,mfg + \beta_6\,cquick$$
$$+ \beta_7\,cafford + \beta_8\,cenforce + \beta_9\,corrupt + \beta_{10}\,journalcap + \beta_{11}\,year$$

where ***x*** indicates resident or non-resident patent applications per capita.

Using the program STATA, I ran a number of versions of this regression, first pooling all countries and all years for a preliminary benchmark. Then, I sorted this regression by third and by quintile according to GDP per capita. Finally, I ran the regression by cross section (year), excluding the *year* variable, and summarized the results. All regressions in this paper utilize robust standard errors to control for heteroskedasticity of variables.

Results of Methodology One

In general, the pooled regressions for resident patents have higher R-squared values than those for non-resident applications, and the explanatory power of these models tends to increase when describing the richest or poorest groups of countries. For the two decades examined as cross sections (1984-2004), non-resident patent regressions returned only 9 significant regressions (defined as F-level >= 90%), while regressions for resident patents returned 16. Of these

[2] Per million people for resident and non-resident patent application data only

significant regressions, average R-squared values were very high (above 70%). Hereafter, when discussing cross-sectional regressions, summary results are strictly for significant regressions.

Residents (see ***Appendix A***)
Cross-sectional regressions averaged 31 observations and an R-squared value of 81%. Results show *gdpcap* to be significant in half of all regressions, in each case exhibiting a positive coefficient. Also of note was *cenforce*, which was positive and significant in about one third of regressions, and *popgrowth*, which was significant in 7 regressions, 6 of which reported a negative coefficient for the variable. Also worth noting was *journalcap*, which was negative and significant in 4 regressions.

The pooled and unsorted regression for resident patents has an R-squared value of 71%. Splitting the analysis into thirds we see more explanatory power (79%) among the richest third, but less for the other two thirds (53% - 65%). Many variables in the sorted regression retain the same significance and sign as in the unsorted one, namely, *lex* is negative and significant, *gdpcap* is positive and significant (though not economically), *popgrowth* is negative and significant, *mfg* is positive and significant, *cenforce* is positive and significant, and *cafford* is negative and significant. While *treaties* is positive and significant for the full sample, this result is only achieved in the middle third when sorting.

Further segmenting the regressions (into quintiles), we see the R-squared values of above 90% for the highest and lowest groups, and around 64% for the middle quintiles[3]. Most interesting here are the coefficients on *year*, *journalcap*, and *treaties*. The richest quintile shows a very strong positive time trend, and is the only group with a negative coefficient on *journalcap*. The variable *treaties* again only obtains a significant (positive) coefficient for the middle quintile.

Overall, results for resident patent applications suggest that manufacturing level and enforceability of court decisions are very important in increasing innovation within a country, while legal formality, population growth, and affordability of the court system may stifle such innovation. One explanation, which I will return to later in the paper, is that these variables may have stronger effects in encouraging innovation from abroad, which, if more advanced, could crowd out domestic innovation. However, some of these effects occur among the richest groups of countries, in which case it is unlikely that foreign innovation would be more advanced.

The results also suggest that the more treaties a developing country has signed, the more applications its residents are likely to file. GDP per capita does not seem to have an appreciable direct effect on resident patent applications per capita except that it tends to change the relative importance of other variables.

Non-Residents (See ***Appendix B***)
Cross-sectional regressions averaged 29 observations and an R-squared value of 90%. These regressions returned more significant variables than the other cross-sectional regressions. The variables *gdpcap*, *cquick*, *journalcap*, and the constant term were significant in at least two thirds of all regressions. The constant term was most often positive, and *journalcap* was always positive. The variables *gdpcap* and *cquick* were always negative. Of note were *cafford*, *cenforce*, and *corrupt*, which were significant in at least one third of all regressions. The variable *cafford* was always positive, *cenforce* was most often positive, and *corrupt* was always negative.

[3] Some high R-squared values may be due to the presence of one highly correlated variable.

The pooled and unsorted regression for non-resident patents displays a much lower R-squared value (38%) than its resident counterpart, suggesting that foreign patent filers depend on a larger set of variables to make their filing decisions. Contrary to the resident sample, *treaties* has a negative and significant coefficient, *cenforce* is negative and significant, and *cafford* is positive and significant. Similar to the resident sample, *lex* is negative and significant. The variable *corrupt* is also negative and significant. At first blush, these results contradict the conclusion provided earlier regarding the crowding out of domestic innovation by foreign inventors.

When sorting the regressions, the middle third behaves interestingly. First, *lex* shows a positive and significant coefficient, the opposite of the unsorted regression, and different from the insignificant coefficients for the rich and poor thirds. This may indicate that legal formality helps to attract patent filers from abroad, while on the whole, it is typically an obstacle to the process, especially among resident filers, a conclusion consistent with the crowding out idea.

Second, the middle third is the only one to show a negative significant relationship to *treaties*, the opposite result of the resident sample. In other words, the more treaties a developing country participates in, the fewer patent applications it will draw from non-residents. This seems completely contradictory to the intention of such treaties.

The coefficient on *mfg* is also interesting to note, as it takes on positive values for the lower two thirds and a large negative value for the top third, yet the variable is significant in all of these sorted regressions and insignificant in the unsorted sample. This may help to confirm my assertion that a manufacturing base helps to attract patent applications from abroad, specifically in poorer countries where costs of production are low. Unfortunately, this potential confirmation is marred by the relative explanatory power of the sorted thirds. The model explains only 26%-27% of the variation in the lower two samples compared to 61% in the richest sample. There also appears to be a strong negative time trend among the richest third, though this result is difficult to interpret.

Breaking the analysis down further, we see an anomaly among R-squared values similar to that found in the resident sample. While the model explains between 26% and 28% of the variation in the middle three quintiles, it explains greater than 66% in the top and bottom groups. This result, along with the inconsistency of significance and sign among GDP groups, supports the notion that the relationship between innovation and the factors of my model is quite murky throughout the various stages of development. It may also suggest that GDP per capita is not the best measure of developmental stage when describing innovation. Perhaps a human capital variable would divide the sample into more homogenous groups.

Some results to note are the presence of only one significant variable in the top quintile, *treaties*, which carries a negative coefficient, suggesting that signing a treaty may negatively impact the number of patent applications rich countries receive from abroad. One explanation is that, among fully developed nations, treaties may serve more to protect domestic innovation than to attract foreign innovation, so countries that have signed more treaties rely more on their own residents for innovation, using patent treaties to protect that innovation abroad. However, this would be an example of reverse causality for the *treaties* variable, and the explanation is not confirmed by resident application data. This variable is also negative and significant for the middle quintile, the opposite of the intended effect of such treaties.

The variable *mfg* is significant and positive for quintiles 2,3, and 5, a result which offers further support for the positive relationship of non-resident patent applications to manufacturing. The variable *lex* is negative and significant for the poorest quintile, consistent with the unsorted result, yet the variable's coefficient is positive in all other quintiles and significant in quintiles 2 and 4. This finding suggests that the benefit of legal formality may be more broadly felt than indicated by the regression sorted by thirds. Compared with the fairly consistent negative relationship it displayed among the resident samples, a general conclusion might be that legal formality is a good indicator to potential foreign patent filers of the strength or reliability of the court system, while it acts as more of an encumbrance for resident filers.

Methodology Two

The above regression model has a number of problems. Interpretation is difficult, given the inconsistency of sign and significance on many coefficients. With respect to methodology, the combination of time-series and static variables and the over/under representation of countries (see ***Figure 2***) due to data availability limits the usefulness of results. To remedy some of these problems, my second regression model takes a differential approach. Rather than comparing the absolute number of patent applications per capita to the presence of a given treaty, this method examines the effect of signing a treaty on growth in patent applications per capita.

Figure 3 on the next page compares the world level of patent applications per capita before signing a treaty (defined as the average of the four-year period beginning five years prior to the signing of a treaty)[4] to the level after signing (defined as the average of the four-year period after signing the treaty).

Figure 3: Average Resident Patent Applications per Million People

	Pre-Signing	Post-Signing	% change	Modal Year
Paris Convention	2	8	276%	1991
Patent Cooperation Treaty	14	21	52%	1991
Hague Agreement	30	35	18%	2003
Patent Law Treaty*	101	100	-1%	1999
Budapest Treaty	50	82	62%	1980
Locarno Agreement	42	48	15%	1991
Strasbourg Agreement	41	49	19%	1996

* many of these did not come into force until the end of the data set

Data from the World Bank's World Development Indicators and the United Nations Common Database.
Average from one through four years prior to signing compared to three years following signing
Does not include countries signing after 2005 or before 1978
Modal Year excludes 1977.

The percent change from before to after is positive in all but an outlier case, which supports the notion that causality flows from treaty signing to patent filing. Furthermore, the average percent change for all periods of the form above is 8%, a very low figure compared to most changes associated with a treaty, suggesting that the events are themselves significant, and not just part of

[4] The year immediately before signing the treaty is excluded from the calculation because signing is presumably being discussed and anticipated prior to the actual event, so the effects of signing may or may not be noticeable prior to the event itself.

an overall time/GDP trend. These findings provided encouragement to conduct an analysis centered around the actual signing of treaties and growth of patent applications rather than the stock versions of those variables. It is important to reiterate here that patent applications are meant to proxy innovation, and that treaty signing is one proxy for the strength of the patent system. Thus, this methodology examines the effect on innovation growth of strengthening the patent system.

Since the most complete data is available for the period from 1984 to 2004, I divide this timeframe into four periods and calculate the average patent applications (resident and non-resident) per capita for each period. This process allows me to bypass small gaps in reported information to create a more cohesive data set. I then compute the compound annual growth rate in patent applications per capita for the entire period based (Δpat) on these four averages[5]. With this variable on the left-hand side of my equation, I include the following right-hand variables: growth in GDP per capita (*gdpgrowth*) from 1980 to 1985 or for the first available five year block of time[6], manufacturing as a percentage of GDP in 1990 (*mfg1990*) and growth to 2000 (*mfggrowth*), scholarly journal articles per capita in 1992 (*journals1992*), legal formality (*lex*), affordability of courts (*afford*), enforceability of court decisions (*enforce*), overall corruption (*corrupt*), and one of three variables representing the number of treaties signed during the period, defined as follows: *treatyraw* = the raw weighted number[7] of treaties signed, which assumes constant returns to treaty signing; *treaty1* = a dummy variable that takes the value 1 if a country signed its first treaty during the period, implying zero return to signing any treaties after the first; and *treaty2* = a compromise between the previous two variables, which is a function of the weighted number of treaties signed reflecting diminishing returns. In function notation, my model can be written as

$$\Delta pat\ \boldsymbol{x} \approx \beta_0 + \beta_1\, treaty\ \boldsymbol{t} + \beta_2\, gdpgrowth + \beta_3\, mfg1990 + \beta_4\, mfggrowth \\ + \beta_5\, journal1992 + \beta_6\, lex + \beta_6\, afford + \beta_4\, enforce + \beta_5\, corrupt$$

where **x** indicates resident or non-resident data and **t** indicates the treaty variable (*raw*, *1*, or *2*).

Since data for every variable is not always available for each country, the number of observations can be very low when sorting regressions into GDP groups. Since my methodology involves examining the entire data set as well as splitting it into thirds, I define two variable subsets in order to increase the observations for each of the smaller regressions. I refer to the above set of independent variables as the Full Variable Set. Variable Subset 1 = { *treaty* ***t*** , *gdpgrowth* , *mfg1990* , *mfggrowth* , *journal1992* , *lex*}. Variable Subset 2 = { *treaty* ***t*** , *gdpgrowth* , *journal1992*}. While this process reduces the explanatory power of the model, it also increases the information that can be gathered when separating the observations into groups. All regressions in this paper utilize robust standard errors.

<u>Results of Methodology Two</u>

Residents (See ***Appendix C***)
The pooled regression for the full variable set boasts high significance and an R-squared of about 31%. The two manufacturing variables maintain positive and significant coefficients, regardless

[5] I use the growth rate from the middle of a given period to the middle of the next period, using these points as the centers of the average value.
[6] Allowing for later periods lets me include former Soviet states.
[7] The weighting scheme in this method is the same as in Methodology One.

of the way I account for treaty signings (*raw*, *1*, or *2*). The treaty variable shows a small negative coefficient with varying levels of significance. Using *raw* treaty variable shows no significance, whereas *treaty1* is significant at the 90% level, and *treaty2* is significant at the 95% level, which seems to imply the appropriateness of a model that reflects diminishing marginal benefit of treaty signing.

Interestingly, the *corrupt* variable shows a significant, slightly positive coefficient. The pooled regressions for both variable subsets are characterized by low levels of overall significance, though one case (subset 1, *treaty2*), boasts a significant regression with a negative coefficient on the *treaty2* variable that is significant at the 99% level. When compared with sorted regression results, we see some very interesting changes.

Using the full variable set, we have too few observations to yield any significance that couldn't readily be described as spurious. Using subset 1, the top and bottom thirds of GDP per capita show little to no significance, but the middle third yields significant regressions with R-squared values above 30%, with significant and slightly negative coefficients on two of the treaties variables (*treatyraw* and *treaty2*). This result may suggest that for countries with average wealth, signing a treaty can deter growth in resident patent applications.

It is possible that signing patent treaties may slow (if only slightly) the rate of resident patent application growth if it accelerates non-resident patent applications that are more innovative. We will see later this may not be the case. Instead, signing patent treaties may impose more red tape on the process for residents, slowing resident patent application growth. Regardless of the explanation, the effect is often very minimal, resulting in some cases of a 95% confidence interval that includes zero.

Using *treatyraw* results in a positive significant coefficient on *mfg1990*, indicating that a significant manufacturing base may encourage innovation growth. A possible explanation is that as a country nears an upper level of development, manufacturing firms begin to see more activity and demand higher productivity, accelerating the rate of innovation.

The one significant regression among the top third yields an R-squared value of 42%. This result occurs with the use of *treaty1* and includes a significant positive coefficient on *gdpgrowth*, suggesting that precedent growth in GDP per capita spurs growth in domestic innovation.

Using subset 2, we again see low levels of significance among the top and bottom thirds, while the middle third offers two significant regressions (using *treaty1* and *treaty2*). Each of these regressions includes a significant, slightly negative coefficient on the treaties variable, further supporting the notion that strengthening the patent system by signing patent treaties may lead to marginally fewer resident patent applications.

These regressions also show significant negative coefficients on *gdpgrowth* and *journal1992*, results which are inconsistent with those of the full variable set. Taken separately, they may suggest that strong growth in GDP per capita discourages growth in future resident patent applications for developing countries, a relationship that could be explained if strong GDP growth among developing countries encourages non-residents to file patents in these countries. As mentioned before, if the non-resident innovations are ahead of domestic research, they could crowd out resident patent applications, leading to an inverse relationship between GDP growth and growth in resident patent applications. It is interesting to note that the full variable set shows the opposite result for developed countries.

Non-Residents (See ***Appendix D***)
Pooled regressions for non-resident data result in significant regressions across the board. R-squared values range from about 33% to 58% using the Full Variable Set, while the other variable sets yield expectedly lower values between 10% and 29%. In every regression, *gdpgrowth* has a positive significant coefficient, the magnitude of which increases with the fullness of the variable set. Simply on the surface, this suggests that the behavior of non-resident patent applications in a country is more predictable and more in line with what we commonly expect. More importantly, the previous explanation for a negative coefficient on *gdpgrowth* among resident patent applications is supported by these non-resident results. That is, rapid growth may engender more non-resident patent filings, potentially crowding out resident inventors.

The pooled regressions only weakly support my prediction that a larger manufacturing base will encourage non-residents to file patents in a country; *mfg1990* is significant only once, with a positive coefficient. This may suggest that the market for sale is more important when making the decision to file a patent than is the manufacturing environment. A few more results are worth noting for the pooled regression.

First, the only significant coefficients for the treaties variable are only slightly negative and occur in data sets using *treatyraw*. Since this anomaly is associated exclusively with the *treatyraw* variable, I am inclined to attribute it to the nature of the variable. That particular variable assumes no diminishing returns to signing treaties, while the other two treaties variables include some sort of control for this effect. This may be weak indirect evidence that, when it comes to attracting non-resident patent applications, the marginal benefit of joining a treaty decreases with the number of treaties in which the country already participates.

Second, the *journal1992* variable shows insignificant (positive) coefficients for the Full Variable Set, while the more restrictive variable sets show mostly significant negative coefficients. One explanation is that this variable's correlation with excluded variables results in the significance of the excluded variables being falsely attributed to *journal1992*.

Third, the coefficient on *lex* was consistently positive and significant in the Full Variable Set, though it lost significance in Variable Set 1. Strangely, *afford* had a negative significant coefficient when it was included in the model, suggesting that the more expensive a given country's court system is, the more non-residents will seek patent protection in that country. One possible explanation is that those non-residents filing patents may be more likely to come from rich countries, and an expensive legal process would provide additional protection against litigation from local firms with fewer resources. This explanation may also account for the positive coefficient on *lex* if legal formality is considered a hassle by resident inventors. The variable may also function as a signal to foreign inventors that the domestic court system is perhaps refined, predictable, or reliable, a result similar to that found in Methodology One.

Moving to the sorted regressions, I find again that the Full Variable Set does not provide enough observations to achieve any useful level of significance. Regressions for Variable Subset 1 are primarily characterized by positive significant coefficients on *gdpgrowth* among the lower two thirds of countries. Additionally, *mfg1990* is significant and positive in three cases, each among the lower two thirds. There are two instances of negative significant coefficients for the treaties variable. Again, both are close to zero, and many insignificant coefficients are positive, suggesting an indeterminate relationship. Furthermore, both significant coefficients occur when *treatyraw* is used, possibly supporting my prior explanation of diminishing returns to treaties. R-squared values are above 63% for the bottom third and vary from 32% to 49% for the upper two thirds. The upper third exhibits only one significant variable (*treatyraw*, negative).

Finally, regressions using Variable Subset 2 have uniformly lower R-squared values (between 18% and 32%), as expected. Regressions for the lower two thirds have high F-statistics as well as positive, significant coefficients for *gdpgrowth*. One instance of a negative, significant coefficient for the treaties variable occurs (*treatyraw*, as expected, found in the top third). The variable *journal1992* is negative and significant once as well (*treatyraw*, top third). Overall, this set of regressions does little more than confirm prior results.

<u>Summary of Conclusions from Both Methodologies</u>

Given the relative significance levels and R-squared values of all regressions, the stock value of resident innovation seems easier to explain using the variables of my model than that of non-resident innovation, while the growth rate of non-resident innovation seems easier to predict than its resident counterpart.

Though perhaps self-evident, it bears noting that resident and non-resident patent applications react fundamentally differently to changes in the patent system and the market, a difference that remains whether examining the absolute number of patents per capita or its growth over time. Most strikingly, growth in GDP per capita may slow the growth rate of resident patent applications, while accelerating non-resident filings. On an absolute basis, however, GDP per capita has no appreciable affect one way or the other, except to alter the impact of other variables.

Overall, a larger manufacturing base seems to positively influence both the absolute number of patent applications per capita and their growth rate. Manufacturing's effect on an absolute basis appears more often among the lower levels of development, though its effect on growth appears uniform.

Results relating to features of the court system are extremely difficult to generalize. In many cases, coefficients switch sign between the two methodologies, between resident and non-resident analyses, and between the highest and lowest levels of GDP per capita, possibly indicating the presence of at least two conflicting forces, the magnitudes of which vary across the aforementioned dimensions.

With respect to signing patent treaties, resident and non-resident applications behave counter to one another on an absolute basis, that is, signing more treaties is associated with more resident patent applications and fewer non-resident applications for developing countries, which seems to run counter to what we might expect to happen. This variable may suffer from reverse causality, which would suggest that fewer non-resident patent applications and more resident patent applications lead to the signing of patent treaties. This ambiguity was a major problem of the first methodology.

Using the second approach, signing treaties tends to slow applications per capita regardless of origin. The non-resident effect is more significant among richer countries, while the resident effect is more significant among poorer countries. However, the coefficients and standard errors of these variables suggest that the overall effect is indeterminate, not negative. That said, these results have two important implications. First, when combined with behavior of the various *treaties* variables, results seem to confirm the notion of diminishing returns to signing patent treaties. Second, the goal of patent treaties, at least concerning developing nations, seems to be unfulfilled insofar as there is no significant positive relationship between treaty signings and innovation.

Such a conclusion lends support to those who claim that such treaties serve only to buttress or protect the interests of firms in developed nations, as opposed to fostering worldwide innovation. The conclusion also finds validity in Dorothy Nee's comment that even if a given country's patent system is excellent, there may be no economic incentive to patent there. In other words, market and culture-related factors may be more important in describing innovation. While prior research has shown that the patent system has a lesser impact on factors of growth than do other variables, my results illustrate the possibility that IPR regulations have a lesser impact on innovation directly than do variables such as manufacturing and precedent GDP growth.

Confounding Factors and Potential Improvements

The biggest barrier to effective analysis is reliability and accuracy of data. Often data is available only for a handful of years or countries. Additionally, the World Intellectual Property Organization records any patent filed under the Patent Cooperation Treaty's international system as a patent in each member state, which creates inconsistencies across time. Furthermore, many patents may also be filed through regional offices, such as the one in Europe. These patents are not included in my data, possibly skewing results. Using patent grant data rather than patent applications should help reduce the inconsistency caused by the PCT. This data may work best if combined with data on the patent grant rate, since that should be a determinant of the expected return to innovation, and consequently of innovation itself.

My model considers patent applications a good proxy for innovation. However, in developing economies where intellectual property rights are scant or scantily enforceable, perhaps productivity gains are made by other means, such as the purchase of foreign technology. Innovation may also originate domestically but find protection by other means, namely trade secrets. Incorporating foreign direct investment or high-technology imports into my model could help to more accurately describe innovation.

My first methodology pools all years and countries together for most regressions, which could bias my results toward a specific year or country if those observations are more prolific. The cross-sections offer a more reliable technique, but the low number of observations limits my ability to subdivide the regressions to find out how each variable's coefficient changes with GDP per capita. Instead of subdividing regressions, I should simply include the interaction between GDP and the other independent variables.

My second methodology puts too much importance on the timing of patent applications. Countries may respond at a different rate to each treaty, and effects may appear quite rapidly or very slowly. Furthermore, since neither of my methodologies use logarithms, my results may be impacted by outliers and are somewhat difficult to interpret.

As mentioned previously, reverse causality is also likely to be a problem, especially with the treaties variables. A two-stage least squares regression with effective instrumental variables could eliminate this problem, but finding the right instruments could prove difficult.

Further Readings

Stern (2000) shows that international patent production depends on GDP per capita, a proxy for a country's stock of knowledge. Glass and Saggi (2002) develops a model that challenges the idea that stronger IPR protection in developing countries (the South) would always encourage innovation. The specific relationship between intellectual property rights and economic growth is discussed by Gould and Gruben (1996). Stern, Porter, and Furman (2000) explain that patents are not a perfect measure for total innovation since the propensity to apply for patent protection may reflect differences in industrial composition and internal intellectual property protection mechanisms across countries. Griliches (1994) discusses the advantages and limitations of using patent data as opposed to other measures of innovation. Evenson (1990) discusses the patterns of international IPR protection among countries at different stages of development. Rapp and Rozek (1990) create a measure of IPRs cited in later studies. Information on quantifying IPR protection is from legal background in Hemnes (1992) and Gadbaw and Richards (1988).

Figure 1: Treaty Descriptions

Paris Convention	1883	Same protection to all nationals, right of priority, and rules regarding many forms of intellectual property
Patent Cooperation Treaty	1970	Can seek patent protection simultaneously in all member countries by filing an international application
Hague Agreement	1925	International registration of industrial designs (multiple additions and revisions since 1925)
Patent Law Treaty	2000	Formalized procedures and requirements, making the filing process more user-friendly
Budapest Treaty	1977	International recognition of the deposit of microorganisms for patent procedure
Locarno Agreement	1968	Classification of industrial designs
Strasbourg Agreement	1971	Established the International Patent Classification (IPC), which divides technology into eight sections with approximately 70,000 subdivisions

Figure 2: Average Representation in Observations

Representation Overview

Total Countries	235
Maximum Average Representation	20
Minimum Average Representation	0
Concentrations = 20	22
Concentrations >15	41
Concentrations >10	76
Concentrations >5	98
Concentrations = 0	111

Countries with Average Representation of 20

Australia
Austria
Brazil
Bulgaria
Denmark
Finland
France
Germany
Hong Kong, China
Hungary
India
Japan
Mexico
Monaco
Netherlands
New Zealand
Poland
Portugal
Romania
Spain
United Kingdom
United States

Figure 2 (cont'd): Average Representation in Observations

Countries with Average Representation of 0

Afghanistan
American Samoa
Andorra
Anguilla
Antigua and Barbuda
Bahrain
Barbados
Belize
Benin
Bermuda
Bhutan
British Virgin Islands
Brunei Darussalam
Burkina Faso
Cambodia
Cameroon
Cape Verde
Cayman Islands
Central African Republic
Chad
Channel Islands
Comoros
Congo
Cook Islands
Cote d'Ivoire
CzechoSlovak Republic (former)
Djibouti
Dominica
Equatorial Guinea
Eritrea
Faeroe Islands
Falkland Islands (Malvinas)
Fiji
French Guiana
French Polynesia
Gabon
Germany, Dem. Rep. (former)
Germany, Fed. Rep. (former)
Ghana
Gibraltar
Greenland
Grenada
Guadeloupe
Guam
Guinea
Guinea-Bissau
Holy See
Isle of Man
Kiribati
Korea, Democratic People's Republic of
Kuwait
Lao PDR
Lebanon
Liechtenstein
Macao, China
Maldives
Mali
Marshall Islands
Martinique
Mauritania
Mayotte
Micronesia, Federated States of
Montserrat
Myanmar
Nauru
Netherlands Antilles
New Caledonia
Niger
Niue
Northern Mariana Islands
Oman
Palau
Papua New Guinea
Pitcairn
Puerto Rico
Qatar
Reunion
Saint Helena
Saint Kitts and Nevis
Saint Lucia
Saint Pierre and Miquelon
Saint Vincent and the Grenadines
Samoa
San Marino
Sao Tome and Principe
Senegal
Seychelles
Sierra Leone
Solomon Islands
Somalia
Sudan
Suriname
Swaziland
Taiwan, China
Tanzania
Timor-Leste
Togo
Tokelau
Tonga
Turks and Caicos Islands
Tuvalu
Uganda
Union of Soviet Socialist Republics (former)
United Arab Emirates
Vanuatu
Virgin Islands (U.S.)
Wallis and Futuna Islands
West Bank and Gaza
Western Sahara
Yemen
Yugoslavia (former)

APPENDIX A

Cross Section of Resident Patent Applications per Capita

Total Significant Regressions (90%)	16

Average R-squared	0.81	Average Obs.	31.1
Median R-squared	0.79	Median Obs.	34.0

Summary of Significant Regressions

	Frequency of Significance	Frequency of Positive Significance	Percent Significant	Percent Positive	Percent Negative
gdpcap	8	8	**50%**	**100%**	**0%**
treaties	2	2	13%	100%	0%
popgrowth	7	1	**44%**	**14%**	**86%**
lex	3	1	19%	33%	67%
mfg	3	3	19%	100%	0%
cquick	1	1	6%	100%	0%
cafford	1	0	6%	0%	100%
cenforce	5	5	**31%**	**100%**	**0%**
corrupt	1	1	6%	100%	0%
journalcap	4	0	**25%**	**0%**	**100%**
_cons	2	0	13%	0%	100%

APPENDIX A (cont'd)

Resident Patent Applications per Capita

Observations	557
Significance F	99%
R-squared	0.71

Variable	**Coefficient**
year	-1.6 ***
gdpcap	0.01 ***
treaties	3.75 ***
popgrowth	-1414.73 ***
lex	-8.12 ***
mfg	156.21 ***
cquick	6.70
cafford	-29.96 ***
cenforce	42.39 ***
corrupt	11.36 **
journalcap	61047.11
_cons	3102.31 ***

Resident Patent Applications per Capita, by Third according to GDP per capita

Third 1 (top)		**Third 2**		**Third 3 (bottom)**	
Observations	154	Observations	275	Observations	128
Significance F	99%	Significance F	99%	Significance F	99%
R-squared	0.79	R-squared	0.53	R-squared	0.65
Variable	**Coefficient**	**Variable**	**Coefficient**	**Variable**	**Coefficient**
year	2.49	*year*	-0.82 *	*year*	-0.23
gdpcap	0.01 ***	*gdpcap*	0.00	*gdpcap*	0.05 ***
treaties	-5.94	*treaties*	3.26 ***	*treaties*	-0.86
popgrowth	-1028.99	*popgrowth*	-1457.95 ***	*popgrowth*	-1290.03 ***
lex	-23.11 **	*lex*	-3.27 *	*lex*	-8.64 ***
mfg	2155.74 ***	*mfg*	71.18 *	*mfg*	-99.98
cquick	70.86 ***	*cquick*	-6.7 ***	*cquick*	4.82
cafford	-48.32 ***	*cafford*	-1.83	*cafford*	-17.33 ***
cenforce	76.8 ***	*cenforce*	19.46 ***	*cenforce*	17.81 ***
corrupt	7.17	*corrupt*	-14.18 ***	*corrupt*	-9.14
journalcap	115948.3 ***	*journalcap*	-29344.80	*journalcap*	(dropped)
_cons	-5715.82	*_cons*	1684.53 *	*_cons*	512.49

APPENDIX A (cont'd)

Resident Patent Applications per Capita, by Quintile according to GDP per capita

Quintile 1 (top)		**Quintile 2**		**Quintile 3**		**Quintile 4**		**Quintile 5 (bottom)**	
Observations	79	Observations	152	Observations	159	Observations	118	Observations	49
Significance F	99%	Significance F	99%	Significance F	99%	Significance F	99%	Significance F	99%
R-squared	0.97	R-squared	0.65	R-squared	0.62	R-squared	0.66	R-squared	0.91
Variable	**Coefficient**	**Variable**	**Coefficient**	**Variable**	**Coefficient**	**Variable**	**Coefficient**	**Variable**	**Coefficient**
year	7 ***	*year*	-0.89	*year*	-0.22	*year*	-0.04	*year*	-0.89
gdpcap	0.00	*gdpcap*	0.00	*gdpcap*	-0.01 *	*gdpcap*	0.02	*gdpcap*	0.00
treaties	-7.76	*treaties*	2.33	*treaties*	2.57 ***	*treaties*	-0.04	*treaties*	2.33
popgrowth	-4099.64 **	*popgrowth*	300.22	*popgrowth*	-1470.26 ***	*popgrowth*	-1748.54 ***	*popgrowth*	300.22
lex	-630.4 ***	*lex*	-1.95	*lex*	-1.99	*lex*	-10.9 **	*lex*	-1.95
mfg	29.43	*mfg*	356.07 ***	*mfg*	108.62	*mfg*	-29.67	*mfg*	356.07 ***
cquick	217.95 ***	*cquick*	22.05 ***	*cquick*	-9.31 *	*cquick*	10.59 **	*cquick*	22.05 ***
cafford	-931.41 ***	*cafford*	8.11	*cafford*	3.02	*cafford*	-25.78 ***	*cafford*	8.11
cenforce	583.03 ***	*cenforce*	-0.91	*cenforce*	15.49 **	*cenforce*	20.36 ***	*cenforce*	-0.91
corrupt	1447.18 ***	*corrupt*	-1.28	*corrupt*	-18.66 ***	*corrupt*	1.69	*corrupt*	-1.28
journalcap	-164232.6 ***	*journalcap*	283646.8 ***	*journalcap*	6501.57	*journalcap*	65041.89	*journalcap*	283646.8 ***
_cons	-12632.27 ***	*_cons*	1599.77	*_cons*	511.86	*_cons*	114.20	*_cons*	1599.77

APPENDIX B

Cross Section of Non-Resident Patent Applications per Capita

Total Significant Regressions (90%)	9

Average R-squared	0.90	Average Obs.	28.6
Median R-squared	0.92	Median Obs.	26.0

Summary of Significant Regressions

	Frequency of Significance	Frequency of Positive Significance	Percent Significant	Percent Positive	Percent Negative
gdpcap	6	0	**67%**	**0%**	**100%**
treaties	2	0	**22%**	**0%**	**100%**
popgrowth	0	0	0%		
lex	1	1	11%	100%	0%
mfg	1	0	11%	0%	100%
cquick	6	0	**67%**	**0%**	**100%**
cafford	4	4	**44%**	**100%**	**0%**
cenforce	3	2	**33%**	**67%**	**33%**
corrupt	4	0	**44%**	**0%**	**100%**
journalcap	7	7	**78%**	**100%**	**0%**
_cons	6	5	**67%**	**83%**	**17%**

APPENDIX B (cont'd)

Non-Resident Patent Applications per Capita

Observations	570
Significance F	99%
R-squared	0.38

Variable	**Coefficient**
year	2.65
gdpcap	0.00
treaties	-19.09 ***
popgrowth	596.52
lex	-12.07 *
mfg	100.43
cquick	-109.85 ***
cafford	63.29 ***
cenforce	-21.21 *
corrupt	-49.18 ***
journalcap	236713.70
_cons	-4700.03

Non-Resident Patent Applications per Capita, by Third according to GDP per capita

Third 1 (top)		**Third 2**		**Third 3 (bottom)**	
Observations	153	Observations	272	Observations	145
Significance F	99%	Significance F	99%	Significance F	99%
R-squared	0.61	R-squared	0.27	R-squared	0.26
Variable	**Coefficient**	**Variable**	**Coefficient**	**Variable**	**Coefficient**
year	-14.39 ***	*year*	1.09 *	*year*	-0.88 **
gdpcap	0.00	*gdpcap*	0.02 ***	*gdpcap*	0.01 ***
treaties	-19.34	*treaties*	-4.81 ***	*treaties*	1.68 ***
popgrowth	-4435.28	*popgrowth*	531.11	*popgrowth*	-141.65
lex	-32.00	*lex*	7.36 **	*lex*	2.22
mfg	-2088.83 ***	*mfg*	316.84 ***	*mfg*	40.45 ***
cquick	-343 ***	*cquick*	-1.69	*cquick*	1.31
cafford	92.23 **	*cafford*	-9.33	*cafford*	5.27 **
cenforce	-111.11 ***	*cenforce*	-4.31	*cenforce*	-4.12 *
corrupt	106.72	*corrupt*	-15.6 ***	*corrupt*	4.05
journalcap	-9408.52	*journalcap*	364302.1 *	*journalcap*	(dropped)
_cons	30932.44 ***	*_cons*	-2153.33 *	*_cons*	1713.39 **

APPENDIX B (cont'd)

Non-Resident Patent Applications per Capita, by Quintile according to GDP per capita

Quintile 1 (top)		**Quintile 2**		**Quintile 3**		**Quintile 4**		**Quintile 5 (bottom)**	
Observations	79	Observations	151	Observations	162	Observations	110	Observations	68
Significance F	99%	Significance F	99%	Significance F	99%	Significance F	99%	Significance F	99%
R-squared	0.66	R-squared	0.26	R-squared	0.26	R-squared	0.28	R-squared	0.73
Variable	**Coefficient**	**Variable**	**Coefficient**	**Variable**	**Coefficient**	**Variable**	**Coefficient**	**Variable**	**Coefficient**
year	-9.48	*year*	4.93 **	*year*	1.64 **	*year*	-0.79 *	*year*	-0.25 **
gdpcap	0.01	*gdpcap*	-0.01 **	*gdpcap*	0.01	*gdpcap*	0.01	*gdpcap*	0.00
treaties	-133.1 ***	*treaties*	-8.98	*treaties*	-5.25 ***	*treaties*	1.45 ***	*treaties*	0.32
popgrowth	-4004.79	*popgrowth*	-470.35	*popgrowth*	134.16	*popgrowth*	-294.24	*popgrowth*	52.66 **
lex	3.27	*lex*	32.19 **	*lex*	0.46	*lex*	5.08 ***	*lex*	-3.35 **
mfg	-5424.96	*mfg*	472.14 *	*mfg*	343.82 ***	*mfg*	48.84	*mfg*	38.92 ***
cquick	-251.94	*cquick*	-35.67	*cquick*	1.18	*cquick*	7.02 ***	*cquick*	2.04 **
cafford	-132.69	*cafford*	-45.05 ***	*cafford*	9.04	*cafford*	6.79 *	*cafford*	3.4 **
cenforce	149.85	*cenforce*	57.7 **	*cenforce*	-10.64	*cenforce*	-14.99 ***	*cenforce*	-3.83
corrupt	-165.70	*corrupt*	-108.09 ***	*corrupt*	-18.96 **	*corrupt*	2.66	*corrupt*	0.48
journalcap	-849070.10	*journalcap*	-19527.05	*journalcap*	203398.50	*journalcap*	-15657.68	*journalcap*	(dropped)
_cons	22789.87	*_cons*	-9474.09 **	*_cons*	-3247.36 **	*_cons*	1542.79 *	*_cons*	496.07 **

APPENDIX C

Full Variable Set, Resident

treatyraw		***treaty1***		***treaty2***	
Observations	38	Observations	38	Observations	38
Significance Level F	99%	Significance Level F	99%	Significance Level F	99%
R-squared	0.31	R-squared	0.38	R-squared	0.37

Variable	**Coefficient**	**Variable**	**Coefficient**	**Variable**	**Coefficient**
treatyraw	-0.01	*treaty1*	-0.06 *	*treaty2*	-0.02 **
journal1992	-19.75	*journal1992*	-84.22	*journal1992*	-60.66
gdpgrowth	-0.03	*gdpgrowth*	0.01	*gdpgrowth*	-0.03
mfg1990	0.7 **	*mfg1990*	0.49 *	*mfg1990*	0.56 **
mfggrowth	1.62 **	*mfggrowth*	1.6 **	*mfggrowth*	1.56 **
lex	-0.09 *	*lex*	-0.08	*lex*	-0.08
afford	0.03	*afford*	0.04	*afford*	0.03
enforce	-0.04	*enforce*	-0.03	*enforce*	-0.03
corrupt	0.05 *	*corrupt*	0.04 *	*corrupt*	0.04 *
_cons	-0.15	*_cons*	-0.12	*_cons*	-0.11

Variable Subset 1, Resident

treatyraw		***treaty1***		***treaty2***	
Observations	61	Observations	61	Observations	61
Significance Level F	*not*	Significance Level F	*not*	Significance Level F	95%
R-squared	0.12	R-squared	0.11	R-squared	0.15

Variable	**Coefficient**	**Variable**	**Coefficient**	**Variable**	**Coefficient**
treatyraw	-0.01 **	*treaty1*	-0.05 *	*treaty2*	-0.03 ***
journal1992	-27.06	*journal1992*	-36.44	*journal1992*	-38.96
gdpgrowth	-0.12	*gdpgrowth*	-0.06	*gdpgrowth*	-0.12
lex	0	*lex*	0.01	*lex*	0.02
mfg1990	0.4	*mfg1990*	0.21	*mfg1990*	0.26
mfggrowth	0.8	*mfggrowth*	0.8	*mfggrowth*	0.78
_cons	-0.01	*_cons*	0.01	*_cons*	0.02

Variable Subset 2, Resident

treatyraw		***treaty1***		***treaty2***	
Observations	105	Observations	105	Observations	105
Significance Level F	*not*	Significance Level F	*not*	Significance Level F	*not*
R-squared	0.01	R-squared	0.02	R-squared	0.02

Variable	**Coefficient**	**Variable**	**Coefficient**	**Variable**	**Coefficient**
treatyraw	0	*treaty1*	-0.03	*treaty2*	-0.01
journal1992	-22.38	*journal1992*	-34.41	*journal1992*	-30.95
gdpgrowth	-0.08	*gdpgrowth*	-0.08	*gdpgrowth*	-0.09
_cons	0.03 *	*_cons*	0.04 **	*_cons*	0.04 **

APPENDIX C (cont'd)

Full Variable Set, *treatyraw*, Resident

Top Third		Middle Third		Bottom Third	
Observations	9	Observations	18	Observations	11
Significance Level F	*not*	Significance Level F	99%	Significance Level F	*not*
R-squared	*NA*	R-squared	0.76	R-squared	0.45
Variable	**Coefficient**	**Variable**	**Coefficient**	**Variable**	**Coefficient**
treatyraw	*NA*	*treatyraw*	0.00	*treatyraw*	0.01
journal1992	*NA*	*journal1992*	367.83	*journal1992*	16659.93
gdpgrowth	*NA*	*gdpgrowth*	0.84 **	*gdpgrowth*	0.18
mfg1990	*NA*	*mfg1990*	1.22 **	*mfg1990*	0.57
mfggrowth	*NA*	*mfggrowth*	1.44	*mfggrowth*	0.64
lex	*NA*	*lex*	-0.03	*lex*	0.17
afford	*NA*	*afford*	0.08 *	*afford*	-0.15
enforce	*NA*	*enforce*	-0.08 *	*enforce*	0.03
corrupt	*NA*	*corrupt*	0.04	*corrupt*	0.13
_cons	*NA*	*_cons*	-0.26 **	*_cons*	-0.17

Full Variable Set, *treaty1*, Resident

Top Third		Middle Third		Bottom Third	
Observations	9	Observations	18	Observations	11
Significance Level F	*not*	Significance Level F	99%	Significance Level F	*not*
R-squared	*NA*	R-squared	0.76	R-squared	0.69
Variable	**Coefficient**	**Variable**	**Coefficient**	**Variable**	**Coefficient**
treaty1	*NA*	*treaty1*	-0.02	*treaty1*	-0.22
journal1992	*NA*	*journal1992*	-696.21	*journal1992*	-3732.40
gdpgrowth	*NA*	*gdpgrowth*	0.84 **	*gdpgrowth*	-0.52
mfg1990	*NA*	*mfg1990*	1.02 *	*mfg1990*	0.63
mfggrowth	*NA*	*mfggrowth*	1.19	*mfggrowth*	4.79
lex	*NA*	*lex*	-0.03	*lex*	-0.06
afford	*NA*	*afford*	0.08 *	*afford*	0.32
enforce	*NA*	*enforce*	-0.09 **	*enforce*	-0.10
corrupt	*NA*	*corrupt*	0.04	*corrupt*	0.01
_cons	*NA*	*_cons*	-0.23	*_cons*	-0.66

Full Variable Set, *treaty2*, Resident

Top Third		Middle Third		Bottom Third	
Observations	9	Observations	18	Observations	11
Significance Level F	*not*	Significance Level F	99%	Significance Level F	*not*
R-squared	*NA*	R-squared	0.78	R-squared	0.63
Variable	**Coefficient**	**Variable**	**Coefficient**	**Variable**	**Coefficient**
treaty2	*NA*	*treaty2*	-0.02	*treaty2*	-0.09
journal1992	*NA*	*journal1992*	-1632.81	*journal1992*	6731.73
gdpgrowth	*NA*	*gdpgrowth*	0.71 *	*gdpgrowth*	-0.79
mfg1990	*NA*	*mfg1990*	0.88	*mfg1990*	0.87
mfggrowth	*NA*	*mfggrowth*	0.75	*mfggrowth*	4.63
lex	*NA*	*lex*	-0.03	*lex*	-0.10
afford	*NA*	*afford*	0.07	*afford*	0.28
enforce	*NA*	*enforce*	-0.08 *	*enforce*	-0.08
corrupt	*NA*	*corrupt*	0.04	*corrupt*	-0.01
_cons	*NA*	*_cons*	-0.16	*_cons*	-0.60

APPENDIX C (cont'd)

Variable Subset 1, *treatyraw*, Resident

Top Third		Middle Third		Bottom Third	
Observations	22	Observations	26	Observations	13
Significance Level F	*not*	Significance Level F	99%	Significance Level F	*not*
R-squared	0.40	R-squared	0.39	R-squared	0.41
Variable	**Coefficient**	**Variable**	**Coefficient**	**Variable**	**Coefficient**
treatyraw	0.00	*treatyraw*	-0.02 *	*treatyraw*	0.00
journal1992	-81.31 *	*journal1992*	-678.08	*journal1992*	15618.20
gdpgrowth	0.41 ***	*gdpgrowth*	-0.58	*gdpgrowth*	-0.25
mfg1990	-0.47	*mfg1990*	0.93 ***	*mfg1990*	0.23
mfggrowth	0.05	*mfggrowth*	1.02	*mfggrowth*	1.57
lex	-0.02	*lex*	0.07	*lex*	0.02
_cons	0.16 **	*_cons*	-0.12 **	*_cons*	-0.05

Variable Subset 1, *treaty1*, Resident

Top Third		Middle Third		Bottom Third	
Observations	22	Observations	26	Observations	13
Significance Level F	90%	Significance Level F	90%	Significance Level F	*not*
R-squared	0.42	R-squared	0.31	R-squared	0.46
Variable	**Coefficient**	**Variable**	**Coefficient**	**Variable**	**Coefficient**
treaty1	0.03	*treaty1*	-0.03	*treaty1*	-0.05
journal1992	-55.76	*journal1992*	-1088.32	*journal1992*	13670.81
gdpgrowth	0.39 ***	*gdpgrowth*	-0.54	*gdpgrowth*	-0.24
mfg1990	-0.46	*mfg1990*	0.65	*mfg1990*	0.21
mfggrowth	-0.18	*mfggrowth*	1.54	*mfggrowth*	1.56
lex	-0.01	*lex*	0.06	*lex*	0.07
_cons	0.13 *	*_cons*	-0.10	*_cons*	-0.04

Variable Subset 1, *treaty2*, Resident

Top Third		Middle Third		Bottom Third	
Observations	22	Observations	26	Observations	13
Significance Level F	*not*	Significance Level F	99%	Significance Level F	*not*
R-squared	0.40	R-squared	0.39	R-squared	0.48
Variable	**Coefficient**	**Variable**	**Coefficient**	**Variable**	**Coefficient**
treaty2	0.01	*treaty2*	-0.04 *	*treaty2*	-0.03
journal1992	-72.55 *	*journal1992*	-1893.22	*journal1992*	15298.33
gdpgrowth	0.41 ***	*gdpgrowth*	-0.59	*gdpgrowth*	-0.38
mfg1990	-0.52	*mfg1990*	0.52	*mfg1990*	0.38
mfggrowth	-0.09	*mfggrowth*	0.69	*mfggrowth*	1.84
lex	-0.02	*lex*	0.07	*lex*	0.08
_cons	0.15 **	*_cons*	-0.03	*_cons*	-0.06

APPENDIX C (cont'd)

Variable Subset 2, *treatyraw*, Resident

Top Third		Middle Third		Bottom Third	
Observations	39	Observations	43	Observations	23
Significance Level F	*not*	Significance Level F	*not*	Significance Level F	*90%*
R-squared	0.16	R-squared	0.15	R-squared	0.33
Variable	**Coefficient**	**Variable**	**Coefficient**	**Variable**	**Coefficient**
treatyraw	0.00	*treatyraw*	-0.01 **	*treatyraw*	0.01
journal1992	-72.04 *	*journal1992*	-460.94	*journal1992*	14486.54
gdpgrowth	0.44	*gdpgrowth*	-0.65	*gdpgrowth*	0.26
_cons	0.07 *	*_cons*	0.05 *	*_cons*	-0.06 **

Variable Subset 2, *treaty1*, Resident

Top Third		Middle Third		Bottom Third	
Observations	39	Observations	43	Observations	23
Significance Level F	*not*	Significance Level F	95%	Significance Level F	*not*
R-squared	0.23	R-squared	0.22	R-squared	0.28
Variable	**Coefficient**	**Variable**	**Coefficient**	**Variable**	**Coefficient**
treaty1	0.06	*treaty1*	-0.08 **	*treaty1*	0.01
journal1992	-49.27	*journal1992*	-698.32 *	*journal1992*	15497.4 *
gdpgrowth	0.43	*gdpgrowth*	-0.66 *	*gdpgrowth*	0.13
_cons	0.05 *	*_cons*	0.05 *	*_cons*	-0.04

Variable Subset 2, *treaty2*, Resident

Top Third		Middle Third		Bottom Third	
Observations	39	Observations	43	Observations	23
Significance Level F	*not*	Significance Level F	99%	Significance Level F	*not*
R-squared	0.21	R-squared	0.22	R-squared	0.29
Variable	**Coefficient**	**Variable**	**Coefficient**	**Variable**	**Coefficient**
treaty2	0.02	*treaty2*	-0.04 ***	*treaty2*	0.01
journal1992	-60.90	*journal1992*	-632.18 *	*journal1992*	15329.26 *
gdpgrowth	0.43	*gdpgrowth*	-0.7 *	*gdpgrowth*	0.16
_cons	0.05	*_cons*	0.07 **	*_cons*	-0.05

APPENDIX D

Full Variable Set, Non-Resident

treatyraw		***treaty1***		***treaty2***	
Observations	39	Observations	39	Observations	39
Significance Level F	99%	Significance Level F	95%	Significance Level F	95%
R-squared	0.58	R-squared	0.33	R-squared	0.36

Variable	**Coefficient**	**Variable**	**Coefficient**	**Variable**	**Coefficient**
treatyraw	-0.03 ***	*treaty1*	0.01	*treaty2*	-0.02
journal1992	108.66	*journal1992*	193.32	*journal1992*	134.96
gdpgrowth	1.21 ***	*gdpgrowth*	1.1 **	*gdpgrowth*	1.14 **
mfg1990	1.04 ***	*mfg1990*	0.52	*mfg1990*	0.51
mfggrowth	-1.01	*mfggrowth*	-0.83	*mfggrowth*	-0.97
lex	0.23 ***	*lex*	0.2 **	*lex*	0.23 **
afford	-0.14 ***	*afford*	-0.15 **	*afford*	-0.15 **
enforce	0.06 *	*enforce*	0.05	*enforce*	0.06
corrupt	-0.03	*corrupt*	0.01	*corrupt*	-0.01
_cons	0.21	*_cons*	0.17	*_cons*	0.21

Variable Subset 1, Non-Resident

treatyraw		***treaty1***		***treaty2***	
Observations	63	Observations	63	Observations	63
Significance Level F	99%	Significance Level F	90%	Significance Level F	95%
R-squared	0.29	R-squared	0.14	R-squared	0.18

Variable	**Coefficient**	**Variable**	**Coefficient**	**Variable**	**Coefficient**
treatyraw	-0.03 ***	*treaty1*	-0.02	*treaty2*	-0.03
journal1992	-148.85 ***	*journal1992*	-113.02 **	*journal1992*	-131.63 ***
gdpgrowth	0.76 ***	*gdpgrowth*	0.77 **	*gdpgrowth*	0.74 **
mfg1990	0.47	*mfg1990*	0.02	*mfg1990*	0.1
mfggrowth	-0.38	*mfggrowth*	-0.3	*mfggrowth*	-0.31
lex	0.07	*lex*	0.05	*lex*	0.07
_cons	-0.03	*_cons*	-0.01	*_cons*	-0.01

Variable Subset 2, Non-Resident

treatyraw		***treaty1***		***treaty2***	
Observations	116	Observations	116	Observations	116
Significance Level F	99%	Significance Level F	99%	Significance Level F	99%
R-squared	0.15	R-squared	0.10	R-squared	0.10

Variable	**Coefficient**	**Variable**	**Coefficient**	**Variable**	**Coefficient**
treatyraw	-0.01 ***	*treaty1*	0	*treaty2*	-0.01
journal1992	-99.75 ***	*journal1992*	-80.57 **	*journal1992*	-91.68 ***
gdpgrowth	0.5 **	*gdpgrowth*	0.6 ***	*gdpgrowth*	0.56 ***
_cons	0.03 *	*_cons*	0	*_cons*	0.01

APPENDIX D (cont'd)

Full Variable Set, *treatyraw*, Non-Resident

Top Third		Middle Third		Bottom Third	
Observations	8	Observations	18	Observations	13
Significance Level F	*NA*	Significance Level F	99%	Significance Level F	*95%*
R-squared	*NA*	R-squared	0.77	R-squared	0.92
Variable	**Coefficient**	**Variable**	**Coefficient**	**Variable**	**Coefficient**
treatyraw	*NA*	*treatyraw*	-0.04 ***	*treatyraw*	0.05
journal1992	*NA*	*journal1992*	6677.12	*journal1992*	-8069.60
gdpgrowth	*NA*	*gdpgrowth*	1.50	*gdpgrowth*	2.76 **
mfg1990	*NA*	*mfg1990*	1.22 **	*mfg1990*	0.09
mfggrowth	*NA*	*mfggrowth*	-2.1 *	*mfggrowth*	-3.43
lex	*NA*	*lex*	0.08	*lex*	0.28
afford	*NA*	*afford*	-0.02	*afford*	-0.26
enforce	*NA*	*enforce*	0.06	*enforce*	0.00
corrupt	*NA*	*corrupt*	-0.07	*corrupt*	0.08
_cons	*NA*	*_cons*	-0.15	*_cons*	0.57

Full Variable Set, *treaty1*, Non-Resident

Top Third		Middle Third		Bottom Third	
Observations	8	Observations	18	Observations	13
Significance Level F	*not*	Significance Level F	*not*	Significance Level F	*95%*
R-squared	*NA*	R-squared	0.47	R-squared	0.92
Variable	**Coefficient**	**Variable**	**Coefficient**	**Variable**	**Coefficient**
treaty1	*NA*	*treaty1*	0.02	*treaty1*	0.09
journal1992	*NA*	*journal1992*	5124.61	*journal1992*	-2330.68
gdpgrowth	*NA*	*gdpgrowth*	2.10	*gdpgrowth*	2.01 ***
mfg1990	*NA*	*mfg1990*	0.85	*mfg1990*	0.51
mfggrowth	*NA*	*mfggrowth*	-0.20	*mfggrowth*	-1.86
lex	*NA*	*lex*	0.08	*lex*	0.14
afford	*NA*	*afford*	0.03	*afford*	-0.22
enforce	*NA*	*enforce*	0.00	*enforce*	-0.02
corrupt	*NA*	*corrupt*	0.00	*corrupt*	-0.02
_cons	*NA*	*_cons*	-0.32	*_cons*	0.76

Full Variable Set, *treaty2*, Non-Resident

Top Third		Middle Third		Bottom Third	
Observations	8	Observations	18	Observations	13
Significance Level F	*not*	Significance Level F	90%	Significance Level F	*99%*
R-squared	*NA*	R-squared	0.59	R-squared	0.91
Variable	**Coefficient**	**Variable**	**Coefficient**	**Variable**	**Coefficient**
treaty2	*NA*	*treaty2*	-0.07	*treaty2*	0.04
journal1992	*NA*	*journal1992*	-2114.76	*journal1992*	-5175.70
gdpgrowth	*NA*	*gdpgrowth*	1.45	*gdpgrowth*	2.19 ***
mfg1990	*NA*	*mfg1990*	-0.33	*mfg1990*	0.50
mfggrowth	*NA*	*mfggrowth*	-3.43	*mfggrowth*	-2.17
lex	*NA*	*lex*	0.10	*lex*	0.23
afford	*NA*	*afford*	-0.03	*afford*	-0.26
enforce	*NA*	*enforce*	0.03	*enforce*	-0.02
corrupt	*NA*	*corrupt*	0.00	*corrupt*	0.01
_cons	*NA*	*_cons*	0.12	*_cons*	0.78

APPENDIX D (cont'd)

Variable Subset 1, *treatyraw* , Non-Resident

Top Third		Middle Third		Bottom Third	
Observations	21	Observations	27	Observations	15
Significance Level F	95%	Significance Level F	99%	Significance Level F	*99%*
R-squared	0.37	R-squared	0.49	R-squared	0.63

Variable	Coefficient	Variable	Coefficient	Variable	Coefficient
treatyraw	-0.03 **	*treatyraw*	-0.03 ***	*treatyraw*	0.00
journal1992	-111.63	*journal1992*	2235.12	*journal1992*	-10889.97
gdpgrowth	0.52	*gdpgrowth*	0.87 *	*gdpgrowth*	1.88 **
mfg1990	-1.10	*mfg1990*	0.85 **	*mfg1990*	1.15
mfggrowth	-0.62	*mfggrowth*	-0.99	*mfggrowth*	-0.44
lex	0.25	*lex*	0.08 *	*lex*	0.29
_cons	0.17	*_cons*	-0.11	*_cons*	-0.18

Variable Subset 1, *treaty1* , Non-Resident

Top Third		Middle Third		Bottom Third	
Observations	21	Observations	27	Observations	15
Significance Level F	99%	Significance Level F	*not*	Significance Level F	*99%*
R-squared	0.32	R-squared	0.22	R-squared	0.66

Variable	Coefficient	Variable	Coefficient	Variable	Coefficient
treaty1	0.13	*treaty1*	0.00	*treaty1*	-0.05
journal1992	7.04	*journal1992*	2863.93	*journal1992*	-12087.71
gdpgrowth	0.05	*gdpgrowth*	0.96 *	*gdpgrowth*	1.76 ***
mfg1990	-1.35	*mfg1990*	0.54	*mfg1990*	1.36 **
mfggrowth	-1.93	*mfggrowth*	0.82	*mfggrowth*	-0.12
lex	0.08	*lex*	0.08	*lex*	0.36
_cons	0.11	*_cons*	-0.14	*_cons*	-0.20

Variable Subset 1, *treaty2* , Non-Resident

Top Third		Middle Third		Bottom Third	
Observations	21	Observations	27	Observations	15
Significance Level F	*not*	Significance Level F	*not*	Significance Level F	*99%*
R-squared	0.25	R-squared	0.28	R-squared	0.65

Variable	Coefficient	Variable	Coefficient	Variable	Coefficient
treaty2	0.02	*treaty2*	-0.03	*treaty2*	-0.02
journal1992	-84.59	*journal1992*	1604.21	*journal1992*	-10431.98
gdpgrowth	0.17	*gdpgrowth*	0.85 *	*gdpgrowth*	1.68 **
mfg1990	-1.62	*mfg1990*	0.42	*mfg1990*	1.42 **
mfggrowth	-1.36	*mfggrowth*	-0.06	*mfggrowth*	0.09
lex	0.08	*lex*	0.08	*lex*	0.33
_cons	0.21	*_cons*	-0.07	*_cons*	-0.20

APPENDIX D (cont'd)

Variable Subset 2, *treatyraw* , Non-Resident

Top Third		Middle Third		Bottom Third	
Observations	42	Observations	46	Observations	28
Significance Level F	90%	Significance Level F	99%	Significance Level F	*99%*
R-squared	0.14	R-squared	0.23	R-squared	0.36
Variable	**Coefficient**	**Variable**	**Coefficient**	**Variable**	**Coefficient**
treatyraw	-0.01	*treatyraw*	-0.01 **	*treatyraw*	0.01
journal1992	-121.3 **	*journal1992*	260.01	*journal1992*	-2110.77
gdpgrowth	-0.18	*gdpgrowth*	0.7 **	*gdpgrowth*	1.28 ***
_cons	0.04	*_cons*	0.04 *	*_cons*	-0.02

Variable Subset 2, *treaty1* , Non-Resident

Top Third		Middle Third		Bottom Third	
Observations	42	Observations	46	Observations	28
Significance Level F	*not*	Significance Level F	90%	Significance Level F	*99%*
R-squared	0.15	R-squared	0.15	R-squared	0.35
Variable	**Coefficient**	**Variable**	**Coefficient**	**Variable**	**Coefficient**
treaty1	0.09	*treaty1*	-0.02	*treaty1*	0.00
journal1992	-73.60	*journal1992*	246.28	*journal1992*	-1939.81
gdpgrowth	-0.19	*gdpgrowth*	0.77 ***	*gdpgrowth*	1.17 ***
_cons	-0.03	*_cons*	0.00	*_cons*	-0.01

Variable Subset 2, *treaty2* , Non-Resident

Top Third		Middle Third		Bottom Third	
Observations	42	Observations	46	Observations	28
Significance Level F	*not*	Significance Level F	90%	Significance Level F	*99%*
R-squared	0.11	R-squared	0.17	R-squared	0.35
Variable	**Coefficient**	**Variable**	**Coefficient**	**Variable**	**Coefficient**
treaty2	0.02	*treaty2*	-0.02	*treaty2*	0.00
journal1992	-96.41 *	*journal1992*	199.90	*journal1992*	-1916.88
gdpgrowth	-0.21	*gdpgrowth*	0.73 **	*gdpgrowth*	1.17 ***
_cons	-0.02	*_cons*	0.02	*_cons*	-0.01

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