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The Impact of Institutional Enforcement Mechanisms On Perceived Intellectual Property Protection

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Abstract

The Trade-Related Intellectual Property Rights (TRIPS) Agreement has effectively bundled a country's adoption of a minimum standard of intellectual property (IP) protection with their membership in the World Trade Organization. This bundling may cause some countries to adopt the stronger TRIPS standards when it is otherwise not optimal to do so. As a consequence, some countries may choose to not fully enforce the IP standards they have legally adopted, thereby creating a divide between statutory levels of IP protection and enforced levels. Given the potentially growing disparity between statutory and enforced IP protection, it is important to have a better understanding as to how measures of statutory IP protection commonly used in research may differ from measures of enforced IP protection. Our paper contributes to this understanding by analyzing how two institutional variables related to enforcement—judicial independence and the reliability of local police—influence the perceived level of IP protection in a country, which arguably captures domestic perceptions about how well laws are being enforced. We find that both higher levels of judicial independence and a more reliable police force positively contribute to domestic perception of IP protection in their country. These factors also help to explain differences that exist between perceived and statutory measures of IP protection. Overall, the results provide evidence that statutory measures of IP protection differ from measures of perceived IP protection in the post-TRIPS era. As a consequence, the outcome of policy analyses may differ depending on which measurement is used.

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I. Introduction

The decisions individual countries make regarding their domestic intellectual property rights (IPRs) have increasingly garnered an international audience. International organizations such as the World Trade Organization (WTO) and the World Intellectual Property Rights Organization (WIPO) often argue that implementation and strengthening of IPRs can stimulate innovation and promote technology transfer and diffusion through and across countries. This, coupled with the increasingly globalized marketplace, has facilitated a push for greater international harmonization of IPRs regimes. It remains questionable; however, as to whether countries are fully enforcing these newly implemented laws. This paper considers the role of two institutional variables related to enforcement—judicial independence and the reliability of police—on domestic perceptions of intellectual property (IP) protection, where perceptions of IP protection are used to capture the interaction between the existence and enforcement of IP laws. Traditional measures of statutory IP protection omit the possibility that pressures for international harmonization may lead some countries to adopt laws even if they cannot or do not enforce them.

Although the Paris Convention (1883), the Berne Convention (1886), and the creation of WIPO (1970) all contributed to the international harmonization of IP standards, the most significant effort to harmonize IPR regimes emerged from the Uruguay Round (1986-1994) of the General Agreement on Tariffs and Trade (GATT) negotiations. As a result of these negotiations, the WTO replaced the GATT as the vanguard of global trade and commerce with the Trade Related Intellectual Property Rights (TRIPS) Agreement enacted as a centerpiece of the WTO. The TRIPS Agreement, which came into effect 1 January 1995, built on the previous international IPR conventions and established an even more comprehensive minimum standard for IP protection applicable to all WTO members[1].

The coupling of the TRIPS Agreement with WTO membership means that nations wishing to join, or remain members of, the WTO must adopt the minimum standards outlined in TRIPS. Currently, 153 countries worldwide are WTO members and are subject to the TRIPS requirements. However, it remains uncertain if all countries, particularly developing countries, truly desire national abidance to TRIPS or if they have agreed to these terms for the wider benefits of WTO membership. Kabiraj (1994) acknowledged that, despite India's reluctance to alter its IPRs, opting out of the GATT and WTO would lead to isolation from the international community, an outcome too severe to consider. Other researchers have suggested that the adoption of TRIPS minimum standards is a consequence of international pressures (Briggs, 2010; Pugatch, 2004) and that the punishment from the international community is less severe if a country adopts stringent IP laws and does not enforce them than if the country does not adopt these IP laws at all (Mertha and Pahre, 2005). In all, the marriage of TRIPS and WTO membership appears to have created incentives for some countries to adopt a statutory level of IP protection above that which is independently optimal. Therefore, it is conceivable, and perhaps

[1] It should be noted that TRIPS granted developed countries one year (until 1 January 1996) to fully implement its statutes. Developing countries and some transitioning countries (those transitioning from centrally planned to market economies) were granted four additional years to implement TRIPS (until 1 January 2000) with the exception of Articles 3, 4, and 5, which deal with general principles such as non-discrimination. Least developed countries were given a total of eleven years (until 1 January 2006) to implement TRIPS; however, in late 2005, the WTO extended LDC's implementation date from 2006 to 2013 for measures not pertaining to pharmaceuticals and 2016 for measures associated with pharmaceuticals.

even likely, that the legal standards of IP protection in a country are dissimilar from the enforced level of protection. Failure to account for the enforcement of IP laws may lead to an unintended overestimation of IP protection in a country (Ostergard, 2000).

Given the breadth of available data for statutory based measures of IP, most empirical studies utilize statutory measures to capture cross-country and time differences in IPRs, commonly assuming that statutory changes reflect a true change in a country's IP protection. While Ginarte and Park (1997) found this to be a sufficiently accurate assumption for the pre-TRIPS era, this conclusion deserves reconsideration in the post-TRIPS era due to the influence of non-IP factors brought about by WTO membership, as discussed above.[2] Country-level, survey-based data on domestic citizens' perceived level of IP protection can arguably be used to approximate the enforced level of IP protection in a country. Although domestic perceptions about protection may not perfectly capture true levels of enforcement, measures of perceived IP protection do attempt to capture the enforcement of laws on the books.

Our paper analyzes how two institutional variables related to enforcement—judicial independence and the reliability of local police—influence perceived levels of IP protection in a country. We find that both higher levels of judicial independence and a more reliable police force positively contribute to the local public's perception of IP protection in their country. In addition, we find that these factors help explain differences that exist between perceived and statutory measures of IP protection. The latter finding implicitly suggests that the outcome of policy analyses may vary depending on which empirical measurement of IP protection is used.

II. Measures of IP Protection

A nation's level of IP protection is currently measured in one of two ways: (1) in terms of a country's statutory protection or (2) in terms of a country's perceived protection. Measures of statutory protection are based on a nation's legal framework regarding IPRs. Two prominent indexes measuring a nation's legal framework are the Rapp and Rozek (RR) index and the Ginarte and Park Patent Rights Index (PRI). Both the RR index and the PRI measure how well national patent laws conform to international standards of patent protection and illuminate variations in IP laws cross-nationally. The RR index of patent strength measures the conformity of 159 nations' patent laws in 1984 with the minimum standards proposed in the *Guidelines for Standards for the Protection and Enforcement of Patents* by the U.S. Chamber of Commerce (Rapp and Rozek, 1990). It does so by ranking national patent regimes on a scale of zero to five, with zero indicating that a nation has no patent protection laws and five corresponding with a nation whose laws are fully consistent with the guidelines proposed minimum standards. The RR index has been overwhelmingly replaced in the literature by the Ginarte and Park PRI, which analyzes national patent laws of 122 countries every five years from 1960-2005 (Park, 2008). The PRI is computed by tabulating the scores each country receives across five categories of patent laws: 1) extent of coverage, 2) membership in international patent agreements, 3) provisions for loss of protection, 4) statutory enforcement mechanisms, and 5) duration of

[2] Ginarte and Park (1997) analyzed complaints made by multi-national firms and concluded that the majority of businesses' concerns were either non-patent (e.g., copyrights, trademarks) related or statutory (that nations lacked appropriate IP laws). The authors found few complaints regarding enforcement (the speed and efficiency of courts and the prosecution of imitators). This led Ginarte and Park to conclude that the gap between statutory measures and actual levels of patent protection was small.

protection. The PRI includes subcategories for each of the five categories adding greater depth and variance for each country. Appendix A and B outline the structure of the RR index and the PRI, respectively, in more detail.

Measures of perceived protection attempt to capture the complex interaction between a nation's legal framework and its enforcement of the laws by gathering opinions of informed members of a nation's business, government, and academic community regarding IPRs. Two prominent indexes capturing perceived IP protection are found in the annually released Global Competitiveness Report – published by the World Economic Forum (WEF) – and the World Competitiveness Yearbook– published by the International Institute of Management and Development (IMD). The WEF's Global Competitiveness Report provides survey-based data gathered by the Executive Opinion Report. The survey asks numerous questions pertaining to a broad range of topics affecting national competitiveness, including the following IP question: "How would you rate intellectual property protection, including anti-counterfeiting measures, in your country? (1= very weak; 7= very strong)."[3] The survey results are then averaged within each participating country. Data for the WEF's IP question are available from 1999 to 2010 with the number of participating countries ranging from 59 in 1999 to 139 in 2010. The International Institute for Management Development's (IMD's) World Competitiveness Yearbook also utilizes an executive opinion survey to create a measure of perceived IP protection in a country. In their survey, the IMD asks informed members of the nation's business and academic community and government officials if, "Intellectual Property Rights are not adequately enforced or are adequately enforced? (0= not adequately enforced, 10 = adequately enforced)" and aggregates the data to produce an average for each country. The IMD initiated the survey in 1989 for 58 countries, with data publicly available from 2003 to 2010.

Both the WEF and IMD survey questions on perceived IP protection capture national opinions about a broad aggregate of IPRs (including patents, copyrights, trademarks, geographical indicators, and so on), which is distinctly different from the statutory-based RR Index and PRI, which exclusively focus on patents. Given that survey data on perceived IP protection do not differentiate across the various types of IPRs, it is possible that enforcement may be stronger for one type of IP, say patents, than for another type, say copyrights. The inability to discern perceptions across different types of IP is a limitation of the data currently available. This also complicates a thorough comparison of the WEF and IMD to the PRI and RR Index. Nonetheless, given that studies utilizing the PRI and RR Index sometimes discuss their findings in the more generally terms of "intellectual property rights" rather than "patent protection" specifically (e.g. Briggs, 2010; Chen and Puttitanun, 2005; Falvey, et al., 2006), it remains important to consider the differences that may exist between the various measures of IP protection.

[3] The wording of this question has changed over the years, but remains the same in spirit. Appendix C documents how the wording of the IP question asked in the WEF's Global Competitiveness Report changed over time. It also documents how the questions related to judicial independence and reliability of police, also appearing in the Global Competitiveness Report, have changed over time.

III. Literature Review

Most existing research has utilized the PRI measure of statutory IP in their empirical investigations, rather than measures of perceived protection (e.g. Allred and Park, 2007; Briggs, 2010; Chen and Puttitanun, 2005; Chiang, 2004; Co, 2004; Falvey et al., 2006; Ivus, 2009). Of these, the research that is most closely related to our research question uses statutory IP protection as the dependent variable. Thus, the first subsection of this literature review discusses previous works that have examined the factors that influence statutory IP protection. The second subsection of the literature review focuses on the rising importance of enforcement in the IP dialogue. More specifically, the second subsection discusses research that suggests that there is a growing gap between the IP laws that a country adopts and the IP laws that are enforced in the post-TRIPS era.

A. Research with Statutory IP Protection as a Dependent Variable

Several authors have produced research examining national characteristics that provide for strong statutory IP protections, as proxied by the PRI (Briggs, 2010; Chen and Puttitanun, 2005; Ginarte and Park, 1997; Park, 2008). Ginarte and Park (1997) identified market freedom as an important factor in determining a nation's statutory protections for both developed and developing nations. For less developed countries, openness was an important characteristic. Lastly, they found that a country's ratio of R&D spending to GDP was significant in determining a nation's level of statutory protection only after the ratio crossed a certain threshold.

In a more recent analysis, Park (2008) noted that a nation's level of patent right protection was positively correlated with per capita income levels. Park also echoed Grossman and Lai (2004) and Eicher and García-Peñalosa (2008) in finding that richer countries have both a greater capacity and willingness to increase patent right protections.

Chen and Puttitanun (2005) analyzed the relationship between income and a country's level of IPRs in more detail, arguing that a U-shaped relationship exists between IPRs and per capita GDP. This would mean that in the early stages of growth a country implements strong IPRs to attract high technology goods, but then weakens IPRs so to engage in imitation. In later stages of growth a country again strengthens IPRs so to encourage innovation. To empirically test this theory, Chen and Puttitanun (2005) incorporate both per capita GDP and per capita GDP squared in their regression equation. They found support for their U-shape theory with a negative coefficient on per capita GDP and a positive coefficient on per capita GDP squared. The authors also found that economic freedom, trade, and secondary education are not significant predictors of a nation's level of statutory protection.

Briggs (2010) analyzed the U-shaped relationship studied by Chen and Puttitanun (2005) and concluded that Chen and Puttitanun had mischaracterized the source of the relationship between per capita GDP and statutory protection in their analysis of panel data. Briggs found support for an alternative theory in which the U-shaped relationship was a product of cross-sectional influences based on the year a country first implemented IPRs rather than on longitudinal changes in a country's level of IPRs over time. She argued that middle income countries were less vulnerable than low income countries to international pressures to initially

implement strong IPRs and instead took advantage of imitation-led growth by adopting relatively lower levels of IP protection than low income countries. Upper income countries, on the other hand, initially implemented stronger IP laws in hopes of encouraging innovation. Briggs' use of the PRI in her analysis provides insight into the adoption of IP laws but prohibits a further understanding as to whether those laws are actually enforced. Therefore, we test for a potential U-shaped longitudinal relationship between perceived IP protection and per capita GDP, but ultimately conclude that the level of perceived IP protection monotonically increases as a country develops. (See Appendix D.)

B. Enforcement in the post-TRIPS world

A significant amount of research suggests that there may be an enforcement gap, or a gap between the laws that are on the books and those laws that are enforced in practice (e.g. Falvey, et al., 2006; Jain, 1996; Mertha and Pahre, 2005; OECD, 2009; Ostergard, 2000). In the post-TRIPS world, leaders have learned that the punishment from the international community is less severe if they adopt stringent IP laws and do not enforce them, than if they do not adopt these IP laws at all (Mertha and Pahre, 2005). Falvey, et al. (2006) found that nations are likely to adopt TRIPS in order to gain the benefits of WTO membership, but then only slowly and incrementally enforce TRIPS provisions to minimize a loss in benefits from their local innovative activity (diffusion, imitation, and adaption) and/or illicit markets (production and distribution of counterfeit goods).

Evidence of a growing gap between statutory laws and enforcement is provided in an OECD (2009) report on international trade and piracy, which notes that even though TRIPS membership has expanded and the level of statutory protection has increased, the amount of losses due to counterfeiting and piracy, as well as the percent of world trade that is counterfeit, has been increasing. Ostergard (2000) and the U.S. Department of Commerce (2002) note a lack of enforcement for IP laws adopted in the post-TRIPS era. An overview of the TRIPS Agreement published by the U.S. Department of Commerce (2002, Section V) stated that, "Enforcement issues are becoming increasingly important as more countries enact laws which are generally TRIPS consistent. Increasingly, the compliance issues in the IPR area will not be inadequate foreign laws, but rather inadequate enforcement of TRIPS-consistent IPR laws."

IV. Determinants of Perceived Protection

A. Theoretical Underpinnings

In general, richer countries are assumed to be better able to incur the costs associated with creating and supporting IP related infrastructure (Ginarte and Park, 1997). It is reasonable to assume that the pre-existing institutional environment in a country may also influence the cost of adopting and enforcing new IP infrastructure, as well as implicitly influence domestic perceptions of how well new IP laws are enforced. Two such institutional factors considered in this paper are the degree of judicial independence and the reliability of local police.

Greater judicial independence in a country brings with it the perception that judges will rule in an impartial way (Landes and Posner, 1975). Specific to the arena of IP protection,

greater judicial independence in a country is expected to positively influence the upholding of IP laws on the books, and minimize the influence of government and private sector opinions on the ultimate decisions in IP cases. As a result, judicial independence is expected to positively influence a country's perception of domestic IP protection.

Countries with a more reliable police force are more likely to have enforcement mechanisms in place to support the newly adopted IP standards and to aid larger federal and international policing services (which are often involved in protecting against international violations of infringement, such as counterfeit trade and parallel importation) in enforcing these laws. Nations with professionally trained enforcement officials are expected to find it both quicker and easier to enforce newly adopted and implemented IP protections. In nations with poorly compensated and/or inadequately trained enforcement officials, the potential for corruption and bribery is likely to persist, and the protection afforded by the law may not be afforded to the innovator. In all, there is an expectation that perceived IP protection will be greater in countries with a more reliable police force.

On a related note, firms that operate in countries with independent judiciaries and reliable police are more likely to utilize the newly adopted IP laws by seeking enhanced protection. Non-independent judiciaries (which can be swayed by the influence of other governmental agencies, powerful individuals, or business interests) and/or unreliable police services (slow or unresponsive to enforce laws and investigate complaints) reduce the benefits that a firm expects to receive from filing a complaint, thereby decreasing the likelihood that a firm attempts to seek protection under the new laws.

The influence of judicial independence and reliability of police on levels of perceived IP protection is the basis of the empirical exploration conducted in the next section. We later consider the influence of alternative institutional and enforcement variables to underscore the robustness of our results.

B. Dependent and Explanatory Variables

Our empirical model considers the impact of judicial independence and the reliability of police on perceived levels of IP protection. Therefore, perceived IP protection appears as the dependent variable in our model, while judicial independence and reliability of police are key independent variables. The WEF survey question on perceived levels of IP protection is our primary dependent variable as it encompasses a broader scope of countries and years than the IMD, although a second series of analyses are conducted using IMD data to demonstrate robustness. We also consider the impact of these institutional variables on statutory IP protection, as approximated by the PRI.

The benchmark independent variables that impact perceived IP protection are: per capita GDP, WTO membership, judicial independence, and reliability of police. The former two measures are included as control variables in the model, while the latter two measures are included to capture different aspects of enforcement.

Per capita GDP is included to capture the effect of a nation's economic development on the level of perceived IP protection. It is a control variable that has been used by Ginarte and Park (1997), Chen and Puttitanun (2005), Park (2008) and Briggs (2010) when statutory IP was the dependent variable. Data on per capita GDP, in constant 2000 U.S. dollars, were obtained from the World Bank's World Development Indicators. As previously discussed, there exists a body of literature that suggests levels of IP protection may first decrease and later increase as a country develops. Therefore, we considered the accuracy of including squared per capita GDP as a regressor. We ultimately found no support for a longitudinal U-shaped relationship between per capita GDP and IP protection, a result similar to that found in Briggs (2010), and omit a squared per capita GDP term in our subsequent analysis. See Appendix D for details about this analysis.

WTO membership is modeled as a dummy variable equal to one if a country is a WTO member in a given year and zero otherwise. WTO membership implies that a nation is willing to adopt the TRIPS minimum standards upon accession to the WTO.

Judicial independence provides a subjective measure of the independence of a nation's legal system and is included as an independent variable for reasons discussed in subsection 4.1. A measure of judicial independence is obtained from a unique survey question reported in the WEF's Global Competitiveness Report which asks: "Is the judiciary in your country independent from political influences of members of government, citizens, or firms? (1 = no - heavily influenced, 7 = yes - entirely independent)." While the exact wording of the question used to measure judicial independence has varied over time (see Appendix C), it consistently focuses on measuring the independence of the judicial system from outside actors such as the government, citizens, or firms. Judicial independence is expected to have a positive effect on perceived protection.

The reliability of police variable provides a subjective measure of the reliability of local police services to protect citizens and businesses and ensure compliance of the law, and is included as an independent variable for reasons discussed in subsection 4.1. Reliability of police is approximated by a unique survey question located in the WEF's Global Competitiveness Report which asks: "Police services in your country (1 = cannot be relied upon to enforce law and order, 7 = can be relied upon to enforce law and order)." Again, while the exact wording of the question used to measure the reliability of police services has varied slightly over time (see Appendix C), it remains focused on measuring the extent to which police services effectively enforce law and order such that security is not an ongoing concern for private businesses. The reliability of police services is expected to have a positive effect on perceived IP protection.

C. Descriptive Statistics

Table 1 presents descriptive statistics for the benchmark data. The average country in the sample has a per capita GDP of $8,982 with a wide variance across countries. Both the WEF and IMD measures of perceived IP protection have mean scores around the middle of the index range. It is obvious from Table 1 that the WEF measure of perceived protection provides a more robust sample for which to conduct our analysis. Lastly, WTO membership (not shown below) has a prevalence of 83.6 percent across all countries and years in the data set.

Table 2 presents a pair-wise correlation matrix for the variables utilized in the empirical analysis. The direction of correlation between all variables is as expected. Our primary measure of perceived IP protection (WEF) and statutory IP protection (PRI) have a correlation of 0.66, while the IMD and PRI have a correlation of 0.56, both supporting the notion that differences exist between the level of perceived IP protection and statutory IP protection. The WEF and IMD (both measures of perceived protection) have a high correlation of 0.92, demonstrating that these measures capture similar perceptions about IP protection. The 0.80 correlation between judicial independence and reliability of police suggests that multicolinearity may exist between these two variables. Therefore, variance inflation factor tests were conducted as part of each regression analysis. The variance inflation factor tests ultimately lead us to refute multicolinearity as a potential issue of concern.

V. Estimation, Equations & Strategy

We consider two benchmark specifications for estimating the perceived IP protection equation. The first explores the lagged influence of the explanatory variables discussed in the previous section on perceived IP protection. The second specification considers the possibility that past perceptions about IP protection influence current perceptions, and that deviations from past perceptions occur as a result of the current levels of the explanatory variables discussed in the previous section. The remainder of this section presents the benchmark equations more completely, and discusses the methodologies used to estimate each benchmark equation.

A. First Benchmark Equation

In the first benchmark equation, we explore how perceived IP protection (as measured by the WEF index) in country *j* is influenced by a series of lagged independent variables; specifically:

$$WEF_{jt} = \beta_0 + \beta_1 ln(\text{per capita } GDP_{j,t-1}) + \beta_2 WTO_{j,t-1} + \beta_3 JI_{j,t-1} + \beta_4 RP_{j,t-1} + \varepsilon_{j,t-1} \qquad (1)$$

where JI is judicial independence and RP is the reliability of police.[4] In this specification, the independent variables are lagged by one year to capture the fact that their influence on IP protection may be delayed rather than instantaneous. Lagging the independent variables also limits their potential endogeneity with the dependent variable; although today's level of perceived IP protection is impacted by the economic and judicial environment in the previous period, it is unlikely that future levels of perceived IP protection have an impact on current levels of per capita GDP, WTO membership, JI, and RP.

Year dummies are included to isolate any possible affect attributable to a specific year not otherwise captured by the independent variables. The inclusion of year dummy variables

[4] Per capita GDP is transformed into its natural log so to capture how a percentage change in the variable influences perceived protection. Logged transformations are not necessary for JI and RP as they are indexes and, therefore, it is more useful to estimate how a one point increase in the respective index impacts the perceived protection index.

also helps to abate the potentially exogenous impact of variations in the variables' scores that derive from changes in the wording of the survey questions over time. The benchmark WEF equation in (1) is estimated both including and excluding country fixed effects. Inclusion of the country fixed effects aids in picking up any additional unexplained differences between countries. Standard errors are clustered by country.

B. Second Benchmark Equation

The second benchmark equation specification is a natural deviation from the first, as it considers the possibility that past perceptions of IP protection influence current perceptions, while accounting for the possibility that current enforcement factors—specifically, judicial independence and reliability of police—may cause perceptions to deviate away from past levels. To do so, a lagged dependent variable is included as an explanatory variable in the estimation equation.

$$WEF_{jt} = \alpha_0 + \alpha_1 WEF_{i,t-1} + \alpha_2 ln(\text{per capita } GDP_{jt}) + \alpha_3 WTO_{jt} + \alpha_4 JI_{jt} + \alpha_5 RP_{jt} + \varepsilon_{jt} \text{ . (2)}$$

Inclusion of the lagged dependent variable on the right hand side of the equation complicates the estimation of (2). First, including JI and RP in the current period (rather than lagged levels) as regressors raises concerns that these variables may be endogenous with the WEF. Second, inclusion of the lagged dependent variable introduces potential autocorrelation into the model. Given that the WEF data set is comprised of a short time dimension (1999 to 2010) and a larger country dimension (129 countries[5]), the Arellano and Bond (1991) GMM estimation process can be appropriately used to estimate (2), while addressing concerns of endogeneity and autocorrelation.

The Arellano-Bond estimator uses first differences to transform (2) into

$$\Delta WEF_{jt} = \alpha_0 + \alpha_1 \Delta WEF_{j,t-1} + \alpha_2 \Delta ln(\text{per capita } GDP_{jt}) + \alpha_3 \Delta WTO_{jt} + \alpha_4 \Delta JI_{jt} + \alpha_5 \Delta RP_{jt} + \varepsilon_{jt} \quad (3)$$

and then utilizes lagged levels of the regressors to instrument each explanatory variable in (3). Arellano and Bond (1991) show that this differencing and instrumenting technique addresses both potential endogeneity and autocorrelation. It should also be noted that the first differencing of equation (2) differences out any time-invarying country fixed effects. Therefore, the Arellano-Bond estimator eliminates the potential for country fixed effects to be multicolinear with the independent variables (which is a common problem in panels with small-time and large-country dimensions). The Arellano-Bond estimator is a widely accepted technique in the

[5] Although the WEF is available for up to 139 countries, 10 of these do not have corresponding data on per capita GDP, judicial independence, and/or the reliability of police. Therefore, our complete data set represents 129 countries. See Appendix E for a list of countries represented in our data set.

presence of small-time, large-country panel data sets for which the lagged dependent variable appears as a regressor (Greene, 2004).

Arellano-Bond estimation requires a sufficient number of years (at least ten years of data is commonly recommended) as the estimation procedure utilizes first differences and lagged levels in its computation. Thus, while the Arellano Bond estimation is appropriate for our benchmark equation that utilizes the WEF data, it is not appropriate for estimations in which PRI or IMD appears as the dependent variable (as the available time dimensions for these data are too short).

VI. Results

A. Benchmark Results

The results for benchmark equation (1) are reported in Column I of Table 3. Both judicial independence and reliability of police have a statistically significant and positive impact on a country's perceived level of IP protection. This supports the theory that nations with independent judiciaries, as well as reliable police forces, will have higher perceived levels of IP protection. Column II estimates equation (1) while including country-level fixed effects.[6] When country level fixed effects are included in Column II, judicial independence and reliability of police remain statistically significant at the one percent level. Inclusion of country fixed effects does; however, result in the WTO variable becoming statistically insignificant, suggesting perhaps that cross-country variations are greater between WTO and non-WTO members than between WTO member countries or between non-WTO member countries.

Column III of Table 3 utilizes the Arellano-Bond estimation methodology discussed in the previous section to estimate benchmark equation (2). The results suggest that hysteresis is present. Statistical significance of the lagged dependent variable (WEF) indicates that perceptions of IP protection in the previous year positively impact perceptions in the current year. However, current levels of judicial independence and police reliability are both statistically significant factors that influence current perceptions of IP protection beyond the influence of previous perceptions. The Arellano-Bond estimation in Column III utilizes an instrumental variables approach in which lagged levels of the explanatory variables are used to instrument the first difference of the estimation equation. We therefore conducted a Sargan test to confirm the validity of these instruments. According to the Sargan test, the null hypothesis that the instruments are jointly exogenous cannot be rejected; thus, we resolve that our instruments are valid. In all, the Arellano-Bond estimation technique in Column III provides perspective about the timing and importance of judicial independence and reliability of police on perceived IP protection; although there is hysteresis in perceptions about IP protection, changes in judicial

[6] It should be noted that country fixed effects are excluded from future estimations when the time dimension is exceedingly small relative to the cross-section of countries. Therefore, estimations for which IMD and PRI are substituted for the WEF as an independent variable, do not include country fixed effects. Inclusion of country fixed effects in these cases would substantially decrease the available degrees of freedom, thereby removing important variability between observations necessary to compute consistent coefficients (Yaffee 2003).

independence and police reliability have a statistically significant role in altering current perceptions from past perceptions.

Column IV of Table 3 examines whether the judicial independence and the reliability of police impact *statutory* IP protection in a country, as measured by the PRI. Judicial independence is found to be statistically insignificant in influencing a country's level of statutory protection. However, reliability of police is found to have a negative, albeit weak (at the 10 percent significance level), impact on a country's level of statutory protection. This suggests that, ceteris paribus, countries with more reliable police may actually have lower levels of statutory protection. One possible explanation might be that countries with more reliable police cannot inflate their statutory IP protection (in response to international pressures for stronger IPRs) beyond the level which they intend to enforce those laws.

A somewhat surprising result is that WTO membership has a statistically insignificant impact on statutory IP protection (Column IV of Table 3). This finding is similar to those found by Rose (2004) on trade, in general. Further exploration; however, reveals that the non-WTO member countries in the data set either gained membership at some point during the time period analyzed or were WTO observer governments during this time, indicating that they were expecting to apply for WTO accession within five years of being granted observer status. Therefore, it is reasonable to assume that even the non-WTO member countries were actively strengthening their IP laws to be WTO compliant. Also interesting is that active membership in the WTO has a positive and statistically significant impact on perceived IP protection (Column I). This serves as an indication that the dispute settlement mechanism in the WTO may have a positive impact on enforcement in member countries or that WTO members are not only implementing TRIPS, but also enforcing TRIPS compliant IP regulations.

Comparing the results of Columns I through III of Table 3 with Column IV indicate that, as hypothesized, there are acute differences between the level of perceived IP protection and the level of statutory protection. Column V builds on this notion and examines whether judicial independence and/or the reliability of police can explain the difference between the measures of perceived and statutory protection. Because the WEF index of perceived IPRs ranges from zero to seven and the PRI of statutory IPRs ranges from zero to five, each measure is standardized by computing the z-score. For each observation, the z-score for the PRI is subtracted from the z-score for WEF to compute the differenced variable, $\text{Difference}_{\text{WEF}}$, which serves as the dependent variable in Column V. The results in Column V suggest that economic growth has a relatively greater impact on increasing statutory levels of IP protection than it does on increasing levels of perceived protection. Column V also suggests that judicial independence and reliability of police each have a positive and strong (at the 1 percent significance level) impact on explaining incremental changes in the gap between perceived and statutory IP protection. These results indicate that improvements in judicial independence and the reliability of police will cause perceived IP protection to increase relatively more than statutory IP protection.[7]

[7] It should be noted again that the PRI, which is our measure of statutory IP protection, focuses on patent protection only, while the WEF measure of perceived IP protection captures a general perception of all IPRs inclusive of, but

B. Robustness Checks

A series of estimations were conducted to ensure the robustness of our results. First, to provide assurance that the results found utilizing the WEF as a proxy for perceived IP protection are not a statistical anomaly, the IMD measure is also considered as an alternative measure of perceived protection (see Table 4). Availability of IMD is constrained to 58 countries from 2003 to 2010 and leads to a much smaller sample compared to the WEF. Judicial independence and reliability of police, once again, have a statistically significant and positive impact on a country's level of perceived IP protection (see Column I). They also explain the difference between perceived and statutory measures of protection (see Column II). The results are strikingly similar to those in Columns I and V of Table 3, which utilized the WEF as the dependent variable.

To further exemplify the robustness of our results, we include additional measures of enforcement and institutional quality in our estimation equation. The three additional variables considered for robustness are: corruption, prevalence of organized crime, and imitation rates. The inclusion of these variables does not alter the significance of judicial independence and reliability of police in determining perceived levels of IP protection. Before discussing our results, we will briefly discuss in more detail the rationale behind including each of these additional explanatory variables.

Organized Crime (OC): In areas where organized crime operates, actors in the black market for counterfeit goods may be able to mount significant opposition to increased enforcement of IP protection, potentially retarding the effectiveness of newly implemented IP laws. Organized crime is measured by the survey question, "To what extent does organized crime (mafia-oriented racketeering, extortion) impose costs on businesses in your country? [1 = significant costs; 7 = no costs]" as reported by the WEF's Global Competitiveness Report.

Corruption (TI): Data on levels of corruption are provided by Transparency International as part of their annual Corruption Perception Index. This index collects data from 13 different sources with respect to corruption and includes surveys of both country experts and business leaders. Countries receive a score on a scale of 0-10 with 0 denoting highly corrupt countries and 10 denoting highly clean countries. High levels of corruption are expected to affect the implementation of laws, as institutions will lack professional administrators, and the enforcement of those laws, as individuals may be more apt to exchange personal monetary gain for enhanced IP protection.

Imitation Rate (IM): The Business Software Alliance's (BSA's) annual Global Software Piracy Study provides data on software piracy rates across 111 countries between the years 2003 and 2010. The BSA is a major trade group representing much of the world's software industry

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not excluded to, patent protection. Therefore, a comparison of the WEF to the PRI may be capturing differences in patents and a more general level of intellectual property protection. Unfortunately, the data that is currently available for perceived IP protection does not enable perceptions across different types of IP to be discerned.

and its hardware partners for a range of business and policy affairs. In their data, piracy rates vary from 100% (if all of the software that is in-use in a country for that year is counterfeit) to 0% (if all of the software in use is legitimate).[8] Although the BSA data are specific to software piracy, they may serve as a proxy for the overall piracy levels in a country. We include this variable specifically to test how well perceptions about IP protection (as measured by the WEF) respond to actual imitation rates in a country. Given the construction of these BSA data, imitation rates are expected to have a negative relationship with perceived IP protection. We believe that the limited scope of the BSA data to the software industry only, precludes it from being considered a good proxy for enforced levels of IP protection in multi-industry analyses. However, the BSA data on imitation rates in the software industry could serve well as a dependent variable for studies focusing specifically on the software industry.

When the additional institutional and enforcement measures are considered in conjunction with judicial independence and reliability of police (see Columns III through X of Table 4), judicial independence and reliability of police each remain a positive and statistically significant influence on a country's perceived level of IP protection. This is true for both the OLS estimation with lagged explanatory variables (Columns III, V, VII, and IX) and the Arellano-Bond estimation with current explanatory variables and a lagged dependent variable (Columns IV, VI, VIII, and X). It should also be noted that variance inflation factor tests indicate that the inclusion of these additional variables puts upward pressure on the variance of the coefficients, suggesting that multicolinearity may exist between the various institutional measures. However, the "negative side effect" of multicolinearity is that it causes the variances of the multicolinear variables to be artificially high, thereby leading to an incorrect conclusion that they have a statistically insignificant impact on the dependent variable. Given the strong statistical significance of judicial independence and reliability of police across Columns III through X of Table 4, there is little concern that inflated variances are altering our interpretation of the significance of these results. Lastly, employing the Arellano-Bond estimation with current regressors and a lagged dependent variable (compared to OLS with lagged regressors and no lagged dependent variable) appears to cause the significance of the "additional" explanatory variables – namely organized crime, corruption, and imitation rates – to change from being statistically significant (insignificant) to being statistically insignificant (significant). Nonetheless, the key independent variables—judicial independence and reliability of police—remain statistically significant throughout the various estimations, providing support for the robustness of our results.

VII. Conclusion

This paper analyzed the impact of judicial independence and the reliability of local police on the level of perceived intellectual property protection in a country, finding that countries with independent judiciaries and reliable police services have higher levels of perceived protection. Perceptions about domestic IP protection can be used to capture the interaction between IP laws and the enforcement of those laws. Therefore, these results provide insight into how institutional factors related to enforcement influence local business leaders' perceptions about how well their IP and the IP of others are protected domestically—a perception that ultimately impacts the behavior of, and the decisions made by, these business leaders.

[8] These data are captured as values between 0 and 1 representing 0 percent and 100 percent, respectively.

We also find evidence that judicial independence and reliability of police have a statistically significant impact on explaining the difference between measures of perceived IP protection and statutory IP protection. This is important as it underscores the fact that measures of perceived IP protection (specifically, the WEF and IMD), can yield different results than when measures of statutory IP protection (such as the PRI) are used. Therefore, it is important to carefully choose the measure of IP protection – perceived or statutory – most suitable to the specific research objective when conducting policy analyses. The PRI is well suited well for historical analyses (as it is available beginning in 1960), analyses specific to patent protection, and analyses that are focused on the effect of statutory changes; but, the PRI is not intended to capture whether the patent laws in a country are being enforced. Survey based measures of perceived IP protection, such as the WEF and IMD, alternatively attempt to capture the interaction of a nation's legal framework for a broad scope of IP and its enforcement of these laws as is reflected in the national opinion of domestic business leaders. Unfortunately, the WEF and IMD are limited in that they are publically available beginning only in 1999 and 2003, respectively, and they capture a broad perception of IPR protection, thereby limiting the ability to discern between specific types of IP protection.

In all, the marriage of TRIPS and WTO membership has arguably enhanced the gap between statutory IP protection and the true, enforced level of protection, making it increasingly important to understand the differences between measures of statutory and perceived IP protection. This paper provides one piece of the puzzle, by underscoring the importance of institutional factors related to enforcement in influencing domestic perceptions about IP protection and in explaining differences between perceived and statutory IP protection. Continued research on this topic will further expand an understanding of the complex relationship between IP laws, the enforcement of these laws, and the domestic perceptions of IP protection.

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Table 1: Descriptive Statistics

Variable	WEF	IMD	PRI	GDPpc	JI	RP
Units	Index range: 1-7	Index range: 1-10	Index range: 0-5	Constant 2000 USD	Index range: 1-7	Index range: 1-7
Observations	1256	429	151	1158	1103	1025
Mean	3.88	5.95	3.69	8,982	4.11	4.32
Std. Deviation	1.24	1.68	0.75	11,438	1.40	1.25
Min	1.50	1.22	1.78	107	1.20	1.71
Max	6.60	8.97	4.88	56,625	6.84	6.80

WEF = primary measure of perceived IP protection, IMD = secondary measure of perceived IP protection, PRI = statutory IP protection, GDPpc = per capita GDP, JI = judicial independence, RP = reliability of police

Table 2: Correlation Matrix

	WEF	IMD	PRI	GDPpc	WTO	JI	RP
WEF	1						
IMD	0.92	1					
PRI	0.66	0.56	1				
GDPpc	0.82	0.75	0.65	1			
WTO	0.24	0.26	0.18	0.20	1		
JI	0.86	0.88	0.50	0.72	0.21	1	
RP	0.82	0.83	0.45	0.73	0.12	0.80	1

WEF = primary measure of perceived IP protection, IMD = secondary measure of perceived IP protection, PRI = statutory IP protection, GDPpc = per capita GDP, JI = judicial independence, RP = reliability of police

Table 3: Regression Results

Dependent Variable:	WEF	WEF	WEF	PRI	$Difference_{WEF}$
	OLS	OLS	AB	OLS	OLS
Column:	I	II	III	IV	V
Lagged WEF			0.17**		
			(0.08)		
Per capita GDP[a]	0.24***	1.13***	-0.79***	0.43***	-0.04***
	(0.02)	(0.22)	(0.25)	(0.04)	(0.01)
WTO[a]	0.26**	0.09	0.00	-0.24	0.08**
	(0.09)	(0.10)	(0.08)	(0.15)	(0.04)
JI[a]	0.36***	0.15***	0.35***	0.03	0.05***
	(0.05)	(0.05)	(0.04)	(0.04)	(0.01)
RP[a]	0.30***	0.10***	0.13***	-0.09*	0.04***
	(0.05)	(0.03)	(0.04)	(0.05)	(0.01)
Constant	-0.79***	-6.07***	-5.22***	0.58**	-0.29***
	(0.19)	(1.38)	(1.96)	(0.25)	(0.06)
Year dummies	yes	yes	yes	yes	yes
Country dummies	no	yes	no	no	no
N	988	988	679	148	146

[a] This independent variable is lagged by one year for the OLS estimations in columns I, II, IV, and V. Additional Notes: Standard errors are clustered by country in the OLS estimation, and are robust using White's correction for Arellano-Bond (AB) estimation. *,**,*** denote statistical significance at the 10%, 5%, and 1% levels, respectively. Per capita GDP is in logs. Years 1999-2010 are utilized in Column I, II, and III. The years 2000 and 2005 are utilized in Columns IV and V. WEF = perceived IP protection, PRI = statutory IP protection, $Difference_{WEF}$= WEF-PRI where the WEF and PRI are normalized to their corresponding z-scores, JI = judicial independence, RP = reliability of police

Table 4: Regression Results

Dependent Variable:	IMD	DifferenceIMD	WEF	WEF	WEF	WEF	WEF	WEF	WEF	WEF
	OLS	OLS	OLS	AB	OLS	AB	OLS	AB	OLS	AB
	I	II	III	IV	V	VI	VII	VIII	IX	X
Lagged WEF				0.14*		0.16**		0.27***		0.21**
				(0.08)		(0.08)		(0.08)		(0.09)
Per capita GDP[a]	0.36***	-0.03*	0.22***	0.74***	0.11***	0.78***	0.10*	0.53**	0.02	0.47*
	(0.06)	(0.02)	(0.02)	(0.25)	(0.03)	(0.25)	(0.05)	(0.24)	(0.05)	(0.27)
WTO[a]	0.02	-0.03	0.22**	-0.01	0.16	0.01	0.22*	0.02	0.19	-0.00
	(0.27)	(0.03)	(0.10)	(0.08)	(0.10)	(0.07)	(0.12)	(0.08)	(0.13)	(0.08)
JI[a]	0.70***	0.06***	0.35***	0.30***	0.26***	0.35***	0.32***	0.39***	0.25***	0.35***
	(0.08)	(0.01)	(0.05)	(0.05)	(0.05)	(0.04)	(0.05)	(0.05)	(0.06)	(0.05)
RP[a]	0.29***	0.06***	0.32***	0.12***	0.24***	0.13***	0.28***	0.10**	0.23***	0.08**
	(0.10)	(0.02)	(0.05)	(0.04)	(0.05)	(0.04)	(0.05)	(0.04)	(0.05)	(0.04)
OC[a]			0.01	0.14***					0.00	0.16***
			(0.04)	(0.04)					(0.04)	(0.05)
TI[a]					0.18***	0.02			0.13***	-0.03
					(0.03)	0.04			(0.04)	(0.05)
IM[a]							-1.56***	-0.16	-1.32***	-0.01
							(0.39)	(0.68)	(0.42)	(0.69)
Year Dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
N	414	47	870	675	871	679	631	502	628	499

[a] This independent variable is lagged by one year for the OLS estimations above, but is not lagged for the Arellano-Bond (AB) estimations. Additional Notes: Standard errors are clustered by country in the OLS estimation, and are robust for the AB estimation. *,**,*** denote statistical significance at the 10%, 5%, and 1% levels, respectively. Per capita GDP is in logs. Years 2003-2010 are utilized in Column I. The year 2005 is utilized in Column II. Years 2003-2010 are utilized in columns III - X. WEF = perceived IP protection, PRI = statutory IP protection, Difference_{IMD}= IMD-PRI where the IMD and PRI are normalized to their corresponding z-scores, JI = judicial independence, RP = reliability of police, IM = imitation rates, OC = organized crime, TI = corruption.

Appendix A

Rapp and Rozek (1990) Index

0 – No patent protection laws
1 – Inadequate protection laws, no law prohibiting piracy
2 – Seriously flawed laws
3 – Flaws in law, some enforcement laws
4 – Generally good laws
5 – Protection and enforcement laws fully consistent with minimum standards proposed by the U.S. Chamber of Commerce

Appendix B

Ginarte and Park Patent Rights Index, as obtained from Park (2008)

Components and scoring method of PRI

(1) Coverage	Available	Not Available
Patentability of pharmaceuticals	1/8	0
Patentability of chemicals	1/8	0
Patentability of food	1/8	0
Patentability of surgical products	1/8	0
Patentability of microorganisms	1/8	0
Patentability of utility models	1/8	0
Patentability of software	1/8	0
Patentability of plant and animal varieties	1/8	0

(2) Membership in international treaties	Signatory	Not Signatory
Paris convention and revisions	1/5	0
Patent cooperation treaty	1/5	0
Protection of new varieties (UPOV)	1/5	0
Budapest treaty (microorganism deposits)	1/5	0
Trade-related intellectual property rights (TRIPS)	1/5	0

(3) Duration of protection	Full	Partial
	1	$0<f<1$

(4) Enforcement mechanisms	Available	Not available
Preliminary (pre-trial) injunctions	1/3	0
Contributory infringement	1/3	0
Burden of proof reversal	1/3	0

(5) Restriction on patent rights	Does not exist	Exists
Working requirements	1/3	0
Compulsory licensing	1/3	0
Revocation of patents	1/3	0

where *f* is the duration of protection as a *fraction* of 20 years from the date of application or 17 years from the date of grant (for grant-based patent systems). Overall score for patent rights index: sum of points under (1) – (5).

Appendix C

World Economic Forum Global Competitiveness Reports: 1999 – 2010

Intellectual Property Rights

1999 – 2000: "Intellectual property is well protected. (1 = strongly disagree; 7 = strongly agree)"

2001-2006: "Intellectual property protection in your country is (1 = weak or non-existent, 7 = equal to the world's most stringent)"

2007: "Intellectual property protection in your country (1= is weak and not enforced; 7= is strong and enforced)?"

2008: "Intellectual property protection and anti-counterfeiting measures in your country are (1=weak and not enforced; 7=strong and enforced)"

2009-2010: "How would you rate intellectual property protection, including anti-counterfeiting measures, in your country? (1 = very weak; 7 = very strong)"

Judicial Independence

1999-2001: "The judiciary is independent and not subject to interference by the government and/or parties in a dispute. (1 = strongly disagree; 7 = strongly agree)"

2002-2010: "Is the judiciary in your country independent from political influences of members of government, citizens, or firms? (1 = no - heavily influenced, 7 = yes - entirely independent)"

Reliability of Police

1999: "The police effectively safeguard personal security so that it is not an important consideration in business activity (1= strongly disagree, 7= strongly agree)?

2000: "Private business can rely on police for protection: (1 = strongly disagree, 7 = strongly agree)"

2001: There is no question on police in the 2001 report.

2002-2007: "Police services (1 = cannot be relied upon to protect business from criminals, 7 = can be relied upon to protect businesses from criminals)"

2008-2009: "Police services in your country (1 = cannot be relied upon to enforce law and order, 7 = can be relied upon to enforce law and order)"

2010: "To what extent can police services be relied upon to enforce law and order in your country? (1 = cannot be relied upon, 7 = can always be relied upon)

Appendix D

Importance of per capita GDP squared in estimation

This appendix provides additional insight into the decision to omit a squared per capita GDP variable from the benchmark estimation equations. The squared per capita GDP variable was the focus of Chen and Puttitanun (2005) and Briggs (2010), which explored a possible U-shaped relationship between statutory protection (as measured by the PRI) and economic development. Chen and Puttitanun suggest that countries below a certain threshold will first lower their IPRs as income increases so to take advantage of imitation led growth, while countries above that threshold will increase their IPRs as income increases in order to promote innovation. In Briggs' critique of Chen and Puttitanun, she noted that statutory protection in a country rarely, if ever, decreased over time, and ultimately concluded that the U-shape exhibited in the panel data was a consequence of cross-sectional influences rather than longitudinal variations in countries' decisions about IPRs.

Table 1A presents results for the effect of the control variables on perceived protection, with Column I and II excluding and including a per capita GDP squared term, respectively. Although Column I suggests that the level of perceived IP protection is monotonically increasing, Column II finds evidence that a U-shape relationship may exist. As pointed out by Briggs (2010), however, the U-shape captured by panel data does not indicate whether the relationship is due to cross-sectional or longitudinal variations. The survey based WEF measure captures relatively more noise around a given level of protection than does the PRI, making it difficult to rely on a numerical count of the number of instances the WEF decreased to provide information about the longitudinal trend of this index in a country. Therefore, additional tests were implemented to better discern if the U-shaped relationship in Table 3 is longitudinal.

Chen and Puttitanun (2005) suggest that countries below a certain threshold will lower their IPRs as income increases while countries above that threshold will increase their IPRs as income increases. In our data, this threshold occurs at a per capita GDP of \$415. [*]

We then divided the data into two groups: countries with per capita income above the threshold and countries with per capita GDP below the threshold. According to Chen and Puttitanun's theory, if the U-shaped relationship is a result of longitudinal changes, per capita GDP in the below threshold group should have a negative correlation with perceived IP protection (as countries are decreasing their IPRs in this range as they develop) and, inversely, per capita GDP in the above threshold group will have a positive correlation with perceived IP protection (as countries are increasing their IPRs in this range as they develop). The correlation between income and perceived IP is positive in both the below and above threshold groups,

[*] Taking the first order condition of the estimation equation in Column II with respect to per capita GDP, enables the critical level of per capita GDP to be determined. The critical level of ln(per capita GDP) = 6.029 translating to per capita GDP of approximately \$415.

although it is not statistically significant in the below group. (Specifically, lagged ln GDP per capita is correlated with the WEF index of perceived IP protection. Of the 1158 total observations in Table 3, 1040 of those fall above the threshold of ln(per capita GDP) = 6.029, while 118 fall below the threshold.) This latter result suggests that at low levels of per capita GDP incremental improvements in income do not substantially reduce the IP infrastructure costs and therefore do not lead to a statistical relationship between per capita GDP and IPRs, thereby negating the downward swinging portion of the U. In all, this analysis casts doubt on the claim that per capita GDP and perceived IP protection have a U-shaped relationship. Additional tests not presented were also conducted, but no support for a longitudinal U-shape relationship was found. Therefore, we conclude that it is appropriate to exclude the per capita GDP squared term from our estimation equations. This result complements the argument made by Briggs (2010) that the squared per capita GDP term is not always the appropriate specification.

Table 1A

Dependent Variable:	WEF	WEF
	I	II
GDP per capita	0.61***	-1.90***
	(0.04)	(0.33)|
GDP per capita squared		0.16***
		(0.02)
WTO	0.39**	0.33***
	(0.18)	(0.11)
Constant	-1.07***	8.75***
	(0.33)	(1.29)
Year dummies	Yes	Yes
R^2	0.65	0.74
N	1158	1158

Notes: Standard errors clustered by country are in parenthesis. *,**,*** denote statistical significance at the 10%, 5%, and 1% levels, respectively. Years 1999 - 2010 are analyzed in Columns I and II. Per capita GDP is in logs. All independent variables are lagged by one year.

Appendix E
List of countries in data set

Albania, Angola, Argentina, Armenia, Australia, Austria, Azerbaijan, Bahrain, Bangladesh, Belgium, Bolivia, Bosnia and Herzegovina, Botswana, Brazil, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Canada, Chad, Chile, Colombia, Costa Rica, Cote d'Ivoire, Croatia, Cyprus, Czech Republic, Denmark, Dominican Republic, East Timor, Ecuador, Egypt, El Salvador, Estonia, Ethiopia, Finland, France, Gambia, Georgia, Germany, Ghana, Greece, Guatemala, Guyana, Haiti, Honduras, Hong Kong, Hungary, Iceland, India, Indonesia, Ireland, Israel, Italy, Jamaica, Japan, Jordon, Kazakhstan, Kenya, Kuwait, Kyrgyzstan, Latvia, Lesotho, Libya, Lithuania, Luxembourg, Macedonia, Madagascar, Malawi, Malaysia, Mali, Malta, Mauritania, Mauritius, Mexico, Mongolia, Montenegro, Morocco, Mozambique, Namibia, Nepal, Netherlands, New Zealand, Nicaragua, Nigeria, Norway, Oman, Pakistan, Panama, Paraguay, Peru, Philippines, Poland, Portugal, Qatar, Republic of Moldova, Romania, Russia, Rwanda, Saudi Arabia, Senegal, Serbia, Singapore, Slovakia, Slovenia, South Africa, South Korea, Spain, Sri Lanka, Suriname, Sweden, Switzerland, Syria, Tajikistan, Tanzania, Thailand, Trinidad and Tobago, Tunisia, Turkey, Uganda, United Arab Emirates, United Kingdom, United States, Uruguay, Venezuela, Vietnam, Zambia, Zimbabwe

The Determinants of Congressional Franking: Evidence from the 110th Congress

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Abstract

Incumbent politicians tend to have an enormous advantage when running for reelection. One of these advantages is their privilege to mass mail constituents with campaign literature free of postage ("franking"). Despite being an advantage over non-incumbents, many politicians sparingly frank. We investigate the primary causes for franking among members of the US House of Representatives in 2007 (110th Congress) and test if franking is spatially dependent upon neighboring districts. We confirm previous research showing that politicians reduce franking expenditures when they become more secure in office but find no evidence of spatial dependence.

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I Introduction

From 1982 to 2004, 95% of incumbent members of the US House of Representatives retained their seat in office. One major proponent of incumbency advantage is attributed to their political right to mass mail the constituency with campaign literature, or franking (Ferejohn, 1977; Bickers and Stein, 1996). The franking privilege allows members of Congress to transmit mail to their constituency postage-free. The principal advantages of the frank for members of Congress is that it allows them to gain greater name recognition—which is particularly beneficial for those members in their first few terms—and more easily educate their constituents of their position on pressing policy issues.

Although franking appears to be a substantial advantage for incumbents, not all representatives take advantage of the franking privilege. Cover (1980) was one of the first to examine causes for franking among members of the US Congress. He conducted a telephone survey of Congressional representatives and concluded that seniority and victory margin in past elections were negatively correlated with use of constituent mass mailings. Mikesell (1987), using data on mass mailings by US Senators between 1970 and 1984, confirms these general influences. More recently, Edwards *et al.* (2009) also find that electoral margin and seniority play a significant role in a politician's propensity to frank.

In this article, we expand upon this previous literature by controlling for possible spatial dependence in the decision to frank. In the presence of spatial dependence, non-spatial estimates can be biased and/or inconsistent (Anselin 1988). Building on the previous empirical literature, we employ two different types of spatial econometric models in analyzing the determinants of franking among members of the US House of Representatives during the first quarter of 2007. Unlike recent estimates of congressional behavior (Lacombe and Shaughnessy, 2007), we find no evidence of spatial dependence in the decision to frank and confirm that member of the US Congress are less likely to frank when they are more secure in office.

II. Data

Data on Congressional franking are reported quarterly in the Statement of Disbursements for the House of Representatives (Chief Administrative Officer of the House, 2007). The data source only includes when an identical piece of unsolicited mail is sent to at least 500 constituents simultaneously. Thus, it excludes very specific or individualized franked mail. We measure franking as mass mailing expenditures during the 2007 calendar year. All other data employed herein are for the same sample period. Table 1 provides descriptive statistics for the data used in our analysis. After excluding all districts with a vacant seat at the time of collection or missing data, our set includes 368 observations.

In selecting explanatory variables for our analysis, we largely follow the work of Mikesell (1987), who looked at mass mailing expenditures per capita for US Senators. Mikesell argues that there exist regional differences in campaign financing, costs of running a campaign, availability of alternative media, etc. He controls for whether a politician is from a Western state as defined by the Census and finds that mass mailing expenditures are lower in the West. In addition to *WEST*, we employ several other constituent control variables to try to capture the

conditions under which franking might be more or less successful. Our data come primarily from O'Roark and Wood (2011). For example, educated constituents might be more likely to read franked mail, and thus members of Congress with a higher percentage of residents with a bachelor's degree (*BA*) might utilize the franking privilege more often. In addition, we control for the unemployment rate (*U*), the percentage of people from a district living in an urban environment (*URBAN*), and the area of the member's district (*AREA*). Finally, we include binary indicator variables indicating the Representative's gender (*GENDER*) and political affiliation (*PARTY*) to allow for variation in the use of franking across these attributes.

Our two important variables related to the incumbency of the member of the US House are *VOTE* and *SEN*. The previous literature points out that the margin that a Representative wins by plays a significant role in their propensity to frank mail since it indicates their security in winning election again. We control for victory margin with the percentage of total votes cast for the current House member in the previous election (*VOTE*). *SEN* measures the number of years that a representative has been in office. We expect that the coefficient on *SEN* will be negative for similar reasons as *VOTE*. However, as suggested by an anonymous referee, the relationship may be non-linear. That is, since the primary benefits of franking is improved name recognition and since name recognition naturally improves with seniority, the use of franking may drop off quickly during the first few terms in office and then more slowly in later terms. Likewise, the relationship between franking and *VOTE* may also demonstrate a similar non-linear relationship.

III. Econometric Approach

A new body of literature finds that controlling for spatial dependence among variables matters in empirical research (see, for example, Lacombe and Shaughnessy, 2007; Hall and Ross, 2010). Here we use this empirical literature to motivate our use of spatial econometric models to measure and possibly control for spatial dependence. Like the previous literature, however, we begin by estimating our empirical model using ordinary least squares (OLS):

$$y_i = \alpha + \sum_{j=1}^{k} \beta_j Z_{ij} + \varepsilon_i \qquad (1)$$

where y_i is our endogenous variable (FRANKING) for district i; α is an empirical constant determined from the regression; Z_i is j-dimensioned vector of exogenous variables (*WEST*, *LNPOP*, *VOTE*, etc.); and ε_i is the noise term.

OLS, however, can lead to biased and inefficient results in the presence of spatial dependence (Anselin 1988). Spatial dependence can show up in two different ways. First, it can show up in the dependent variable, as occurs in yardstick competition. Despite the fact that party leadership particularly encourages newly elected members to use the frank to gain name recognition, members of Congress may also take their cues from their Congressional neighbors. That is, given the highly competitive political environment, members of Congress are likely to follow closely the methods used by their Congressional neighbors to communicate with their constituents and will mimic those methods deemed successful. Thus, if a given Congressional member successfully employs franked mail, other neighboring members are also more likely to employ the frank, *ceteris paribus*. To account for the possibility of this type of spatial

dependence, we employ a Spatial Auto-Regressive (SAR) model, which can be thought of as being analogous to an AR model from time-series econometrics, however with lags over nearby jurisdictions instead of time.

We implement our SAR model by building a standardized weight matrix to determine contiguous neighbors. This matrix, *W*, is an *nxn* matrix, where *n* is the number of districts in our data set. Each column and row are labeled for each district and a one is placed in a cell A_{ij} if district *i* is adjacent to district *j*, if they are not adjacent the cell is zero. The main diagonal of this matrix is comprised of zeros since a district cannot be a neighbor to itself, that is $A_{ij} = 0$ if $i=j$. The weight matrix is standardized by normalizing it so that each row-sum adds to a unity, to denote this standardization we label the weight matrix as $\tilde{W}$. The *SAR* model is expressed in Equation 2.

$$y_i = \alpha + \rho\tilde{W}y + \sum_{j=1}^{k} \beta_j Z_{ij} + \varepsilon_i \qquad (2)$$

Here the notation is similar to the OLS model, with the exception of the $\rho\tilde{W}y$ term. As mentioned earlier, $\tilde{W}$ is the contiguous weight matrix, which is then multiplied by *y* to essentially create a weighted average of the vote totals of district *i's* contiguous neighbors. Here the term ρ measures spatial dependence in the dependent variable, so if ρ is statistically different from zero, we infer that the model is spatially dependent.

Using just the finding that ρ is *not* statistically different from zero as evidence of a lack of spatial dependence is problematic since the SAR model assumes that the variance-covariance matrix of the error term exhibits no spatial dependence. This is often not the case with cross-sectional data, however, as omitted variables often follow a spatial pattern. Thus, it is possible for ρ to be biased in the presence of spatially dependent omitted variable bias. This concern can be addressed, however, with the Spatial Durbin Model (SDM), which deals with possible spatial dependence in the error term by including the spatial lags of all explanatory variables in the model. The SDM model can be written as

$$y = \alpha + \rho\tilde{W}y + X\beta + \tilde{W}X\gamma + \varepsilon_i \qquad (3)$$

In Equation 3, we simplify the summation of the control variable vector from Z_{ij} to *X*, and it retains the empirically estimated coefficients β. The major difference between the SDM and the *SAR* model is the inclusion of an additional term: the product of the standardized weight matrix, the vector of control variables, and the empirically estimated coefficients γ. A finding that ρ is statistically different from zero in the SDM model is futher evidence that there is spatial dependence and thus OLS estimates are biased. A finding that ρ is not statistically different from zero in the SDM is strong evidence that there is no spatial dependence in Congressional franking behaviour and thus OLS estimates are appropriate and that OLS is the proper method of estimation.

IV. Empirical Results

Our regression results are presented in Table 2. When interpreting the estimates from SAR and SDM models, it is important to recognize that the coefficients are not directly interpretable. This is because the partial derivative with respect to a given variable is not the coefficient alone due to the presence of the spatial lag. As such, the direct and indirect effects must be computed (both of which are suppressed from Table 2 for space concerns) which can then be summed to produce the total effects. The total effects can be interpreted in the same manner as the OLS coefficients. We first turn our attention to the question of spatial dependence. What becomes readily apparent is that ρ is not statistically different from zero in either the SAR or DRM models. We thus conclude with some certainty that franking is not spatially dependent and thus neighboring representatives franking habits do not induce other members to frank. This is important because it allows us to confirm that the results of the previous literature are not biased because of a failure to control for spatial dependence.

Given our inability to statistically reject the null of no spatial dependence in the use of the frank, we discuss only the OLS estimates below, although all three models produce qualitatively similar estimates. We find that *WEST* is statistically insignificant in explaining franking behavior. While Mikesell (1987) fins this variable to be important in his analysis of US Senate franking behaviour, Edwards et. al. (2009) omitted the variable in their model for US Representatives. Thus, perhaps the difference between the US Senate and House is the reason for the difference in our findings.

Only two of the control variables are found to be statistically important in the model, with the coefficients on each of *BA*, *GENDER*, *PARTY*, and *AREA* found to be statistically insignificant from zero. While *GENDER* is statistically insignificant due to a large standard error, it may be economically important given the size of the coefficient; male Representatives are estimated to spend over $6,000 more on franking than are female Representatives. *URBAN* is significant at one percent level; a one percentage point increase in *URBAN* is associated with just over a $1,000 increase in franking expenditures. As such, it appears that House members serving in more urbanized districts may be under more pressure to use various modes of communicating with their constituents. For every one percentage point increase in the district unemployment rate (*U*), franking expenditures decline by roughly $16,000, a result that is statistically significant at the five percent level.

We now turn our discussion to our two primary explanatory variables of interest, *VOTE* and *SEN*. Both variables are highly statistically and economically significant and exhibit the expected diminishing returns relationship with franking. For instance, franking expenditures decline by over $4,500 for the second marginal year of service; however, expenditures decline by only approximately $2,700 for the tenth marginal year of tenure (mean *SEN* is ten years). These findings support the idea that the additional name recognition and reputation that naturally comes with greater tenure relatively quickly reduces the benefits of the frank. The inverse relationship between *VOTE* and *FRANKING* is similarly non-linear. Beyond 86 percent, franking expenditures are estimated to rise. For instance, the marginal impact of the 52nd percentage point of votes is to reduce franking expenditures by just over $6,000 while the 81st marginal percentage point of votes (mean *VOTE* is 81.5) gained results in only a $1,000 reduction in

expenditures. Thus, we can once again conclude that the benefits of franking—namely name recognition – are much greater when the previous election was more hotly contested.

V. Concluding Remarks

We find no evidence that there exists any spatial dependence in the decision of a member of the US House of Representatives to engage in franking behavior. This confirms that the results of the previous literature did not suffer from spatially-omitted variable bias. In addition, our results confirm that politicians reduce franking expenditures when they become more secure in office, either because of seniority or because their district was not competitive in the last election, although this relationship is non-linear and suggests diminishing returns to franking expenditures as seniority and winning margin increase. This also suggests that when representatives are not secure in their prospects for reelection they will be more likely to use franking to give them an electoral advantage.

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Table 1. Descriptive Statistics

Variable	Mean	Standard Deviation	Minimum	Maximum
FRANKING (x1,000)	115.783	105.703	0.000	632.475
WEST	0.220		0.000	1.000
VOTE (%)	68.356	13.145	50.010	100.000
SEN	9.978	8.809	0.000	52.000
U (%)	0.029	0.009	0.013	0.068
URBAN (%)	0.795	0.199	0.213	1.000
BA (%)	0.100	0.039	0.024	0.241
GENDER (Male = 1)	0.840		0.000	1.000
PARTY (Republican = 1)	0.416		0.000	1.000
AREA (x10,000 miles^2)	2.025	8.414	0.003	148.135

Table 2. Regression Results

	Ordinary Least Squares	Spatial Autoregressive Model		Spatial Durbin Model	
Variable	Coefficient	Coefficient	Total Effect	Coefficient	Total Effect
CONSTANT	725.917***	715.095***		277.537	
	(4.752)	(4.712)		(0.702)	
WEST	-1.839	-2.358	-2.213	-3.885	-16.698
	(0.139)	(0.181)	(0.158)	(0.074)	(0.907)
VOTE	-15.260***	-15.202***	-16.082***	-13.559***	-1.886
	(3.759)	(3.814)	(3.632)	(3.309)	(0.161)
$VOTE^2$	0.089***	0.088***	0.093***	0.078***	-0.007
	(3.373)	(3.404)	(3.269)	(2.923)	(0.086)
SEN	-4.903***	-4.924***	-5.252***	-5.154***	-3.700
	(2.909)	(3.183)	(3.037)	(3.306)	(0.897)
SEN^2	0.116**	0.117***	0.124**	0.118***	0.029
	(2.398)	(2.637)	(2.529)	(2.647)	(0.255)
U	-16.194**	-15.667*	-16.636**	-18.477**	-11.525
	2.438)	(1.940)	(1.982)	(2.106)	(0.799)
URBAN	1.045***	1.046***	1.114***	1.026***	1.363*
	(3.279)	(3.142)	(3.040)	(2.967)	(1.733)
BA	0.148	0.268	0.338	0.220	-2.470
	(0.091)	(0.147)	(0.169)	(0.114)	(0.584)
GENDER	-6.328	-6.035	-7.600	-6.654	-30.021
(Male = 1)	(0.487)	(0.434)	(0.504)	(0.470)	(0.867)
PARTY	0.090	0.106	1.130	-4.385	-17.169
(Republican = 1)	(0.008)	(0.009)	(0.094)	(0.358)	(0.685)
AREA	-0.437	-0.414	-0.457	-0.370	-0.830
	(1.443)	(0.665)	(0.671)	(0.584)	(0.228)
W * WEST				-11.879	
				(0.215)	
W * VOTE				11.758	
				(1.224)	

Table 2 (continued). Regression Results

W * VOTE^2			-0.084
			(1.336)
W * SEN			1.537
			(0.428)
W * SEN^2			-0.086
			(0.851)
W * U			7.801
			(0.552)
W * URBAN			0.251
			(0.342)
W * BA			-2.361
			(0.640)
W * GENDER			-21.616
			(0.710)
W * PARTY			-11.721
			(0.499)
W * AREA			-0.379
			(0.112)
Spatial Lag Term (ρ)		0.054	0.056
		(0.667)	(0.644)
Observations	368	368	368
R^2	0.224	0.223	0.238

Least squares estimates are corrected for heteroskedasticity using White's matrix. Absolute t-statistics appear in parentheses below coefficient values. Statistical significance of 1%, 5%, and 10% are denoted by ***, **, and *, respectively.

An Empirical Investigation Into The Local Decision to Ban Smoking

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Abstract

Little has been done toward understanding the political economy of local smoking bans. This study uses variation in the timing and location of county and sub-county smoking bans to estimate the relationships between the presence of these policies and several local community characteristics. The motivation behind this effort is to establish a foundation for estimating the economic impact of local smoking bans. The probability of bar, restaurant, and workplace smoking bans are examined separately. The results suggest that partisanship, education, population, and population density all inform the probability of a local smoking ban. These relationships are robust to the inclusion of county-specific effects, a time trend, and both year and state indicators.

Acknowlegment: I would like to thank the Department of Economics at the University of Kentucky for various contributions. I owe a particular debt of gratitude to the members of my dissertation committee -- Christopher Bollinger, Glenn Blomquist, William Hoyt and James Marton -- for their guidance and advice. I would also like to thank Aaron Yelowitz for his invaluable contributions to this work."

I. Introduction

While there are a few well-published papers that examine the political economy of state smoking bans, there exists very little insight into the causes of local smoking bans. The absence of work in this area persists despite calls for examination of the local-policy choice and evidence that state smoking bans differ from local smoking bans in their causes and effects. Also, there is a great deal of variation in the location and timing of local smoking bans. This variation provides an opportunity to understand the underlying causes of this type of regulation.

Among the potential factors driving the probability of local smoking bans, employment in the affected industry and market thickness are of particular interest. A key issue in this paper is the potential for smoking bans to be driven by employment levels in the affected industry. If, for example, counties with more restaurant employees are more likely to pass restaurant smoking bans, then estimating the impact of these smoking bans on industry employment while ignoring this fact will lead to biased estimates. Also, in thicker or more densely populated markets, where consumers have more options, firms have more to gain through differentiation. A business's smoking policy represents one spectrum over which firms can offer product differentiation. This motivation could promote profitable market solutions to the environmental tobacco smoke (ETS) issue that are not feasible in thin markets. It is anticipated that smoking bans will be less likely in thick markets.

Increases in restaurant revenues, or a correlate, have been reported as increasing the probability of local restaurant smoking bans (Fleck and Hanssen, 2008). They suggest that increases in restaurant revenues in California communities often preceded the decision to ban smoking and that ignoring this fact leads to biased estimates of economic impact. This finding brings into question the validity of the majority of estimates of the economic impact of smoking bans.[1] This point is highlighted in their paper by pointing out that Bartosch and Pope (2002), considered to be the most sophisticated of previous efforts, did not take into account the potential self-selection of local communities.

The results reported here suggest that industry employment reduces the probability of both restaurant and workplace smoking bans. Also, in the case of restaurant smoking bans, the industry share of total county employment increased the probability. However, none of the employment-related results were robust to the inclusion of state indicators. Smoking bans of each type were less likely within more densely populated counties. At the same time, more populated counties were more likely to pass each type of smoking ban.

II. Literature

Comprehensive smoking bans have become the leading policy measure utilized to reduce ETS in restaurants, bars, and workplaces. The scope of the coverage of these policies demands continued inquiry into their potential economic impact. While there are numerous estimates of the economic impact of smoking bans, few take into consideration the importance of self-selection. Also, Fleck and Hanssen (2008) suggest that "…more research into the causes and effects of smoking bans is necessary to identify their true effects".

[1]For a review of the literature see Scollo and Lal (2008).

While there is a developing literature aimed at understanding the underlying process behind the decision to ban smoking at the state level, very little has been done to examine the political economy of local smoking bans. This study fills that gap by obtaining estimates of the relationships between several local characteristics and the decision to ban smoking at the county and sub-county levels in bars, restaurants, and workplaces.

Fleck and Hanssen (2008) also suggest that it is inappropriate to view state and local smoking bans as being driven by the same factors or as having the same effect. The decision to ban smoking at the local level differs significantly from that of the state decision. One source of this difference is the relative geographic scope of the bans. The ability of consumers to substitute geographically is much more of a concern for a local community than it is for the state. Also, from the local perspective, state-determined cigarette taxes are taken as given. Finally, the state tobacco tax environment contributes to the probability differently since the revenue motive, present at the state level, is either absent or severely diluted at the local level.

This paper extends the work of Del Rossi, Hersch, and Viscusi (2004) and Gallet, Hoover, and Lee (2006). Both papers examine smoking ban demand functions at the state level. Del Rossi, Hersch, and Viscusi *(2*004) use voter preferences and state characteristics to construct a model for the likelihood of the presence of a number of different state smoking regulations. They show that the probability of the presence of a statewide smoking regulation is related to both expected and stated voter preferences. While other state characteristics generally resulted in statistically insignificant estimates, their data suggest that the general population is more in favor of restaurant smoking bans than bar smoking bans.[2]

Gallet, Hoover, and Lee (2006) use state characteristics to estimate demand functions for several types of state smoking restrictions. They report the significance of several state characteristics including cigarette consumption, cigarette taxes, conservative leadership, metropolitan population, per capita income, and tobacco production. They also provide evidence that, at the state level, cigarette consumption and cigarette taxes are endogenous in their determination of the state decision to pass certain types of smoking bans. Of the two endogenous factors, only state cigarette taxes were available for use in the present study. Since local communities do not make decisions related to state cigarette excise taxes, the variable is treated as exogenous in this paper.

A related literature investigates the political economy of environmental policies.[3] While it may not be entirely appropriate to characterize smoking bans as environmental policy, concern for public health is a key factor motivating both improved outdoor and indoor air quality. The primary National Ambient Air Quality Standards are based on protecting human health (Portney and Stavins, 2000). Several of the community characteristics evaluated in this literature are aimed at capturing the importance of public health in the community of interest. These factors include per-capita income, political party affiliation, severity (including measures of population

[2] Interestingly, Hersch (2005) finds that smokers that are trying to quit are more likely than non-quitting smokers to be in favor of smoking bans. Additionally, smokers trying to quit for the second time are more likely to vote for a ban than first time quitters.

[3] For a detailed literature review see Becker, R. (2004).

and population density) and educational attainment. Other factors that are commonly used to model these policy decisions relate to the relative ability of the population to take political action and include employment in the affected sector and inter-governmental relations.

Several studies report per-capita income to be an important determinant of environmental policy (Stanton and Whitehead (1994); Elliott, Seldon, and Regens (1997); Kahn and Matsusaka (1997); Khan (1999); Helland (1998a and 1998b) and Becker (2004)). These studies, excluding Helland (1998a and 1998b), also find political partisanship to be a driving factor. Additionally, several authors find that employment levels in the affected sectors, used to capture special interest group influence, decreases environmental stringency (Becker, R. (2004); Kahn and Matsusaka (1997); Khan (1999); Helland (1998a and 1998b); and Gray and Deily (1996)). Population density measures, used to capture pollution severity are also found to contribute to local environmental policy by Becker, R. (2004), Elliott et al. (1997) and Khan (1999). Finally, intergovernmental relations are also shown to be important determinants of environmental expenditures by Stanton and Whitehead (1994).

III. Data

My data consist of three annual unbalanced panels containing between 1,887 and 2,143 counties, depending on the type of smoking ban, over the years 1998-2006. The data were gathered and assembled using several sources. In some cases, variables had to be trended over time due to a lack of availability on an annual basis. For a list of variables and data sources see Table 1.

Industry-specific county averages are detailed in Table 2. Counties in states without local clean air jurisdiction are excluded from the sample.[4] The averages are reported in three categories representing the three types of smoking bans under consideration. The North American Industry Classification System (NAICS) is used for employment figures. Restaurant industry employment is from the "full-service restaurants" category (NAICS code 722110), and the bar industry employment figures are from the "drinking places" category (NAICS code 722410). In the case of the workplace sector, total county employment is used due to the lack of disaggregated data.

Each category in Table 2 has two columns of sample statistics. In each case, the column on the right is based on fewer observations because of the limited availability of industry-level employment data. The inclusion of employment data restricts the sample size in that employment is not reported in situations where doing so may create anonymity concerns. The sample averages reported on the right are representative of a sample of larger counties where anonymity is no longer threatened by reporting industry employment levels. This is especially true for the bar industry where anonymity is more threatened as a result of there being fewer establishments per county. In the bar industry the average median incomes are $38,575 and $44,707 (where employment data are available) respectively and those for population are 68,999 and 182,774 (where employment data are available).

[4] Because the optimal local decision is unobservable in the event of state jurisdiction, the variable for local bans is recoded to missing in the event of a state smoking ban or the state preemption of local smoking bans.

The dependent variable indicates the presence of a county or sub-county smoking ban that meets the Americans for Nonsmokers' Rights Foundation (ANRF) definition of a 100 percent smoking ban (smoking ban).[5] Strict smoking bans are a national phenomenon. Information pertaining to the location, timing and nature of state and local smoking bans was provided by the ANRF.[6] ANRF maintains a list of state, county, and local 100 percent smoking bans.[7] They strive to publish the universe of existing 100 percent bar, restaurant, and workplace smoking bans.

To improve the accuracy of the dependent variable the publically available data were augmented with location and timing detail (ANRF, 2005) for legislation that once qualified as 100 percent smoking bans but due to repeal or statute revision are no longer on the published list.[8] The addition of this detail is important because without it a county that had once passed and later repealed a smoking ban would otherwise look as though it had never passed a smoking ban. The added detail can only serve to improve the accuracy of the results.

To obtain accurate estimates, counties that are subject to a state smoking ban in the industry of concern are dropped from the sample as are counties that do not have the jurisdiction to pass a smoking ban due to state preemption. ANRF has published a document (ANRF, 2007) containing timing details related to the state-level preemption of local smoking ban authority. This detail allows the identification of counties that have the authority to make policy decisions. State preemption of local control is often difficult to determine as indicated by several contradicting court decisions. Likewise, it is often difficult to determine which sectors are covered under the preemptive clause. While determining which sectors were covered, "public places" was interpreted as meaning both bars and restaurants unless otherwise specified. Also, preemption was deemed to be binding even in the face of contrary court decisions if the matter had not been completely decided.

IV. Empirical Specification

A random effects pooled probit is used as in Gallet, Hoover, and Lee (2006).[9] This method of estimation was chosen because it prevents county-level heterogeneity from biasing the

[5] 100% smoking bans do not allow smoking in attached bars or separately ventilated rooms and do not have size exemptions.

[6] ANRF should not be confused with Americans for Nonsmokers' Rights (ANR). While ANR actively lobbies for nonsmoking policy intiatives, ANRF does not. ANRF describes itself on its website in the following way: "Our mission is to promote nonsmoking as the national norm through prevention education programs, information dissemination, technical assistance, and training."

[7] A referee pointed out that there may be bias as a result of using data generated by a non-smoking advocacy group. In this case the goal of the group is to demonstrate that smoking bans are commonplace. Also, ANRF would not want to report a false positive because it may reduce interest in the pursuit of smoke free air. It may also be that ANRF is the only entity that has the motivation to undertake this formidable data collection effort.

[8] Although several studies have used ANRF data, to my knowledge, this paper is the first to take advantage of this detail. Examples of studies that have used ANRF data include Bartosch and Pope (2002), Fleck and Hanssen (2008), Adams and Cotti (2007), Alamar and Glantz (2004). There are more than thirty cases where repeal or a weakening of the legislation changed the policy environment.

[9] Their paper also takes advantage of an instrumental variables specification to prevent endogenous regressors from biasing the results. These regressors, cigarette consumption and cigarette taxes, do not present the same issue in the model utilized here. Consumption is only sparsely available at the local level and is not utilized as an explanatory

estimates of the coefficients while modeling a dichotomous dependent variable.[10] Also, specifications that utilize county-level fixed effects would result in the incidental parameters issue. To take advantage of the available variation in both the timing and location of these decisions an assumption regarding the correlation between the unobserved county specific effects and the regressors was required. For the purpose of the reported estimates the assumption that the county specific effects are uncorrelated with the regressors was chosen over the issues related to the incidental parameters problem. Also, many of the regressors vary more between counties than over time. The choice of specification is also supported by precedent in the literature.

This specification allows the use of time-invariant factors which are an important aspect of the model. A random effects probit allows for unobservable county specific effects to be estimated and controlled for in the following way:

$$Y_{it} = \Phi(\beta x_{it} + \varepsilon_{it}), \tag{1}$$

$$\varepsilon_{it} = (v_{it} + u_i), \tag{2}$$

By smoking ban type, Y_{it} indicates the presence of a comprehensive smoking ban in county *i* and year *t*, x_{it} contains the independent variables, ε_{it} represents the error term which can be broken down into v_{it} and u_i which represents unobserved county-level heterogeneity.

To obtain consistent estimates of the partial effects of the independent variables on the probability of a local smoking ban, a few assumptions must be made (Wooldridge, 2002). First, it is assumed that x_{it} is exogenous after conditioning for u_i which appears additively within the normal cumulative density function. This precludes the use of leading or lagging values of the dependent variable within x_i. This assumption is detailed in the first equality in the equation below:

$$p(Y_{it} = 1 | x_i, u_i) = p(Y_{it} = 1 | x_{it}, u_i) = \Phi(x_{it}\beta + u_i), \tag{3}$$

Here x_i contains x_{it} for all *t*. The second equality illustrates that outcomes must be independent conditional on x_{it} and u_i. Finally, there is a distributional assumption related to the random effects: namely that u_i given x_i is assumed to be distributed normally, mean zero with variance, σ_u^2.

The dependent variable is an indicator for the presence of a local 100 percent smoking ban. In some cases, states prevent the local determination of clean air policy. States may establish clean air jurisdiction by passing a state wide smoking ban or through preemptive legislation. Working from the premise that the local policy choice is unobservable in either case,

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variable. Also, cigarette taxes, while simultaneously determined along with state smoking bans, are not determined at the local level and are treated as exogenous.

[10] Log likelihood tests provided statistical evidence of the importance of county-level-unobservable effect in each of the reported specifications.

these observations are excluded from the sample.[11] The explanatory variables include state cigarette taxes and a set of county-level community characteristics. For a list of variables and their expectations see Table 1

While there is no theoretical expectation related to the size of the affected industry and the probability of a local smoking ban, it is anticipated that the sign of the coefficient will line up with the industry's opinion of the legislation. To the extent that the size of the industry is associated with its ability to influence political outcomes, it is anticipated that the coefficient on employment will reveal any ex-ante industry smoking ban sentiment. The industry share of local employment is also included as an alternative measure of industry influence.

Population density (population per acre) is included because as areas become more densely populated both the bar and restaurant markets will thicken, offering consumers more variety in each sector. One way that this variety could become apparent is in the offering of both a smoking and nonsmoking bar or restaurant of a specific type. For example, while a small town may not be able to support both a smoke free and smoking Chinese restaurant, a more densely populated city could. Population density is anticipated to reduce the probability of a local smoking ban, because densely populated counties are better suited for private market solutions to the ETS issue.

The natural logarithm of population is used to capture the severity of the health risk associated with air pollution. Unlike typical air pollution, ETS holds risks only for those that enter the businesses of concern, thus population becomes a less accurate indication of the degree of the health risk. Still, this widely available measure may be used to prioritize the advocacy efforts of interest groups on each side of the issue. I anticipate that local population will be positively correlated to the probability of a smoking ban due to the relative size of the ETS related benefits as compared to the cost of enacting the policy.

Since health is a normal good, it is anticipated that concern related to ETS will be higher in more educated and wealthier counties. This concern should result in both income and education levels being positively related to the probability of a smoking ban. This line of reasoning certainly supports the body of evidence demonstrating that per-capita income drives environmental policy. Also, past evidence suggests that community partisanship informs environmental policy. It has been demonstrated that more liberal communities produce policy that deals more aggressively with public health concerns. Because smoking bans represent a solution to the ETS issue, it is anticipated that the Democratic share of local presidential votes will be directly related to the probability of a local smoking ban.

Since state tobacco excise taxes are determined at the state level, they are more descriptive of the state than they are of local communities. Also, a state's optimal tax will take into consideration revenue concerns as well as concerns related to public health and resulting expenditures. To the extent that state tax rates reflect a bottom up sentiment related to tobacco

[11] The differences between local-jurisdiction and state-jurisdiction states may contribute to the local policy decision. While the topic of endogenous local jurisdiction determination is worthy of attention, it is beyond the scope of this paper.

consumption, it is anticipated that state-cigarette taxes will be positively related to the presence of a local smoking ban.

V. Results

Table 3 contains the results for the bar industry. Results are reported for three specifications based on the inclusion of year and state indicators. More populated counties are estimated as having an increased probability of passing a bar smoking ban, and the estimates of the effect of population density support the market thickness hypothesis. The sign and significance of the coefficients on partisanship are in agreement with past findings in both the environmental policy and smoking ban literature. Additionally, college completion rates yielded coefficients that agree with theory in sign and significance. These results consist of standard probit coefficients (top), standard errors (in parentheses) and mean evaluated marginal effects (bottom).

While the signs of the estimates of the impact of median household income are not consistently positive, as theory would predict, the estimated coefficients are not statistically different from zero in the specification including state indicators. It may be that education is more important than income in the determination of local smoking bans. It is also interesting that state level cigarette excise taxes do not appear to play a role in the local policy decision. This may be the result of the absence of a revenue incentive.

Estimates of the coefficients on industry employment and the share of industry employment did not yield any significant results for the bar industry. It is important to keep in mind that the inclusion of employment, particularly in the case of the bar industry, comes at the expense of lost observations. This tradeoff can be seen clearly by examining the difference in sample size between the first and second columns in Table 2. The conclusion that can be made here is that, according to these specifications, bar employment does not appear to be a factor in the decision to pass a local bar smoking ban in the subset of the data for which industry-within-county employment data are available.

The results from the full sample estimation of the probability of a restaurant smoking ban, Table 4, are very similar to those in Table 3. The signs of the coefficients on partisanship, college completion, population, and population density again line up with theory in each specification. Again, each estimate is statistically significant.

Table 5 contains the results for the restaurant industry when industry-within-county employment and the industry share of total county employment are added to the specification. Unlike the results for the bar industry, employment and the share of industry employment are significant in the specifications without state indicators. According to these specifications, an increase in restaurant employment is associated with a decrease in the probability of a local smoking ban and an increase in the restaurant share of total county employment is associated with an increase in the probability of a smoking ban. Neither the signs nor significance of these results are common to those of the specification with state indicators.

The full sample estimates for the probability of a local workplace smoking ban are reported in Table 6. Apart from the significance of the racial control, these results are very similar to those from both the restaurant and bar industries. These results, though consistent with other estimates, provide new insight into the interpretation of the coefficient on population density. If the market thickness hypothesis holds, it seems clear that differentiation would play less of a role in workplaces than it does in restaurants and bars. Yet while the probit coefficients are smaller in the workplace specification, the estimates of the marginal effects are not. This could be driven by the fact that this type of smoking ban is more common in the data than the other types.

Table 7 contains the estimates from the workplace specifications augmented to include total county employment. Again, the results are very similar to those in Table 5. Total county employment is estimated to have been inversely related to the probability of a workplace smoking ban and is again only statistically significant in the first two specifications.

Table 8 displays the above results, from the specification that includes state indicators, for all three industries. In each case, the results from the full sample are reported because; once state indicators are included, none of the employment measures were statistically significant. The results are very similar across smoking ban types. When the results are taken as a whole, it appears as though partisanship, college completion, population, and population density are strong determinants of local smoking bans.

VI. Conclusion

Past literature has suggested that understanding the underlying causes of smoking bans is necessary before their economic impacts can be properly estimated. Also, it has been suggested that it is improper to think of the local decision to ban smoking as a simple disaggregation of the state decision. Beyond improving the understanding of the local decision to ban smoking, these estimates could be used by advocates on both sides of the issue to prioritize advocacy efforts and expenditures.

This paper improves the understanding of the local decision to ban smoking by providing estimates of the effects of determinants of local policy including: partisanship, education, population, and population density. These relationships are robust to the inclusion of county specific effects, a time trend, and, separately, year and state indicators.

The results support the hypothesis regarding population density. The estimates demonstrate that smoking bans are less likely in densely populated counties. This reduced probability may be evidence of voluntary market solutions to the ETS issue. If voluntary smoke-free alternatives are present in thick markets, then non-smoking consumers would receive less benefit from a smoking ban. Also, in markets with sufficient voluntary smoke-free alternatives a smoking ban would reduce industry profitability as a consequence of a reduced ability to differentiate through smoking policies. This reduction in both consumer and firm benefit in thick markets may explain the reduced probability of a smoking ban in these markets.

My estimates provide some evidence that industry employment, in the case of restaurant smoking bans, decreases the probability of local policy. A similar relationship was demonstrated between total county employment and the probability of a workplace smoking ban. None of these estimates were robust to the inclusion of state indicators. If employment levels have an effect on the probability of smoking bans, then nearly all existing estimates of the impact of smoking bans on industry employment are biased due to reverse causality.

County characteristics have been shown here to be related in expected ways to the local decision to ban smoking. Some of these characteristics are also used as explanatory variables in estimates of the economic impact of smoking bans. The results reported here begin the process of understanding the factors that lead to local smoking bans and will serve to inform the process of improving estimates of the economic impact of local smoking bans.

Del Rossi, Hersch, and Viscusi *(*2004) provide evidence that the probability of a state smoking ban is driven by both stated and expected voter preference. This article provides some insight into the underlying characteristics that drive policy at the local level. My results provide strong evidence of the relevance of county characteristics in the determination of local clean air policy and perhaps the political economy of other public health related policies. These results generally agree with past findings in the environmental policy literature, apart from the role of median household income.

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Table 1: Data Sources and Expectations

Data (1998-2006)	Expectation	Source
Annual County and Industry Comprehensive Smoking Ban Information		Americans for Nonsmokers' Rights
State Level Cigarette Excise Tax Values[AB]	?	Counsel of State Governments & The Tax Foundation
County Level Democrat Share of Majority Party Presidential Votes[A]	+	Polidata 1992-2006 & USA Today 2008
County-Level Measures of Median Household Income[B]	+	U.S. Census Bureau, Small Area Estimates Branch
Racial Composition	?	U.S. Census Bureau, Population Estimates Branch
1990 and 2000 County College Completion[A]	+	U.S. Census Bureau, Summary File Three
Annual County Population	+	U.S. Census Bureau, Population Estimates Branch
Annual County Population Density	-	U.S. Census Bureau
Annual Industry-Level County Employment Information	?	U.S. Census Bureau, County Business Patterns

Notes: Total county employment serves as a proxy for workplace employment. Caucasian share does not include Caucasians of Hispanic origin. College completions rates are determined by receipt of a bachelor's degree. [A]Trended, when necessary, to provide annual "variation". [B]Adjusted to year 2005 dollars using the BEA's chained adjustment for GDP.

Table 2: Simple County Averages

	Bars		Restaurants		Workplaces	
Comprehensive Local Smoking Bans	0.0148	0.0355	0.0237	0.0300	0.0433	0.0435
Cigarette Tax	0.4365	0.5399	0.4259	0.4515	0.4788	0.4784
Share Democrat	0.3934	0.4360	0.3946	0.4027	0.3995	0.4002
Median Household Income (Natural Logarithm)	10.5316	10.6806	10.5312	10.5829	10.5422	10.5424
Share Caucasian	0.8421	0.8552	0.8404	0.8532	0.8424	0.8422
College Completion Rate	0.1661	0.2151	0.1654	0.1777	0.1680	0.1679
Population (Natural Logarithm)	10.0299	11.1715	10.0450	10.4327	10.1230	10.1394
Population Density	0.2775	0.7883	0.2795	0.3641	0.2977	0.2985
Industry Employment (Natural Logarithm)		4.4824		5.8265		8.7323
Industry Share of Total Employment		0.0059		0.0411		
Median Household Income	38,575	44,707	38,554	40,523	39,001	39,009
Population	68,999	182,774	69,994	90,507	86,136	86,545
Industry Employment		278		1,343		17,928
Sample Size	16,770	4,813	16,765	12,359	18,018	17,928

Notes: Averages reported are not weighted by county population. Democrat share is based on linear trends of 1992-2008 presidential election results. College completion rates are based on 25 and older population and are calculated using 1990 and 2000 census numbers. Completion requires a bachelor's degree. Median household income and cigarette taxes are adjusted for inflation using the BEA's chained adjustment for GDP.

Table 3: Bars (Full Sample)

Probability of a Local Comprehensive Smoking Ban (Random Effects Probit)

Cigarette Tax	0.2156		0.2499		-0.0981	
	(.1817)		(.1914)		(.3388)	
	3.11E-07		3.83E-07		-5.09E-11	
Share Democrat	3.6000		3.5155		2.5589	
	(.6376)	***	(.6462)	***	(.8697)	***
	5.19E-06		5.39E-06		1.33E-09	
Median Household Income (Natural Logarithm)	-0.9890		-1.0342		-0.6574	
	(.4043)	**	(.4071)	**	(.5410)	
	-1.43E-06		-1.58E-06		-3.41E-10	
Share Caucasian	0.7566		0.7581		0.2621	
	(.3990)	*	(.4058)	*	(.5803)	
	1.09E-06		1.16E-06		1.36E-10	
College Completion Rate	6.5106		6.5606		7.0795	
	(.9480)	***	(.9492)	***	(1.2070)	***
	9.38E-06		1.01E-05		3.67E-09	
Population (Natural Logarithm)	0.5154		0.5175		0.5245	
	(.0664)	***	(.0664)	***	(.0801)	***
	7.43E-07		7.93E-07		2.72E-10	
Population Density	-0.1188		-0.1177		-0.2248	
	(.0667)	*	(.0663)	*	(.0807)	***
	-1.71E-07		-1.80E-07		-1.17E-10	
Trend	0.3911		0.3972		0.5650	
	(.0290)	***	(.0466)	***	(.0469)	***
	5.64E-07		6.09E-07		2.93E-10	
Year Fixed Effects	No		Yes		No	
State Fixed Effects	No		No		Yes	
Pseudo R Squared	0.3628		0.3636		0.4612	
Counties	2,010		2,010		2,010	
Observations	16,770		16,770		16,770	

Notes: Median household income and cigarette excise tax in year 2005 dollars. Statistical significance is indicated at the 1%(***), 5%(**) and 10%(*) levels. Standard errors are reported in parentheses. Mean evaluated marginal effects are reported at the bottom in scientific notation.

Table 4: Restaurants (Full Sample)

Probability of a Local Comprehensive Smoking Ban (Random Effects Probit)

Cigarette Tax	0.2131		0.2878		0.3120	
	(.1810)		(.1915)		(.3689)	
	7.35E-07		1.19E-06		7.33E-10	
Share Democrat	2.7100		2.5431		1.5356	
	(.5621)	***	(.5724)	***	(.7961)	*
	9.34E-06		1.05E-05		3.61E-09	
Median Household Income (Natural Logarithm)	-0.9270		-0.9768		-0.3215	
	(.3561)	***	(.3586)	***	(.4649)	
	-3.20E-06		-4.05E-06		-7.55E-10	
Share Caucasian	0.8126		0.7484		-0.2267	
	(.3656)	**	(.3705)	**	(.5279)	
	2.80E-06		3.10E-06		-5.33E-10	
College Completion Rate	7.0903		7.1288		8.0376	
	(.8567)	***	(.8558)	***	(1.0888)	***
	2.44E-05		2.96E-05		1.89E-08	
Population (Natural Logarithm)	0.5810		0.5826		0.6069	
	(.0605)	***	(.0604)	***	(.0747)	***
	2.00E-06		2.42E-06		1.43E-09	
Population Density	-0.1385		-0.1385		-0.3074	
	(.0667)	**	(.0667)	**	(.0825)	***
	-4.77E-07		-5.74E-07		-7.22E-10	
Trend	0.4716		0.4412		0.6471	
	(.0254)	***	(.0402)	***	(.0402)	***
	1.63E-06		1.83E-06		1.52E-09	
Year Fixed Effects	No		Yes		No	
State Fixed Effects	No		No		Yes	
Pseudo R Squared	0.3718		0.3726		0.4771	
Counties	2,051		2,051		2,051	
Observations	16,765		16,765		16,765	

Notes: Median household income and cigarette excise tax in year 2005 dollars. Statistical significance is indicated at the 1%(***), 5%(**) and 10%(*) levels. Standard errors are reported in parentheses. Mean evaluated marginal effects are reported at the bottom in scientific notation.

Table 5: Restaurants (Industry Employment Sub-Sample)

Probability of a Local Comprehensive Smoking Ban (Random Effects Probit)

Cigarette Tax	0.1339		0.2126		0.1696	
	(.1887)		(.2000)		(.3766)	
	1.38E-06		2.64E-06		6.47E-10	
Share Democrat	2.9501		2.7523		1.8798	
	(.6207)	***	(.6331)	***	(.8884)	**
	3.05E-05		3.41E-05		7.17E-09	
Median Household Income (Natural Logarithm)	-0.8722		-0.9377		-0.0678	
	(.3785)	**	(.3818)	**	(.5085)	
	-9.01E-06		-1.16E-05		-2.59E-10	
Share Caucasian	0.8528		0.7951		-0.2877	
	(.4157)	**	(.4224)	*	(.5641)	
	8.81E-06		9.86E-06		-1.10E-09	
College Completion Rate	7.3519		7.4486		7.9935	
	(1.0019)	***	(1.0038)	***	(1.2780)	***
	7.60E-05		9.23E-05		3.05E-08	
Population (Natural Logarithm)	0.9386		0.9534		0.5409	
	(.1914)	***	(.1903)	***	(.2505)	**
	9.70E-06		1.18E-05		2.06E-09	
Population Density	-0.1298		-0.1289		-0.3065	
	(.0668)	*	(.0667)	*	(.0844)	***
	-1.34E-06		-1.60E-06		-1.17E-09	
Trend	0.4776		0.4508		0.6637	
	(.0268)	***	(.0412)	***	(.0427)	***
	4.94E-06		5.59E-06		2.53E-09	
Industry Employment (Natural Logarithm)	-0.3225		-0.3345		0.0168	
	(.1576)	**	(.1566)	**	(.2017)	
	-3.33E-06		-4.15E-06		6.42E-11	
Industry Share of Total Employment	10.4833		10.6684		-2.9122	
	(4.5852)	**	(4.5471)	**	(6.3003)	
	1.08E-04		1.32E-04		-1.11E-08	
Year Fixed Effects	No		Yes		No	
State Fixed Effects	No		No		Yes	
Pseudo R Squared	0.3724		0.3734		0.4812	
Counties	1,887		1,887		1,887	
Observations	12,359		12,359		12,359	

Notes: Median household income and cigarette excise tax in year 2005 dollars. Statistical significance is indicated at the 1%(***), 5%(**) and 10%(*) levels. Standard errors are reported in parentheses. Mean evaluated marginal effects are reported at the bottom in scientific notation.

Table 6: Workplaces (Full Sample)

Probability of a Local Comprehensive Smoking Ban (Random Effects Probit)

Cigarette Tax	-0.0115		0.0627		-0.2266	
	(.1420)		(.1474)		(.2469)	
	-8.74E-08		5.12E-07		-1.36E-09	
Share Democrat	3.8260		3.4784		3.0184	
	(.5760)	***	(.5816)	***	(.7975)	***
	2.92E-05		2.84E-05		1.81E-08	
Median Household Income (Natural Logarithm)	-0.5825		-0.7060		0.4745	
	(.3754)		(.3772)	*	(.5029)	
	-4.44E-06		-5.76E-06		2.85E-09	
Share Caucasian	0.1630		0.0902		-0.8661	
	(.3066)		(.3101)		(.4255)	**
	1.24E-06		7.37E-07		-5.20E-09	
College Completion Rate	3.5212		3.7265		5.9290	
	(.9578)	***	(.9519)	***	(1.1918)	***
	2.68E-05		3.04E-05		3.56E-08	
Population (Natural Logarithm)	0.8199		0.8204		0.6987	
	(.0614)	***	(.0610)	***	(.0723)	***
	6.25E-06		6.70E-06		4.19E-09	
Population Density	-0.1103		-0.1073		-0.1619	
	(.0402)	***	(.0402)	***	(.0563)	***
	-8.41E-07		-8.76E-07		-9.72E-10	
Trend	0.3732		0.3644		0.5154	
	(.0200)	***	(.0252)	***	(.0296)	***
	2.85E-06		2.98E-06		3.09E-09	
Year Fixed Effects	No		Yes		No	
State Fixed Effects	No		No		Yes	
Pseudo R Squared	0.3011		0.3054		0.4524	
Counties	2,143		2,143		2,143	
Observations	18,018		18,018		18,018	

Notes: Median household income and cigarette excise tax in year 2005 dollars. Statistical significance is indicated at the 1%(***), 5%(**) and 10%(*) levels. Standard errors are reported in parentheses. Mean evaluated marginal effects are reported at the bottom in scientific notation.

Table 7: Workplaces (Industry Employment Sub-Sample)

Probability of a Local Comprehensive Smoking Ban (Random Effects Probit)

Cigarette Tax	-0.0393		0.0381		-0.2402	
	(.1428)		(.1480)		(.2475)	
	-3.12E-07		3.24E-07		-1.53E-09	
Share Democrat	3.8323		3.4779		3.0579	
	(.5787)	***	(.5836)	***	(.8003)	***
	3.05E-05		2.96E-05		1.94E-08	
Median Household Income (Natural Logarithm)	-0.6074		-0.7385		0.5019	
	(.3770)		(.3786)	*	(.5052)	
	-4.83E-06		-6.28E-06		3.19E-09	
Share Caucasian	0.2836		0.2117		-0.8745	
	(.3122)		(.3148)		(.4264)	**
	2.25E-06		1.80E-06		-5.55E-09	
College Completion Rate	4.1806		4.4089		5.5709	
	(.9994)	***	(.9937)	***	(1.2524)	***
	3.32E-05		3.75E-05		3.54E-08	
Population (Natural Logarithm)	1.2760		1.2933		0.4979	
	(.1818)	***	(.1803)	***	(.2307)	**
	1.01E-05		1.10E-05		3.16E-09	
Population Density	-0.1071		-0.1046		-0.1648	
	(.0383)	***	(.0381)	***	(.0566)	***
	-8.51E-07		-8.90E-07		-1.05E-09	
Trend	0.3743		0.3656		0.5171	
	(.0201)	***	(.0253)	***	(.0296)	***
	2.97E-06		3.11E-06		3.28E-09	
Industry Employment (Natural Logarithm)	-0.4037		-0.4172		0.1782	
	(.1524)	***	(.1513)	***	(.1941)	
	-3.21E-06		-3.55E-06		1.13E-09	
Year Fixed Effects	No		Yes		No	
State Fixed Effects	No		No		Yes	
Pseudo R Squared	0.3021		0.3066		0.4524	
Counties	2,141		2,141		2,141	
Observations	17,928		17,928		17,928	

Notes: Median household income and cigarette excise tax in year 2005 dollars. Statistical significance is indicated at the 1%(***), 5%(**) and 10%(*) levels. Standard errors are reported in parentheses. Mean evaluated marginal effects are reported at the bottom in scientific notation.

Table 8: All (Full Sample)

Probability of a Local Comprehensive Smoking Ban
Random Effects Probit with State Fixed Effects

	Bar		Restaurant		Workplace	
Cigarette Tax	-0.0981		0.3120		-0.2266	
	(.3388)		(.3689)		(.2469)	
	-5.09E-11		7.33E-10		-1.36E-09	
Share Democrat	2.5589		1.5356		3.0184	
	(.8697)	***	(.7961)	*	(.7975)	***
	1.33E-09		3.61E-09		1.81E-08	
Median Household Income (Natural Logarithm)	-0.6574		-0.3215		0.4745	
	(.5410)		(.4649)		(.5029)	
	-3.41E-10		-7.55E-10		2.85E-09	
Share Caucasian	0.2621		-0.2267		-0.8661	
	(.5803)		(.5279)		(.4255)	**
	1.36E-10		-5.33E-10		-5.20E-09	
College Completion Rate	7.0795		8.0376		5.9290	
	(1.2070)	***	(1.0888)	***	(1.1918)	***
	3.67E-09		1.89E-08		3.56E-08	
Population (Natural Logarithm)	0.5245		0.6069		0.6987	
	(.0801)	***	(.0747)	***	(.0723)	***
	2.72E-10		1.43E-09		4.19E-09	
Population Density	-0.2248		-0.3074		-0.1619	
	(.0807)	***	(.0825)	***	(.0563)	***
	-1.17E-10		-7.22E-10		-9.72E-10	
Trend	0.5650		0.6471		0.5154	
	(.0469)	***	(.0402)	***	(.0296)	***
	2.93E-10		1.52E-09		3.09E-09	
Pseudo R Squared	0.4612		0.4771		0.4524	
Counties	2,010		2,051		2,143	
Observations	16,770		16,765		18,018	

Notes: Median household income and cigarette excise tax in year 2005 dollars. Statistical significance is indicated at the 1%(***), 5%(**) and 10%(*) levels. Standard errors are reported in parentheses. Mean evaluated marginal effects are reported at the bottom in scientific notation.