

“It’s only words, and words are all I have”:  
Using Latent Text Analysis to Analyze Topics in  
Philippine Supreme Court Decisions

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Dear CPW,

*Thank you in advance for reading a draft of my work with latent text analysis and topic models. I apologize in advance because this is – or is intended to eventually become – a methods paper. As such, I do at times consciously focus more on demonstrating and utilizing the method than on the judicial politics theory or Philippine jurisprudence.*

*At times, latent text analysis seems like a “method without a cause” so to speak. The judicial politics field has only just begun to utilize it, and even then largely to critique hand-coded databases. I ultimately hope to use latent text analysis to test theories about the relationship between civil society actors and the judiciary.*

*However, for practical and intellectual reasons, I have decided not to take this paper down that route – at least not yet. The practical reason is that I would need more time to adequately code 20,227 cases for information about the identity of the plaintiff and how each judge voted. More importantly, latent text analysis is new enough to the comparative judicial politics discipline that I thought it might be worth writing a more basic paper introducing the method and explaining its uses with relatively simple examples.*

*In short, should I try to spin this off as a publishable paper in the near future, or wait until I can code the cases more thoroughly? As always, I appreciate your comments and feedback.*

*Sincerely,  
Dominic J. Nardi, Jr.*

*P.S. – If printing, you will need to print in color in order to interpret Figures 2 and 3 correctly.*

## Abstract

*In this paper, I employ an LDA model in order to classify 20,227 judicial decisions from the Philippine Supreme Court during the 1996-2012. I begin by introducing the Philippine Supreme Court, its jurisdiction, and significant controversies during this time period. Next, I explain the problems that would arise from hand-coding these judicial decisions. I then explain the Latent Dirichlet Allocation methodology, as well as the process for converting the decisions into data. After running the model, I present the resultant 36 topics and discuss potential substantive interpretations. Finally, I then use the results to analyze how the Supreme Court's docket has changed over time, with particular attention paid to the identity of the chief justice. Ultimately, the results suggest that latent topic models could be used to determine if a court is responsive to and engaged with broader political disputes.*

As a field, comparative judicial politics relies heavily on our ability to classify and categorize judicial opinions by topic. Scholars often test inferences about judicial behavior on a subset of cases, such as “constitutional” or “civil rights” law. The central question underpinning the discipline’s entire research agenda is whether judges decide cases according to their policy preferences in certain issue areas. For example, in American judicial politics, attitudinalists frequently use the Supreme Court Database “issue” codes in order to predict the votes of liberal and conservative judges (Segal and Cover, 1989; Segal and Spaeth, 1996). In the comparative courts context, numerous models of judicial voting behavior include “issue” dummy variables in an attempt to control for the ways in which the type of case influence judicial voting (Carroll and Tiede, 2011; Vanberg, 2001; Carrubba and Zorn, 2010).

However, the reliability of such “issue” variables has come under increased criticism on both substantive and methodological grounds. Supervised hand-coding introduces the risk of bias and coding error. Even more importantly, the discipline still lacks a consensus on how exactly to categorize cases. Legal scholars tend to group cases by the law or legal provision at issue (e.g., 14<sup>th</sup> Amendment; § 201 of the Uniform Commercial Code), while political scientists focus on fields of public policy (e.g., civil rights; contracts). Moreover, hand-coding often forces each case into a single “issue” category, overlooking the fact that many cases address multiple issues (Shapiro, 2009). There is a risk of confirmation bias as scholars categorize cases in line with their theoretical worldview, not with that of the judges they are supposedly studying (Harvey and Woodruff, 2011).

In response to such methodological challenges, political scientists have begun to utilize unsupervised computer learning methods in order to uncover the latent structure in collections of textual documents (Grimmer, 2010; Gerrish and Blei, 2011; Rice, 2012). Latent text analysis determines topic clusters based on word frequency in documents, using topics actually generated from the texts themselves rather imposed by coder discretion. The Latent Dirichlet Allocation (LDA) model uses a Bayesian approach to determine complex posteriors for the probability that a particular document falls within a particular topic cluster (Blei et al., 2003; Blei and McAuliffe, 2007). In addition to avoiding the time and resources often incurred hand-coding documents, LDA minimizes coder discretion and can assign multiple topics to a single case.

In this paper, I employ an LDA model in order to classify 20,227 judicial decisions from the Philippine Supreme Court from 1996-2012. I begin by introducing the Philippine Supreme Court and its jurisdiction. Next, I explain the problems that arise from hand-coding these judicial decisions. I then explain the Latent Dirichlet Allocation methodology, as well as the process for processing the texts into data.

After running the model, I present the resultant 36 topics and discuss potential substantive interpretations. Interestingly, the model produces some topics similar to those in hand-coded databases, such as “family law” and “elections”, but it also reveals new legal topics, such as procedural motions, that are often ignored in political science analyses. Finally, I then use the results to analyze how the Supreme Court’s docket has changed in relation to broader political trends. Ultimately, the results suggest that latent topic models could be used to determine if a court is responsive to and engaged with broader political disputes.

## 1 The Philippine Supreme Court

There is a long and venerable tradition of legal and political science research on the Philippine Supreme Court. One of the founders of modern comparative judicial politics, Neal Tate, often used hand-coded decisions in order to analyze the substance of Supreme Court decisions (Tate, 1997a,b; Tate and Haynie, 1993). A significant body of scholarship has studied the court’s relationship with the presidency and congress, using both legal analysis and quantitative methods (del Carmen, 1974; Haynie, 1994; Pangalangan, 2004, 2008; Gatmaytan, 2003; Gatmaytan and Magno, 2011; Smith and Farrales, 2010). Moreover, Philippine investigative journalists have provided detailed accounts of backroom politicking in the court and help uncover some of the deeper motivations underlying judicial behavior (Vitug, 2012; Vitug and Yabes, 2011; Vitug, 2010; Nardi, 2012). In short, unlike the judicial systems of the rest of Southeast Asia, there is more than enough contextual knowledge with which to analyze the results of any topic model. This section provides background on the Supreme Court, with particular attention to institutional features that might influence the content of cases that reach the court’s docket.

While the Philippine Supreme Court was initially founded at the advent of America’s colonial occupation, the 1986 People’s Power movement against President Ferdinand Marcos signified a rebirth for the institution. The drafters of the 1987 Constitution expanded judicial power as a potential veto against traditional Filipino politicians (*trapos*). Moreover, the founders removed the constraint of political question doctrine, behind which the Supreme Court hid under Marcos in order to avoid ruling on controversial issues. Where the court had previously followed U.S. jurisprudence on legal standing (*locus standi*), it has gradually lowered standing requirements for constitutional litigation.<sup>1</sup> Since 1986, the court has become infamous throughout Southeast Asia both for its willingness to intervene in politics (Tate, 1997a, 461) and for its expansive jurisprudence (Gatmaytan, 2003).

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<sup>1</sup>Chavez v. Presidential Commission on Good Government, G.R. No. 130716 (S.C. Dec. 9, 1998) (finding standing for a citizen to bring a taxpayer’s suit to recover Marcos’ hidden wealth).

Like the U.S. Supreme Court, the Philippine Supreme Court is a court of general jurisdiction. Under Art. VIII, §5(2) of the 1987 Constitution, the Supreme Court has jurisdiction over:

1. All cases in which the constitutionality or validity of any treaty, international or executive agreement, law, presidential decree, proclamation, order, instruction, ordinance, or regulation is in question.
2. All cases involving the legality of any tax, impost, assessment, or toll, or any penalty imposed in relation thereto.
3. All cases in which the jurisdiction of any lower court is in issue.
4. All criminal cases in which the penalty imposed is *reclusión perpetua* or higher.<sup>2</sup>
5. All cases in which only an error or question of law is involved.

The court also possesses original jurisdiction over cases affecting “ambassadors, other public ministers and consuls, and over petitions for certiorari, prohibition, mandamus, quo warranto, and habeas corpus” (§5(1)). Of course, jurisdiction alone does not indicate the distribution of topics present in the court’s docket – cases affecting ambassadors are notably rare – but it should at least exclude certain topics, such as minor crimes or questions exclusively of fact.

In most cases, litigants do not have an appeal by right, although the Philippine Supreme Court rarely rejects petitions for *certiorari*. In 2011 alone, the court received 23,509 judicial and administrative cases and disposed of 6,107 (SCPIO, 2011). By contrast, for its 2005-06 term the U.S. Supreme Court accepted just 78 out of 8,517 cert petitions (Thompson and Wachtell, 2009). Obviously, not all of the 6,107 cases are contained in my data because many were summary denials of motions (my data contain 1,061 cases from 2011). Nonetheless, the court’s docket backlog has two important implications for a topic model analysis. First, unlike in the U.S., the distribution of topics in the court’s docket is probably not a strategic function of the judges’ preferences or interest in those topics.<sup>3</sup> As such, we might expect the distribution of topics to arise from social, political, and economic variables in society.

Unlike in the U.S., the Philippine Supreme Court chief justice does not assign opinions to the justices. Justices cannot lobby to write the decision for a particular case. Rather, a raffle committee designates one justice, known as the *ponente*, to study the arguments closely and prepare a draft decision (*ponencia*). While the other justices are not bound by the decision of the *ponente* (it could even end up in the dissent after the conference vote), they tend to rely heavily on the *ponente*’s analysis (Vitug, 2010, 154-55). Thus, we should in theory expect authorship of the decision to not be correlated with topic.<sup>4</sup>

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<sup>2</sup>*Reclusión perpetua* is a type of prison sentence under Philippine law usually set at 40 years or longer (Revised Penal Code).

<sup>3</sup>With a few exceptions for high-profile motions to reconsider (Vitug, 2010).

<sup>4</sup>Vitug (2010) among others raises questions about the integrity of the *ponencia* process. Nonetheless, no definitive evidence has been presented that would undermine this assumption. However, if I code the author of each decision, it would be possible to use latent text analysis in order to determine whether case topics are truly assigned at random.

## 2 Problems with Hand-Coding

In this section I highlight some of the substantive and methodological critiques of hand-coding judicial opinions, using examples from the Supreme Court Database (Spaeth et al., 2012) and the High Courts Judicial Database (HCJD) (Haynie et al., 2007). The SCD is a comprehensive database of U.S. Supreme Court decisions and contains information both about issues and outcomes. The High Courts Judicial Database (HCJD) (Haynie et al., 2007) contains the most comprehensive publicly available database of Philippine Supreme Court decisions, although even it only covers 809 cases during the years 1996-2003 (compared to 8,859 in my sample) (see Tables 1 & 2). Because of the sheer volume of court decisions, and because hand-coding requires intensive time and resources, the HCJD was forced to rely upon a random sample of cases. The literature obviously focuses on the more prominent SCD, but the critiques are generally equally applicable to the HCJD.

### 2.1 Experience with the SCD

Coding rules inherently presume that judges decide cases by *these* legal issue area rather than some other potential substantive division of the docket (Rice, 2012; McGuire and Vanberg, 2005). In the U.S. context, Shapiro (2009) warns that scholars using the U.S. Supreme Court Database risk conflating policy and legal issues. The SCD explicitly codes substantive public policy issues, such as “abortion”. However, expectations about the legal issue underlying the case, such as the statute or constitutional provision, might not line up with expectations about the policy issue. For example, an issue area coding assumes judges decide affirmative action cases based on preferences for equal rights rather than 14th amendment jurisprudence. Of course, observationally these two types of judicial behavior might be indistinguishable because judges typically want to portray themselves as adhering to legal principle.

Indeed, Harvey and Woodruff (2011) finds evidence that “confirmation bias” in SCD issue coding has a significant impact on how we interpret judicial behavior. Issue areas generally align to the coder’s expectations of how a case was decided along a liberal–conservative political spectrum. In short, coding risks forcing cases into politically salient or controversial issue areas. Attitudinalists have used these SCD issue areas in order to argue that Supreme Court justices vote based on their policy preferences, not legal principle. By contrast, when Harvey and Woodruff (2011) recode cases based on the statute at issue, they find that congressional preferences have a significant constraining effect on the court.

Another problem with hand-coding is that it has trouble reconciling cases that contain multiple issues. When coders must categorize each case into a single issue area, they risk misidentification of issues in cases with mixed issues. For example, in the SCD, an election crime would be forced into “election” or “crime”. Shapiro (2009, 515) finds that of a sample of 95 cases from the SCD, only six contained a single issue. While the HCJD allows coders to include a second issue, many cases could conceivably contain far more than two issues.

First Substantive Issue	Frequency	Percent
murder	136	16.81
killing without intent	1	0.12
attempted murder or homicide	1	0.12
rape	108	13.35
other crimes of violence against person	10	1.24
property crimes - serious	25	3.09
property crimes - minor	1	0.12
drug offenses	12	1.48
crimes against morality	1	0.12
business regulation & license violation	5	0.62
government corruption/attempts to corru	17	2.10
other - perjury, contempt of court, DUI	4	0.49
not able to classify crime	1	0.12
equal treatment under the law - discrim	1	0.12
voting rights	1	0.12
speech, press, assembly, right to petit	1	0.12
other civil rights	2	0.25
government health & safety regulation	1	0.12
other government regulation of business	6	0.74
government regulation of agriculture	1	0.12
land reform & government land use, emin	9	1.11
government regulation unions/business/l	1	0.12
other government regulation	2	0.25
taxation	5	0.62
government benefits	4	0.49
abuse of govt authority - not civil rig	4	0.49
public employment	12	1.48
immigration, deportation, citizenship	1	0.12
disputes over elections	24	2.97
disputes over appointments to office	3	0.37
disputes over removal of government off	1	0.12
other public law	4	0.49

**Table 1: Topics of Philippine Supreme Court Decisions in High Courts Judicial Database for 1996-2003**

## 2.2 Coding the Philippines and the HCJD

All of the aforementioned problems are amplified when coding judicial opinions from a foreign country, such as the Philippines. At the very least, in U.S., the divide between liberal-conservative is well accepted as the primary division in politics, paralleling the divide between

First Substantive Issue	Frequency	Percent
creditor-debtor disputes	40	4.94
insurance disputes	4	0.49
other contract disputes: breach, franch	43	5.32
land possession disputes (agricultural	36	4.45
landlord - tenant disputes - agricultur	3	0.37
landlord - tenant disputes - commercial	12	1.48
copyrights, patents, trademarks	5	0.62
corporate law - disputes over managemen	6	0.74
labor/ management disputes (in private	75	9.27
other private economic disputes	19	2.35
motor vehicle accidents	10	1.24
product liability	4	0.49
other personal injury	1	0.12
libel or defamation	2	0.25
other torts	4	0.49
603	1	0.12
marriage, divorce, and family disputes	2	0.25
inheritance, probate, succession disput	12	1.48
other family law	3	0.37
regulation of bar and judiciary	119	14.71
other issue or unable to classify	3	0.37
Total	809	100

**Table 2: Topics of Philippine Supreme Court Decisions in High Courts Judicial Database for 1996-2003 (continued...)**

Democrats and Republicans. Because the president nominates judges, there is good reason to suspect this divide will be replicated on the Supreme Court bench. By contrast, a left–right spectrum might not be appropriate in a country with different political institutions.

First, the appointment process to the Philippine Supreme Court should mitigate the extent to which judicial preferences and topics mirror broader cleavages. The Judicial and Bar Council, composed of the Supreme Court Chief Justice, Secretary of Justice, and representatives from Congress, the Integrated Bar of the Philippines (IBP), legal academia, and the private sector, screens judicial candidates and prepares a shortlist for the president (Art. VIII, §4(1)). The process is designed to shield candidates from political dealmaking and does tend to result in more members from private firms than typically found in the U.S. bench.<sup>5</sup> Any confirmation bias based on American norms of judicial behavior would be doubly inappropriate for the Philippines.

Second, the court’s institutional rules might produce a different distribution of cases on

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<sup>5</sup>However, Vitug (2010) alleges that some some judges did have to lobby for their appointments.



its docket. As noted above, because the Philippine Supreme Court typically does not deny appeals, the justices cannot select the topics that most interest them. Indeed, the second largest category of cases in the HCJD list is “regulation of bar and judiciary”. However, grouping the two together seems to reflect the U.S. perception of how such cases as peripheral rather than the reality facing the Philippine Supreme Court. Given the prominence of such cases in the HCJD, one might wonder if for the Philippines the topic should at least be desegregated in “the bar” and “the judiciary”.

Moreover, the list of 53 issues in the HCJD does not contain a single reference to legal procedural topics. This is probably because such issues are seldom the sole topic to arise in a case. Nonetheless, judges often decide cases based on questions of standing, motions, and notice. While the underlying dispute might involve a particular issue area, procedural defects in a case can prevent judges from even addressing the substantive issues. Indeed, the Philippine Supreme Court spokesman often implores journalists to remain cognizant of procedural issues when reporting on the outcome of cases. By forcing cases into substantive issue areas, the HCJD coding could lead researchers to draw incorrect inferences about the judge’s decision-making process.

Hand-coding leads to several other puzzling results in the HCJD issue clusters. For example, 15 of the issue codes only contain a single case. Some, such as “disputes over removal of government official” (probably the Estrada impeachment), might be worth classifying separately because they are of particularly noteworthy or exceptional. However, it is not entirely clear all of these issues deserve to be separate. Do judges treat “insurance disputes” differently from “other contract disputes”, or do they all fall under the rubric of contract law? Several of these single-digit issue areas are simply “other” fields of law, allowing for no substantive interpretation except that the coder could not categorize them elsewhere.

### 3 Data & Text Processing

The data for this paper consists of 20,227 judicial decisions from the Philippine Supreme Court from January 1, 1996 to May 29, 2012, when Chief Justice Corona was convicted by the Senate. The full texts of each case are available on the Supreme Court’s website and were downloaded as .txt files with the Firefox DownloadThemAll application.<sup>6</sup>

Before running a latent text model, all texts must be pre-processed in order to extract information about word frequency counts across documents. For each .txt file, I removed line breaks using TextWrangler such that each file would be read as a single document, rather than several separate paragraphs. I then imported the texts into a .csv file, along with other relevant metadata about the case, such as the filename, date, chief justice, and whether the case was heard en banc or in a division.<sup>7</sup> Finally, I imported the .csv file into the Stanford

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<sup>6</sup>Available at <http://sc.judiciary.gov.ph/>. A handful of cases are missing due to technical errors with the website server, but I have no reason to believe that these glitches are not at random.

<sup>7</sup>I could add more metadata about each case, but this would require hand-coding, whereas this metadata was extracted from the file’s location on the Supreme Court website. I collated the texts and metadata into a single file using R, and then wrote a new .csv file.

Natural Language Processing (SNLP) Topic Modeling Toolbox (TMT),<sup>8</sup>

Next, I processed the texts in order to remove any words or other characters not relevant to classifying topics. As recommended by Grimmer (2010), I stripped the texts of any numbers, punctuation, and extra whitespace. I also converted all words to lowercase so the same word in a different case would be recognized as the same. I also removed a standard list of “stop words” (e.g., “and”, “the”, “will”). Finally, I employed a Porter stemming algorithm in order to stem words to their roots. This step ensures that words with the same root information content will be recognized as the same (e.g., “courts” becomes “court”).

Using these “tokens”, I then process the texts to make remove words that are less likely to contain information about topics. I remove the top 30 terms from the corpus. This removes words such as “court” and “justice” that appear in almost all of the texts. I also remove terms that do not appear in at least 20 documents (0.10% of the total). Finally, I remove any words that contain fewer than three letters (this also removes common articles and prepositions).

Because English is the official language of the Philippine Supreme Court, I did not need to translate the decisions before processing them.<sup>9</sup> However, one issue that arises in the data is that the justices sometimes transcribe statements from witnesses or parties in the original Tagalog. Occasionally, the justices themselves will use a Tagalog quote. I decided not to translate or remove these sections for two reasons. First, to some researchers, foreign language in judicial opinions might constitute an interesting topic in its own right. Second, because Latent Dirichlet Allocation assumes that topics are uncorrelated, removing the Tagalog text has no effect on the distribution of the other topics. In fact, as shown below, LDA groups all of the most frequent Tagalog terms into a single, unique topic .

## 4 Methodology

In this section, I provide the statistical basis for the Latent Dirichlet Allocation (LDA) model that I use. We start with  $\omega = (\omega_1, \dots, \omega_N)$  documents of corpus  $D$  containing  $N$  words from a vocabulary of  $V$  different words, i.e.  $\omega_i \in \{1, \dots, V\}$  for all  $i = 1, \dots, N$  (Grün and Hornik, 2011). Latent Dirichlet Allocation estimates the proportion of topic distributions  $\theta$  for document  $\omega$  as a latent variable.

### 4.1 Selecting the Number of Topics

The number of topics  $k$  must be set a priori in both models. Selecting the number of topics is often the most difficult part of using a latent text model. There is currently no method that completely eliminates human discretion. Following Blei et al. (2003); Rosen-Zvi et al. (2004); Rice (2012), I use perplexity scores to guide my choice. Perplexity equals the geometric mean per-word likelihood, as follows:

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<sup>8</sup>Available at <http://nlp.stanford.edu/software/tmt/tmt-0.4/>

<sup>9</sup>There are natural language processing tools for some foreign languages, including Tagalog.

$$Perplexity(\omega) = E^{-\frac{\log(p(\omega))}{\sum_{d=1}^D \sum_{j=1}^V n^{(jd)}}}$$

, where  $n^{(jd)}$  indicates how often the  $j$ th term occurs in  $d$ th document (Grün and Hornik, 2011).<sup>10</sup>

Perplexity scores indicate the ability of the model to read part of a document, learn the topic distribution, and then predict the remaining words in the rest of the document. The better the prediction, the less “perplexed” the model. However, perplexity is monotonically decreasing in the number of topics (Blei et al., 2003), so researchers cannot simply select a global or local minimum. Rather, best practice is to select based on the change in the rate of decrease (Blei et al., 2003; Rice, 2012). If perplexity decreases drastically at  $k = k^*$  and then only improves gradually afterwards, then  $k^*$  provides the best improvement in perplexity.<sup>11</sup>

Visual inspection of the top 10 terms in each topic is recommended in order to check that the results have substantive meaning at  $k$  topics (Grimmer, 2010). I devised several rules for evaluating topics visually. First, any  $k$  that produced topics with more than one non-informative personal or geographic name in the top 10 terms suggested that the model was forced to create too many unique topics without enough informative terms. While conceivably a personal name could carry substantive meaning – for example, the name of the Ombudsman might be connected to corruption cases – in practice personal names were not correlated in this manner. In fact, before I removed them, LDA tended to group the top personal and geographic names into a single topic.

Second, the top 10 terms should not contain any words that do not have any logical relationship with each other. If there are too few topics such that  $k < k^*$ , then the topic model will clump distinct topics. Admittedly, this step leaves more to the researcher’s discretion. However, one useful metric is that there should exist at least one case within the corpus that contains all of the top terms in a way related to the topic of the case. Usually, clumping indicates that the model groups two terms together based upon their relationship to a third term, even if each relationship is of a different nature. For example, a model with fewer topics might group civil rights and institutional authority topics together because both are closely linked to the word “constitution”.

I use the SNLP TMT to calculate perplexity scores for my corpus of texts ranging from 1 to 50 topics. I place 80% of texts in a training set and use the remaining 20% for testing. The SNLP TMT then use the first half of each document to estimate the topic distribution within that document based on the parameters derived from the training data. Finally, the TMT estimates the number of equally probably word choices for the second half of the document. The perplexity score is simply the average perplexity across all testing

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<sup>10</sup>Unlike LDA, another type of latent text analysis, the Correlated-Topic Model (CTM), allows topics to be correlated. As such, Blei and Lafferty (2007) claim that CTM should encounter less perplexity than LDA because it bases its estimate not only on topics from the first half of the document, but also correlated topics.

<sup>11</sup>Grimmer (2010, Appendix B) discusses a newer methodology using a nonparametric model for text clustering, based on the Dirichlet process prior. The method attempts to find high-information words based on the distance between those words and other high-information words in the corpus. Grimmer is currently working on a paper expanding upon this method, which will be adapted to my project as soon as it is available.

documents.

## 4.2 Latent Dirichlet Allocation Model

For LDA, the generative process relies upon a Dirichlet distribution for the topic distribution  $\theta$  and the term distribution  $\beta$  for each topic as follows:

$$\theta \sim \text{Dirichlet}(\alpha)$$

$$\beta \sim \text{Dirichlet}(\delta)$$

, where  $\alpha$  is a parameter that governs the Dirichlet distribution. The level of  $\alpha$  helps determine pooling of topics. For this paper, I set the starting value of  $\alpha$  at  $\alpha = \frac{50}{k}$  and allow the variational expectation-maximization (VEM) to estimate  $\alpha$ , as recommended by Griths and Steyvers (2004). The Dirichlet distribution assumes independence between the topics (Grimmer, 2010, footnote 6), which affects the number of topics it can support when compared to a Correlated-Topic Model (Blei and Lafferty, 2007).<sup>12</sup>

Next, for each  $N$  words  $\omega_i$ :

1. choose topic  $z_i \sim \text{Multinomial}(\theta)$
2. choose word  $\omega_i$  from multinomial probability distribution conditioned on topic  $z_i$  :  
 $p(\omega_i|z_i, \beta)$

, where  $\beta$  is the term distribution of topics and contains the probability of a word occurring in a given topic  $k_i$ .

In order to estimate the model, maximum likelihood estimation is used to maximize the log-likelihood of the data with respect to the model parameters. For LDA, the variational expectation-maximization of the log-likelihood for one document  $\omega \in D$  is:

$$\begin{aligned} l(\alpha, \beta) &= \log(p(\omega|\alpha, \beta)) \\ &= \log \int \sum_z \prod_{i=1}^N p(\omega_i|z_i, \beta)p(z_i|\theta)p(\theta|\alpha)d\theta \end{aligned}$$

, maximized for parameters  $\alpha$  and  $\beta$ .

The VEM algorithm is an iterative method for determining ML estimates in a missing data framework. It iterates between an Expectation (E)-step, where given the data and current parameter it estimates the complete likelihood, and a Maximization (M)-step, where the expected complete likelihood is maximized in order to find new parameter estimates new parameter estimates. For topic models, the missing data are the latent variables  $\theta, z$  for LDA (Grün and Hornik, 2011).

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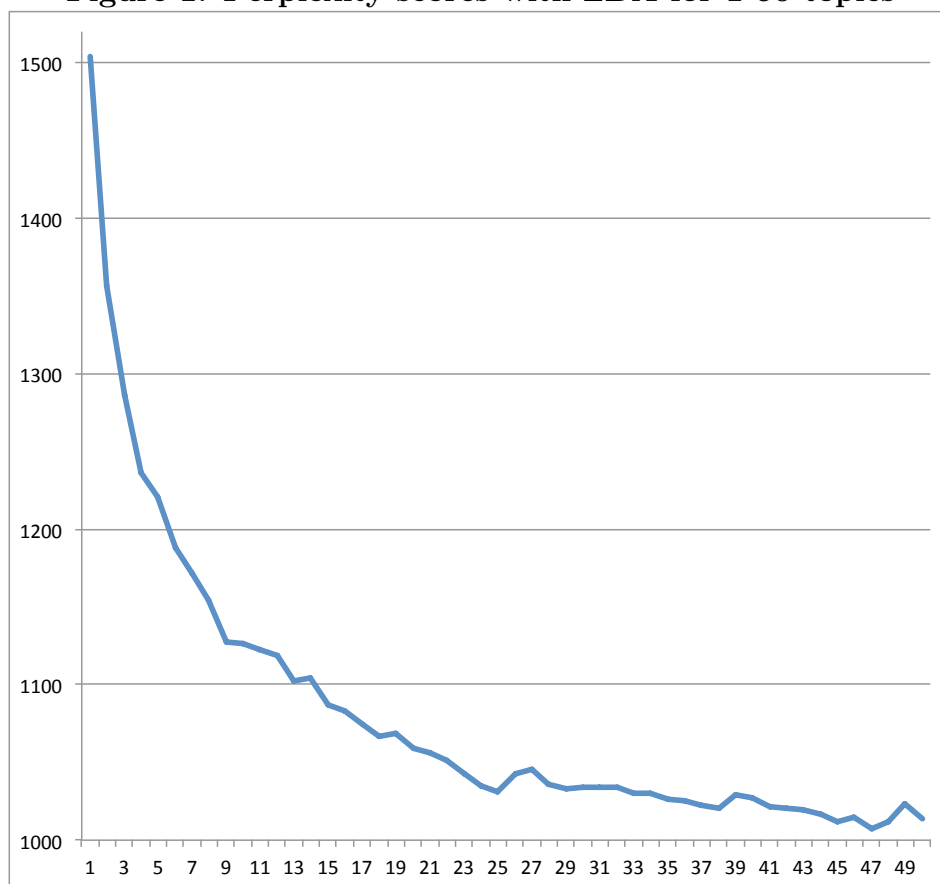
<sup>12</sup>Political scientists who use topic models have tended to use LDA and minimize this assumption. I do intend at some point in the future to redo this model using CTM, but CTM is currently not available in the Stanford Natural Language Processing Topic Modeling Toolbox.

## 5 Interpreting Topics in the Tropics

### 5.1 Number of Topics

For my data, I selected  $k = 36$  topics. As seen in Figure 1, perplexity decreases rapidly from a single topic up to around 25 topics, continues to decrease up to around 36 topics, and then flatlines. Moreover, as discussed below, each of the 36 topics has a substantively interpretable meaning, whereas a greater number of topics produced topics that yielded little substantive information. Unfortunately, when deciding between a close number of topics (e.g.,  $k = 35$  versus  $k = 37$ ), visual inspection becomes far more difficult.

Figure 1: Perplexity scores with LDA for 1-50 topics



While 36 topics is fewer than the 53 topics coded in the HCJD (Table 2), as discussed above the HCJD coding scheme probably overestimates the number of latent topics in the 809 cases by using coder-created tags for certain “low-frequency” topics. For example, LDA did not detect a separate latent topic for free speech, which is perhaps not surprising given that only one out of the 809 cases in the HCJD were classified as such. If we omit any topic

that contains only a single case, the HCJD would then list only 38 topics – remarkably close to the number of latent topics LDA detected. (Rice, 2012).

## 5.2 Substance of Topics

The latent topic model does not assign a name or label to the topics. Therefore, it is up to the researcher to provide a substantive interpretation for each topic. In Tables 3 and 4, I list the top ten terms for each topic, as well as provide a label for each topic. The label is only intended for ease of reference, not to force a substantive interpretation of value judgment onto each topic. Moreover, the label might aid non-lawyers in appreciating how the words under each topic are related.

Generally, the words in each topic correspond to recognizable areas of law or policy. Some broader areas receive more than one topic. For example, the model disaggregates crime into robbery (Topic 7), sexual assault (Topic 16), and violence (Topic 32). Property is disaggregated by ownership (Topic 8), rental (Topic 9), finance (Topic 11), and registration (Topic 19), as well as a separate topic for agricultural disputes (Topic 34). Unlike the HCJD, the model also identified a distinction between regulation of the the legal profession and the judiciary (Topics 3 and 4).

Moreover, almost a quarter of the topics LDA identified focus on procedural or evidentiary law. Topics 17 and 18 cover civil procedure and notice procedures, respectively. Topic 20 focuses exclusively on sentencing procedures as distinct from the substantive nature of the crime. Topics 5 and 30 cover documents and oral testimony, covering the two main fields of evidence law. Topic 26 appears to cover questions related to the burden or sufficiency of proof. Topic 22 appears to cover procedures for enforcing judgments and exception of orders. Finally, topic 35 represents the statement of certification or attestation attached to many opinions heard en banc. In short, ignoring procedural and evidentiary topics, as is the case in the HCJD, will ignore much of what judges actually discuss in their decisions.

As noted above, I did not remove Tagalog words from the corpus. As such, Topic 12 identifies a list of the most frequent Tagalog words used in the corpus. These words do not in and of themselves contain substantive information about the case; the first four words translated simply mean “the”, “I”, “the”, and “not”. However, such common words *are* informative to the extent that they indicate the decision contains extensive usage of Tagalog. In other words, Topic 12 not simply detecting references to specialized foreign legal terms, much as American lawyers occasionally use Latin expressions. Tagalog in this context is frequently employed when witnesses or parties give oral statements to the court, explaining the presence of the word “statement”.

## 5.3 Multiples of Topics

One of the greatest advantage of computer-based latent topic models is that researchers are not limited to selecting a single topic or two per case. LDA assigns probabilities across all 36 topics for each document. This allows LDA to capture the complexity of judicial opinions. By contrast, as Shapiro (2009) alleges, hand-coded databases such as the SCD and HCJD

<b>Topic 01 (Corruption)</b>	<b>Topic 02 (Court Management)</b>	<b>Topic 03 (Contracts)</b>	<b>Topic 04 (Bar Management)</b>	<b>Topic 05 (Documents)</b>	<b>Topic 06 (Commerce)</b>
crimin	judg	contract	complain	document	insur
ombudsman	administr	agreement	atti	certif	good
investig	complain	parti	lawyer	exhibit	product
prosecutor	clerk	payment	complaint	sign	custom
inform	branch	oblig	client	record	electr
charg	report	price	bar	affidavit	vessel
prosecut	oca	term	investig	signatur	compani
sandiganbayan	submit	agre	conduct	copi	servic
public	conduct	condit	recommend	present	busi
resolut	recommend	compromis	counsel	wit	philippin
<b>Topic 07 (Robbery Crime)</b>	<b>Topic 08 (Property Ownership)</b>	<b>Topic 09 (Property Rental)</b>	<b>Topic 10 (Local Governance)</b>	<b>Topic 11 (Property Finance)</b>	<b>Topic 12 (Tagalog)</b>
polic	properti	leas	citi	bank	ang
person	sale	possess	govern	loan	ako
crime	deed	properti	project	mortgag	mga
robber	lot	premis	public	sale	hindi
car	titl	rental	municip	oblig	niya
firearm	spous	eject	local	properti	prioriti
vehicl	subject	vacat	area	foreclosur	statement
investig	right	right	construct	payment	ito
wit	estat	defend	bid	pnb	lang
citi	heir	plaintiff	author	secur	kung
<b>Topic 13 (Banking)</b>	<b>Topic 14 (Labor)</b>	<b>Topic 15 (Personal Names)</b>	<b>Topic 16 (Sexual Crime)</b>	<b>Topic 17 (Civil Procedure)</b>	<b>Topic 18 (Notice)</b>
check	labor	cruz	rape	action	notic
bank	employe	san	peopl	jurisdict	dai
account	nlrc	santo	accusedappel	dismiss	reconsider
deposit	employ	dela	victim	complaint	resolut
fund	dismiss	francisco	complain	civil	period
cash	arbit	jose	aaa	parti	counsel
payment	pai	antonio	testimoni	certiorari	time
collect	work	manuel	crime	judgment	requir
receipt	privat	rey	father	befor	procedur
monei	compani	rollo	sexual	rtc	hear

**Table 3: Top 5 terms with LDA when the number of topics set at k=36**

force cases into a set number of topics. Moreover, a latent topic model does not run into the problem of assigning difficult cases to an “other” category.

One potential failing of latent topic models is that they have trouble categorizing low-frequency, high-impact cases. Scholars of U.S. interbranch conflict surely would want some

<b>Topic 19 (Property Registration)</b>	<b>Topic 20 (Sentencing)</b>	<b>Topic 21 (Constitution)</b>	<b>Topic 22 (Execution)</b>	<b>Topic 23 (Costs)</b>	<b>Topic 24 (Corporate)</b>
land	penalti	constitut	writ	damag	corpor
titl	crimin	power	execut	fee	share
lot	year	section	injunct	defend	sec
properti	crime	public	sheriff	plaintiff	stock
registr	peopl	govern	judgment	award	board
certif	penal	presid	preliminari	pai	director
possess	offens	philippin	issuanc	attornei	stockhold
applic	impos	right	restrain	civil	asset
subject	code	provis	grant	moral	manag
regist	articl	state	rtc	claim	busi
<b>Topic 25 (Workers Comp.)</b>	<b>Topic 26 (Proof)</b>	<b>Topic 27 (Family)</b>	<b>Topic 28 (Overseas Workers)</b>	<b>Topic 29 (Narcotics)</b>	<b>Topic 30 (Testimony)</b>
medic	fact	marriag	complain	drug	sir
hospit	present	famili	recruit	polic	hous
caus	reason	children	estafa	search	wit
neglig	question	code	monei	arrest	time
injuri	right	child	privat	shabu	becaus
disabl	alleg	person	employ	prosecut	went
death	mere	articl	illeg	peopl	told
compens	conclus	wife	person	inform	ask
work	consid	husband	abroad	oper	happen
employ	doe	civil	philippin	accusedappel	testifi
<b>Topic 31 (Elections)</b>	<b>Topic 32 (Violent Crime)</b>	<b>Topic 33 (Public Employ)</b>	<b>Topic 34 (Agriculture)</b>	<b>Topic 35 (Certify)</b>	<b>Topic 36 (Tax)</b>
elect	victim	servic	land	associ	tax
comelec	peopl	appoint	agrarian	divis	section
vote	accusedappel	employe	compens	chairperson	revenu
resolut	wit	posit	reform	befor	assess
commiss	crime	commiss	properti	attest	incom
candid	stab	benefit	agricultur	rtc	intern
ballot	kill	retir	dar	conclus	exempt
canvass	wound	administr	just	consult	commission
protest	testimoni	govern	darab	reach	cta
banc	murder	salari	determin	abov	refund

**Table 4: Top 5 terms with LDA when the number of topics set at k=36**

means of identifying *U.S. v. Nixon*. However, so few cases dealing with executive privilege reach the U.S. Supreme Court that a topic model risks classifying them under a less obvious topic, such as criminal law. Of course, this is also a risk with hand-coded issue areas, but



at least then the coder can use his expertise to create special categories for exceptional cases.

To see how the topic model performed in distinguishing prominent Philippine cases, I selected four high-profile constitutional cases from the Supreme Court’s docket during the period 1996-2012, including:

- *Tatad v. Secretary of Energy*, G.R. No. 124360 (Nov. 5, 1997)
- *Estrada vs. Desierto*, G.R. No. 146710-15 (March 2, 2001)
- *Province of North Cotabato vs. Philippines*, G.R. No. 183591 (Oct. 14, 2008)
- *de Castro vs. Judicial & Bar Council*, G.R. No. 191002 (March 17, 2010)

In Figure 2, I graph the posterior topic distributions over each of the aforementioned cases. As expected, the largest single topic in all of the cases is constitutional law (Topic 21), around 50% for each. However, the topic model does clearly distinguish the cases from each other by assigning different posterior distributions along the other 35 topics.

In *Tatad v. Secretary of Energy* (G.R. No. 124360), the Supreme Court struck down the Oil Industry Deregulation Law for failing to carry out the constitutional mandate against monopolies. According to the topic model, the second largest topic is commerce (Topic 6) at 34% probability, which includes monopoly law. The case also includes significant coverage of contracts (Topic 3) and corporations (Topic 24), and tax (Topic 36), all of which were discussed in the actual opinion. However, the topic model did not detect any latent topics regarding oil or natural resources, despite the prominence of such cases in the media. If the results for *Tatad v. Secretary of Energy* are any indication, it might simply be that many of the cases that involve natural resource disputes spend more time discussing other substantive areas of law.

In *Estrada vs. Desierto* (G.R. No. 146710-15), the Supreme Court confirmed the removal of President Joseph “Erap” Estrada on allegations of corruption. The topic model identified the case as primarily a constitutional case combined with several other smaller topics. The second largest was corruption (Topic 1), at 8% probability, which accords with the basis for Estrada’s removal. The model also assigned management of the bar association (Topic 4) to this case, perhaps because the language of investigating and disciplining officials resembles that of impeachment. However, none of the other topics assigned to this case clearly identify it as impeachment. Of course, impeachment cases are rare, but to the extent that researchers want to treat these “low-frequency, high-impact” cases separately, it is not clear the LDA model can achieve this.

In *Province of North Cotabato vs. Philippines* (G.R. No. 191002), the Supreme Court reviewed and annulled a peace agreement between the Arroyo administration and the Mindanao Islamic Liberation Front. Obviously, the case included a significant discussion of contract language. The topic model assigned a posterior topic probability of 9% to the contracts topic (Topic 3), suggesting that Topic 3 should not be interpreted solely as “private” contracts. However, the topic model also detected discussion of local governance by assigning 15% probability to Topic 10. One of the central disputes in the Mindanao conflict has

been local autonomy in Muslim-majority provinces. However, the conflict has also raised key questions about property rights, so it is perhaps surprising that the topic model did not assign significant probability to any of the property topics.

Finally, *de Castro vs. Judicial & Bar Council* (G.R. No. 191002) recognized President Arroyo’s authority to appoint Renato Corona as chief justice in May 2010, despite a constitutional ban on midnight appointments before the 2010 general election (Vitug, 2012; Nardi, 2012). In addition to constitutional law, the topic model assigned high probability (15%) to the public employment topic (Topic 33). Indeed, the central legal question was whether appointing a judge to the Supreme Court was the same as appointing a government official. Likewise, the model assigned 13% probability to the elections topic (Topic 31), reflecting the timing of the appointment. Interestingly, the model assigns around 4% probability for both management of the judiciary and of the bar association. While *de Castro vs. Judicial & Bar Council* did not involve any questions of legal ethics, the name of the body that nominates judicial candidates is the Judicial & Bar Council, so the topic model likely picked on that usage.

Overall, the topic model can assign posterior topic distributions to “low-frequency, high-impact” constitutional cases in a manner that provides salient information about the case. However, because the model only detected a single topic to cover constitutional law, the model is limited in its ability to differentiate between different types of constitutional issues. Thus, in order to distinguish the cases, researchers must rely upon the posterior distribution over other topics, which might reflect the underlying substantive disputes.

## 6 Detecting Judicial Engagement in Politics

One of the most fundamental questions about any judicial system is whether courts are engaged in adjudicating salient political disputes. Because courts are essentially passive institutions and must receive cases from petitioners, if courts are actively engaged in such disputes we would expect the distribution of topics in the court’s docket to be correlated with broader trends in the political environment. It would suggest, at least to some extent, that political elites, businesses, and civil society actors resort to courts in order to adjudicate disputes. By contrast, we would expect courts whose dockets do not change in response to political trends to be less embedded in society.

We can plot the posterior topic distributions over time in order to assess whether the number of cases in the Philippine Supreme Court’s docket changes around the same time as broader changes in the political environment. For the purposes of this paper, I focus on the total number of documents affiliated with the three most politically salient topics during 1996–2011: corruption (Topic 1), constitutional law (Topic 21) and elections (Topic 31).<sup>13</sup> Unfortunately, the Supreme Court website does not post cases before 1996, meaning it is impossible to use the model to analyze the impact of critical events that occurred before January 1, 1996, such as the People’s Power revolution. Of course, the results do not prove causation, but, as discussed below, are indicative of a relationship.

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<sup>13</sup>I omit 2012 because my sample only covers the first four months of the year.

As mentioned above, the overwhelming presumption in the literature is that the Philippine Supreme Court has become a power veto player actively involved in controversial political disputes (Pangalangan, 2004, 2008; Gatmaytan, 2003). The court has appellate jurisdiction over corruption cases from the Sandiganbayan (the anti-corruption court), as well as broader constitutional review. The court has frequently ruled against the government in high profile political disputes. The justices have also stricken down major economic initiatives on the grounds that they claimed violated the constitution’s protectionist provisions.<sup>14</sup> The preliminary results in Figure 3 suggest that this view of the Philippine Supreme Court as responsive to and engaged in political disputes is accurate, albeit the topic model cannot confirm how frequently the justices rule against the government.

## 6.1 Corruption Cases

As seen in Figure 3, corruption cases in the Supreme Court’s docket peak between 1998–2001 and 2004–2010. The first period corresponds with the presidency of Joseph Estrada, whom, as mentioned in the discussion of *Estrada vs. Desierto*, was removed due to allegations of corruption. The second period corresponds to President Arroyo’s second term in office. Arroyo is widely alleged to have engaged in even more widespread corruption than her predecessor. Most of these cases likely arrived before the Supreme Court on appeal from the Sandiganbayan. By contrast, corruption cases declined during Arroyo’s first few years and the onset of Aquino’s term in 2010.

The results are puzzling to the extent that one would expect a delay between public allegations of corruption and corruption cases appearing in the court’s docket, especially given the Supreme Court’s chronic backlog of cases (SCPIO, 2011). However, corruption cases do peak around the most allegedly corrupt presidencies. The first peak might simply represent the general increase in cases on the court’s docket around the late 1990s. The court around this time was still deciding cases involving corruption under the Marcos regime. However, the total number of cases remains relatively constant after the late 1990s, whereas the number of corruption cases dips after 2000. The second peak might in fact reflect cases against Joseph Estrada coming through the pipeline. As such, it will be interesting to observe whether the number of corruption cases rises or falls over the next few years as pending cases against Arroyo reach the Supreme Court.

## 6.2 Constitutional Cases

The posterior topic distributions in Figure 3 appear to track major constitutional events well. The first peak, around 1997, likely corresponds to litigation surrounding President Ramos’ attempts to amend the 1987 Constitution. The explanation for the second peak, around 2000,

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<sup>14</sup>See, e.g., *Garcia v. Board of Investments*, G.R. No. 92024 (S.C. Nov. 9, 1990) (prohibiting investors from relocating a petrochemical plant); *Manila Prince Hotel v. GSIS*, G.R. No. 122156 (S.C. Feb. 3, 1997) (allowing a losing Filipino bidder to match post hoc the bid of a Malaysian for the historic Manila Hotel, citing the constitutional provision granting preferential rights to nationals). For more examples, see Tate (1997a, 475-78).

is less clear, but it might correspond to petitions complaining about the constitutionality of some of Estrada’s actions, such as imposing martial law in Manila, as well as questions surrounding his removal. The third peak, between 2004–2006, corresponds to the litigation surrounding President Arroyo’s attempts to amend the constitution. The court issued several opinions in *Lambino v. Commission on Elections* in declaring the method of constitutional change unconstitutional.

The final peak, from 2007–2010, corresponds to Renato Puno’s term as chief justice. While it is not clear his chief justiceship caused the increase, it was marked by several high-profile constitutional disputes, including the aforementioned *Province of North Cotabato vs. Philippines* and *de Castro vs. Judicial & Bar Council*. Moreover, Puno himself was very active in encouraging civil society to file constitutional cases with the court, even hosting a high-profile summit on extrajudicial killings and promulgating new writs to aid human rights victims (Parreno, 2011).

### 6.3 Elections Cases

Elections in the Philippines are held every three years, with presidential elections occurring every six. While the Supreme Court does not possess primary jurisdiction over elections disputes, it does have appellate jurisdiction. Moreover, according to the constitution, it forms a Presidential Electoral Tribunal in adjudicating disputes over presidential elections (Art. VII, §4). The court can also review the constitutionality of laws regulating elections or political parties.

The results in Figure 3 do show a cyclical pattern for the number of elections cases on the court’s docket. Typically, elections cases peak approximately every three years, reaching a peak around a year before the next election. This seems to suggest that the majority of the court’s elections cases do not involve adjudicating electoral results – which falls primarily to the Commission on Elections and other bodies – but rather receives petitions from parties and candidates preparing to compete in the next election. Some of the more prominent elections cases in the sample involve smaller political parties challenging restrictions on the party-list system.

## 7 Conclusions & Extensions

For years, one of the most significant obstacles to research in comparative judicial politics has been the lack of reliable data. Coding judicial decisions, when possible, entailed a significant investment of time and resources. Latent topic models provide a new way to take advantage of our most abundant source of data: the words in the judicial decisions themselves. While Latent Dirichlet Allocation and other topic models are not holy grails, they do help mitigate the risk of bias and coding error inherent in hand-coded data.

In this paper, I have attempted to contribute to the literature in several ways. First, propose a new use for latent topic models in comparative judicial politics by analyzing the distribution of topics on the court’s docket in relation to broader political trends. Second, I

use the results of the latent topic model to suggest that hand-coding often underestimates the number of unique topics dedicated to procedural or administrative topics. Third, I show that while topic models cannot pinpoint the “low-frequency, high-impact” cases frequently of interest to political scientists, they do provide meaningful interpretations of those cases. Finally, on a practical level, I have addressed some of the issues that arise when conducting a topic model in a comparative context, including the prevalence of foreign vocabulary.

The ability to track the distribution of topics over time and compare the results with broader political trends has potential to be a useful new method for assessing the extent to which courts have become political actors. Current either develop categorical variables of judicial independence (Staton and Rios-Figueroa, 2011) or count the percentage of cases in which the court rules against the government. The latent text results promise to provide a more nuanced measure of judicial engagement with and embeddedness in society. It should also be possible to utilize the posterior topic distributions as data for statistical models of the court’s docket.

One future direction for this research involves splicing the data further with other social, political, and economic variables. Perhaps because the judicial politics literature has until recently focused so heavily on the U.S. Supreme Court, there is limited theoretical literature about the distribution of topics on the judicial docket. In particular, a latent topic model could help test Epp (1998), particularly his theory that increases in philanthropy help create public interest litigation NGOs, which in turn increases the proportion of rights cases on the court’s docket. Unfortunately, LDA cannot code whether a particular case involves an NGO litigant, so that information must be extracted through hand-coding.

Another direction for research is testing how latent topic models perform cross-nationally. To my knowledge, this has not yet been attempted. Can the topic model appropriately categorize translated documents from several different countries? Should texts from different countries be processed differently? With these questions answered, it should be possible to create a topic model not just for the American or Philippine Supreme Court dockets, but also for the dockets of all supreme courts combined.

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Figure 2: Posterior topic distributions for select cases at  $k = 36$

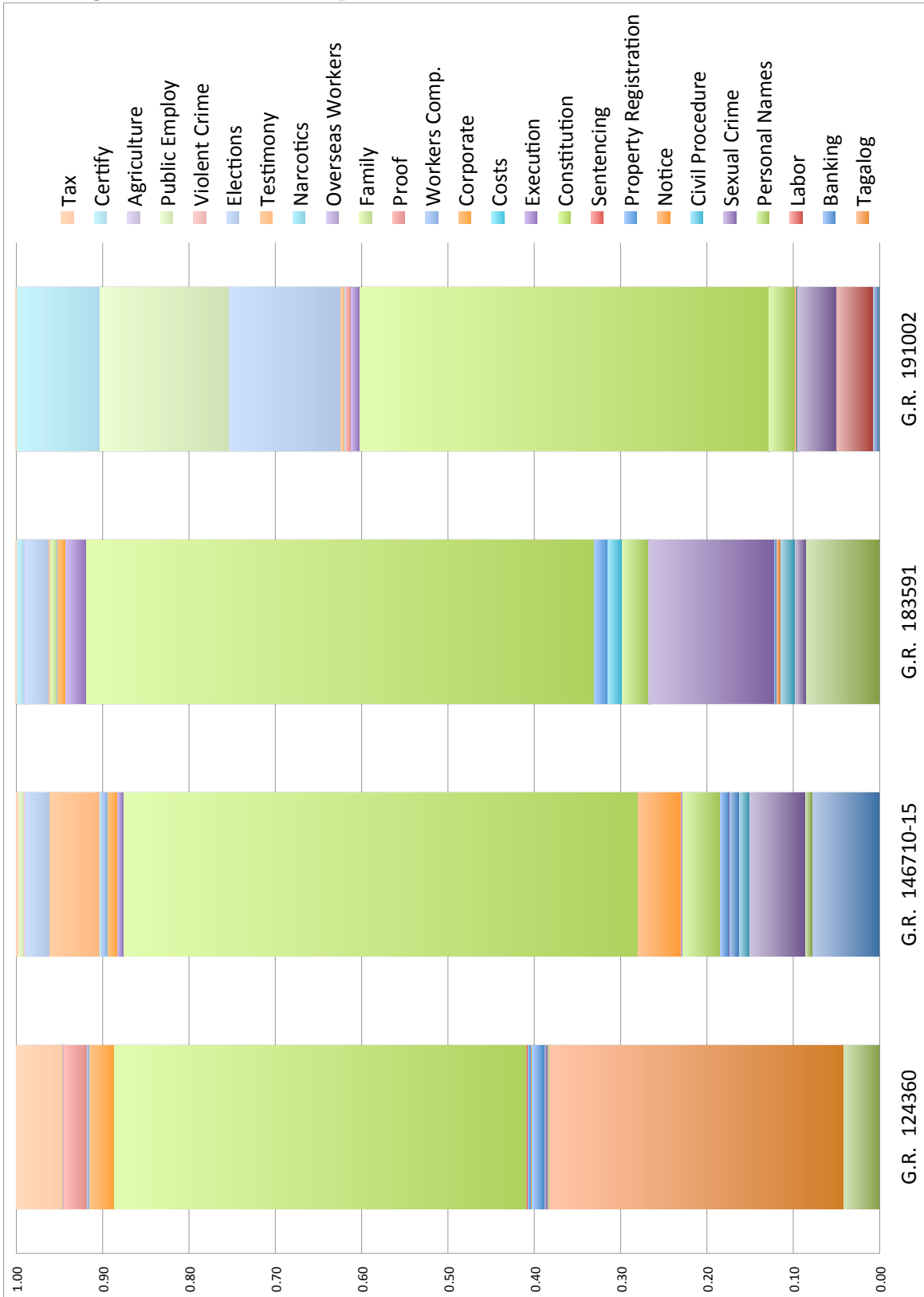


Figure 3: Total documents affiliated with corruption (Topic 1), constitutional law (Topic 21) and elections (Topic 31) from 1996–2011

