Driving Forces of Diversification in Central Banks' Functions: Global Textual Analysis of Central Bank Laws*

Kenya Amano† & Masaaki Higashijima‡

October 10, 2023

Abstract

Why are some governments delegate more functions to their central bank than others? Despite the importance of non-monetary functions of central banks that significantly affect economic activities both domestically and internationally, little is known about the relationship between a variety of central bank functions and governments' delegation strategies. The conventional wisdom of independent central banks considers that the narrower focus of central bank mandate on price stability, the better economic outcomes. However, no central bank operates only monetary policies, and delegating non-monetary functions has increased, especially after the Great Financial Crisis. To empirically capture the diversification of central bank mandates, we apply the Keyword Assisted Topic Models to the central bank statute of 103 countries. We analyze governments' delegation strategies by focusing on a trade-off between central bank autonomy and the breadth of its policy functions. We suggest that governments are likely to allow broader policy roles to the central bank when countries are more autocratic and have lower state capacity. Our findings advance our understanding of when governments formally delegate certain political and economic powers to central banks.

*This work was supported by a JSPS grant-in-aid (Grant Number 21K18417).
†Postdoctoral Research Fellow at Harvard University.
‡Associate Professor of Comparative Politics, Institute of Social Science at the University of Tokyo.

Introduction

Since the early 1990s, reforms in central banks have been advanced globally, which dramatically increased the independence of this "unelected power"(Tucker 2018). In the wave of central bank reforms, central bankers' main mandate has been price stability guided by credible monetary policy. More recently, reforms of central banks have gone further to expand their mandates for a broader range of policies (Ortiz 2009). Accountability and informational transparency of central banks were viewed as an important agenda for central bank reforms to enhance the credibility of monetary policy (Geraats 2002). Furthermore, both the 2008 Great Financial Crisis and the COVID-19 pandemic posed pertinent lessons for policymakers to embed institutional mechanisms to stabilize financial systems. These experiences resulted in expanding functions of central bankers beyond monetary policies, including micro- and macro-prudential oversight, supervision of financial institutions, provisions of liquidity as "the lender of last resort," and foreign exchange operations (e.g., Musthaq 2021; Cantu et al. 2021). The imminent risk of climate change has also been proposing discussions among central bankers on how to deal with financial risks stemming from climate-related issues, prompting central banks to lead green energy policies (NGFS 2020; Buch 2021). Given the development of the diverse functions and mandates of modern central banks, one pertinent question arises: Under what conditions do governments delegate a variety of policy functions to their central banks?

Despite expanding mandates of central banks, we know little about when governments decide to offer central banks formal policy discretion in a wide range of economic policies. The literature on central banking has mostly focused on a mandate of monetary policy – price stability –, while assuming that conservative central bankers seek to control price increases and thus use traditional monetary policy tools (i.e., manipulation of short-term interest rate and limits on government borrowing) to combat inflation (e.g., Grilli, Masciandaro, and Tabellini 2014; Alesina and Summers 1993). The literature greatly deepened our understanding on the relationship between central banking and economic performance. However, the exclusive focus on price stability as the bank's goal as well as monetary policy as its means does not allow scholars to explore what implications the recent diversification of central banks' policy mandates may have on the causes and consequences of the banks' institutional design.

This paper aims to fill this void in the central banking literature by conducting a new textual analysis of central bank laws. The text analysis of central bank statute enables us to capture a broader range of policy functions that contemporary central bankers hold yet have not been adequately explored by scholars. Referring to the classification by Ortiz (2009), we identify six policy functions of central banks and different degrees of policy delegations across countries: financial stability and regulation; currency provision; payment and settlement; foreign exchange and reserve management; other operations functions as well as traditional monetary policy function. Then, we operationalize the degree of policy function delegation as the share of the topic word amounts related to each policy function in the entire laws, using the Keyword Assisted Topic Models (Eshima, Imai, and Suzuki 2021).

To explain the cross-national variation in central bankers' mandates, we then conduct a preliminary analysis of the correlates of policy delegation. When diversifying central banks' mandates, governments need to consider a principal agent problem: Delegating a broader range of powers to an agent with expertise (i.e., the central bank), the government as the principal may be able to increase policy efficiency, while risking agency slack arising from dissimilar preferences between the government and the central bank. With this problem in mind, we focus on the following two factors as explanatory variables: political regimes and state capacity. We expect whether a country is democratic or not to significantly influence the degree to which the government controls the central bank: autocratic governments can make central bankers at their disposal, even if they formally delegate policy functions to central bankers, while the rule of law and high levels of political accountability in democracies make it difficult for politicians to renege on what central bank statute stipulates. Consequently, autocratic governments are more likely to offer a wide range of functions to central bankers than their democratic counterparts. Regarding state capacity, countries with low state capacity may find it more difficult to disperse policy functions across ministries because the executive is unable to orchestrate bureaucrats and, thus, effectively conduct macroeconomic policies. Under this situation, governments are more likely to concentrate diverse policy functions on the central banks, which essentially exist in most countries.

Overall, the findings in the preliminary analysis support our expectations. First, we find that democratic countries are less likely to have a higher distribution of text related to financial stability and regulatory function, and foreign exchange and reserve management function. Second, within the five non-monetary policy functions, all but other operative functions have a negative association with high state capacity, while only the foreign exchange and reserve management function is statistically significant at the 5% level.

This paper makes three important contributions. First and foremost, we contribute to advancing our understanding on the diversification of central bank functions. To the best of our knowledge, this study is a first attempt to systematically understand this important research agenda by analyzing the text of central bank laws worldwide via a topic model. By conducting textual analysis on our preliminary collection of cross-sectional text data of central bank laws, we illuminate the conditions under which governments formally delegate policy functions to central bankers. Second, in so doing, we go beyond a dominant view in the literature that central banks only seek to achieve price stability by utilizing monetary policy tools. By relaxing this assumption of central bankers' policy objective, we expand the focus of the central banking literature to non-monetary dimensions. Third, by focusing on political regimes and state capacity as primary variables explaining variations in central bank functions, we suggest that these two factors influence the content and coverage of central banking, as well as monetary and fiscal effects of central bank independence (Bodea and Hicks 2015; Bodea and Higashijima 2017) as well as other socio-economic outcomes (e.g., Besley and Persson 2010; Gerring, Knutsen, and Berge 2022).

This paper is organized as follows. The next section reviews the comparative political economy literature on central banking, suggesting that research has exclusively focused on the central bankers' roles in monetary policy and price stability. In the third section, we explore determinants of diversification of central banks' policy functions, while shedding light on the impacts of political regimes and state capacity. The fourth section conducts a preliminary textual analysis of central bank statutes to empirically assess our theoretical expectations. Lastly, conclusions follow to suggest possible implications derived from this study as well as the next tasks this research will tackle in the future.

Beyond Inflation: Varieties of Central Banks' Functions

Driven by expanding roles of central banks, scholars have explored the conditions under which central banks become a credible authority to influence policy-making and economic performance. Governments are tempted to use monetary policy to boost their political support for their electoral purposes (Hibbs 1977; Block 2002; Franzese 2002). As a measure of shielding monetary policy from political motives, researchers emphasized the importance of delegating the mandate of monetary policy to an independent institution – the central bank. By delegating monetary policy to conservative, independent central banks which prefer price stability, central banks can adopt short-term interest rates and control lending to governments in response to economic needs without facing political manipulation of monetary policy, thereby enhancing policy credibility (Barro and Gordon 1983; Rogoff 1985; Alesina and Summers 1993). Although debates still ensue on when independent central banks become effective in producing low inflation (Adolph 2013; Bodea and Hicks 2015) as well as what side effects central bank independence is likely to produce (Aklin and Kern 2021; Hansen 2022), scholars mostly agree on the view that independent central bankers' main objective is to pursue price stability.

Based upon this paradigm, the study on central banking has employed the Central Bank Independence (CBI) Index to empirically capture the political independence of central banks, which is originally created by Cukierman, Webb, and Neyapti (1992) and then expanded by other researchers (Polillo and Guillén 2005; Bodea and Hicks 2015; Garriga 2016). In the CBI Index, central bank laws are coded on 16 dimensions related to four major components of CBI: (1) CEO's characteristics (i.e., appointment, dismissal, and tenure of the chairman of the bank), (2) policy formulation attributions (i.e., who formulates and has the final say in monetary policy and the role of the central bank in the budget process), (3) the central bank's objectives (i.e., whether price stability is stipulated as the main objective), and (4) the central bank's limitations on lending to the public sector. These 16 components are then combined into a single weighted index, ranging from 0 to 1 CBI. Higher scores indicate that the central bank is able to decide monetary policy for price stability, politically independent of the government.

Although the CBI index greatly contributed to developing empirical analysis of central banking politics, we encounter at least the following two limitations that need to be addressed by further research. First, the conventional measure of CBI exclusively focuses on the role of central banks in the sphere of traditional monetary policy. The index is based on the assumption that independent central bankers solely pursue price stability and determine levels of short-term interest rates and limit lending to governments for that goal. Although this assumption is reasonable when exploring how central bankers use monetary policy tools independent of governments' political motives, the exclusive focus on central banks' discretion over these conventional monetary tools does not allow us to illuminate the recent growing diverse functions of central banks. For instance, the 2008 Great Recession and the COVID-19 pandemic prompted policymakers to institutionalize mechanisms for preventing a financial crisis and swiftly stabilizing financial systems from economic downturns (Musthaq 2021; Cantu et al. 2021; **?**). Through these experiences, policy mandates of central bankers were greatly expanded in many countries, including micro- and macro-prudential oversight, enhancing liquidity for private banks, supervision and regulation of financial institutions. Additionally, given the importance of improving accountability and transparency of central banks for monetary policy credibility, an increasing number of central banks publish economic and financial indices to validate their projections (Geraats 2002).

Emerging comparative political economy literature starts investigating the cause and consequences of these new mandates of central banks. For instance, constructing a new CBI data set which comprises multiple components of fiscal independence and forecast reporting and information disclosure, as well as the conventional 16 items, Romelli (2022) reports that past levels of independence, IMF loan, and democratic reform are all positively associated with independent central banks. Similarly, using an original database capturing the extent of central bank involvement in financial sector supervision, Masciandaro and Romelli (2018) shows that systemic banking crises tend to be followed by the strengthening of financial sector supervision. Conducting case studies of exchange operations by the Reserve Bank of India and asset purchase programs by the U. S. Federal Reserve, Musthaq (2021) suggests that since the 2008 financial crisis, these unconventional measures have been increasingly used even in non-crisis times, blurring boundaries between crisis and non-crisis interventions. These studies strongly suggest that the non-monetary functions of central banks have significant implications on central banks' institutional design as well as economic performance. However, these studies focus on one or two non-monetary functions and/or limit their empirical scopes to a smaller number of countries.

The second problem of the conventional CBI index is that it simply aggregates two different dimensions of central bank characteristics – (1) political independence from the government (e.g., CEOs' autonomy of appointment/dismissal by the government, decision-making power of central banks) and (2) monetary functions and objectives. This is problematic, especially when one wants to capture varieties of *de jure* policy functions that central banks hold and how diversification of policy functions may change according to political independence from governments. By clearly distinguishing the concept of political independence from policy functions formally given to central bankers, we investigate the relationship between political independence and policy functions. Since the extant research only used central bank laws to code how much emphasis is put on the price stability goal and central banks' political independence, we know little about what factors are likely to influence the diversification of central banks' policy mandates. This paper fills this void by conducting a text analysis that includes all the provisions documented in central bank laws of 103 countries. In what follows, we focus on three factors that are likely to be correlated with policy delegation to central banks: *political independence of central banks, political regimes and state capacity.*

Explaining Variations in Central Banks' Functions: Political Independence, Political Regimes and State Capacity

For central banks to hold particular policy mandates, governments need to decide to delegate those policy functions to central banks by revising central bank statutes to formally guarantee central banks' discretion over the policy areas. Such a delegation of policy mandates to central bankers, however, is likely to entail an important trade-off for governments. On the one hand, by delegating various policy functions to this professional economic institution, governments can rely on central banks' expertise, which makes it possible to conduct reasonable economic policymaking in response to the current issues. Furthermore, by declaring that governments delegate many policy functions to independent central banks, policy credibility is likely to increase across various policy areas without being exposed to political manipulation of economic policy tools.

On the other hand, by delegating policy mandates to independent central banks leads governments to significantly lose discretion over these policy tools, enhancing central bankers' decision-making powers in a wide range of economic policies. If governments cannot effectively control central banks in the way that the preferences of the central bank are in line with the governments' ones, then delegating policy functions to central banks is likely to generate a problem of agency slack. In other words, when offering a variety of policy functions to the central bank, the government is likely to face a trade-off between policy efficiency/credibility and political use of economic policy.

Although there should be numerous factors that are likely to mitigate this trade-off, this paper focuses on the following two determinants – political regimes and state capacity. By political regimes, we refer to a set of "rules that identify the group from which leaders can come and determine who influences leadership choice and policy" (Geddes, Wright, and Frantz 2014). In democracies, citizens choose leaders via elections. Governments are constrained by vertical and horizontal accountability and thus need to respond to preferences of citizens and other political elites: democracies hold free and fair elections to make politicians respond to what voters prefer and develop checks and balances between authorities through judicial and legislative constraints on the executive. Conversely, autocracies significantly lack these two dimensions of political accountability: authoritarian leaders do not hold free and fair elections and are less constrained by the institutional balance of powers.

We suggest that democratic governments are less likely to delegate a broad range of policy functions to central banks than their autocratic counterparts, especially when the central bank is stipulated to be politically independent from the government on central bank laws. In democracies, the robust presence of vertical and horizontal accountability makes it difficult to renege on what governments stipulate on central bank law (Bodea and Higashijima 2017). Transgressing *de jure* policy discretion of central banks, it is more likely that democratic governments are electorally punished by citizens as well as denounced by legislative and judicial branches and other third-party actors. Given these constraints on the executive, governments become more selective in deciding in what policy area governments need to reap the benefits of policy efficiency and thus increasing policy discretion to central bankers. Put differently, by engaging in delegating policy mandates in the face of strong vertical and horizontal accountability, governments are able to commit more credibly to their promises of increasing central banks' discretion over a particular policy tool.

Conversely, autocratic governments are less worried about the risk of delegating a wide range of policy mandates to central bankers on central bank law, even if central bankers are politically independent from governments on paper. Since vertical and horizontal accountability is very weak or does not exist in authoritarian regimes, autocratic governments are less reluctant to renege on what they once promised on central bank law. Given a larger room for intervening in central banks' decisions in authoritarian politics, autocrats may delegate a broader range of policy functions to central banks. By doing so, autocratic may even be able to obtain several benefits. First, they may be able to use central banks as a scapegoat in the face of economic downturns (Bodea, Garriga, and Higashijima 2019). They may find it easier to attribute policy failure to central banks by delegating many policy functions to central bankers. Second, other things being equal, maintaining policy discretion within the government have the potential of decentralizing policy-making processes across ministries, retaining power of other political elites that hold veto power (Noble 2020). By concentrating a variety of policy mandates in the hands of the central bank, autocrats can easily dominate a broad range of policy areas by only capturing the bank. These discussions lead to the first hypothesis:

> Hypothesis 1 (Political Regimes and Policy Functions of Central Banks):
> Democratic governments are less likely to delegate a wider range of policy functions to central banks than their autocratic counterparts.

The second factor that is likely to influence the pay-off of the government under the trade-off between policy efficiency and policy discretion is state capacity. We suggest that lower state capacity is positively correlated with delegating a wider range of policy functions to the central bank. In the process of state building, no country starts without founding its central bank. For one, creating and circulating national currency is an important aspect of market infrastructure, which the central bank needs to manage. Besides, one outstanding feature of this national economic institution is that it is tightly linked to the international community of central banks via the expertise of economics and the English language. Due to this reason, institutions of central banks are very likely to be transplanted to new states, where their institutional designs are largely based upon those of preceding counties, although then customized according to various domestic circumstances (Johnson 2016).

Countries with low state capacity do not usually possess well-institutionalized bureaucracies which have enough capacities to implement public policies, in particular in the policy areas of exchange rate management, public administration of monetary and fiscal affairs, and maintenance and publication of government statistics. In the face of the underdevelopment of bureaucracy across ministries, governments themselves cannot effectively carry out macroeconomic policies by using government agencies. Under this condition, governments with low state capacity are more likely to concentrate a variety of policy functions on central banks, a ubiquitous economic institution established even in young, weak states. In contrast, countries with high state capacities are armed with high-quality bureaucracy which enables politicians to manage a wide range of policy functions within the government. Therefore, governments with higher state capacity may be more reluctant to delegate a wide variety of policy mandates to central banks, especially if central banks are politically independent.

> Hypothesis 2 (State Capacity and Policy Functions of Central Banks): Governments with high state capacity are less likely to delegate a wider range of policy functions to central banks than those with low state capacity.

Preliminary Textual Analysis of Central Bank Laws

Text Data and Method

We conduct quantitative textual analysis by using cross-national text data of central bank statutes to test our hypotheses. We collected central bank laws from 103 countries on the globe[1]. Analyzing what central bank law stipulates (and what it does not stipulate) is a very useful source of information measuring in what policy areas the government delegates policy-making power to the central bank. Central bank laws

[1] Majority of central bank statutes are as of 2016.

refer to, in general, its primary objectives, forms of organization, the appointment, dismissal and term of office of management, relations with the government, and powers and functions entitled to the central bank. Thus, in this study, we operationalize the degree of policy function delegation as the share of the topic word amounts related to each policy function in the entire laws – *document-topic distribution*. This measurement has the advantage of quantifying the delegation of policy functions than simply coding each function as dummy variables because the relative proportion of the word amounts within each text of central bank laws could reflect the legislator's intention regarding the degree of authorization of each function. Thus, document-topic distribution can quantify both the existence of policy functions and the degree of authorization.

To quantify document-topic distribution, we employ a semi-supervised topic model developed by Eshima, Imai, and Suzuki (2021). Since classifying and coding documents manually needs lots of time and effort, political scientists increasingly rely on fully automated content analysis based upon machine learning models (Grimmer and Stewart 2013). In particular, researchers have frequently used probabilistic topic models to explore the associations between identified topics and meta-information like, in our case, political regimes and state capacity (e.g., Grimmer 2010; Roberts, Stewart, and Airoldi 2016). Although the conventional structural topic models are good at letting the data speak about the underlying theme of a corpus, they are not necessarily well suited to measure specific concepts that researchers want to measure. Relatedly, the conventional approach demands researchers to interpret and label estimated topics after model fitting, which risks *post-hoc* decisions about a connection between estimated topics and substantive concepts of interest. To overcome this problem, Eshima, Imai, and Suzuki (2021) proposed the keyword-assisted topic model (keyATM). These semi-supervised estimations by the keyATM model enable us to classify the topics using keywords that the researcher specifies *ex ante*. We rely on this approach to operationalize the degree of policy function delegation in the following process.

Table 1: Topic-identifying keywords

Policy Function Topic						Governance Function Topic	
Monetary policy	Financial stability and regulation	Currency provision	Payment and settlement	Foreign exchange and reserve management	Other operations	Appointment	Relation to government
monetary	banking	coins	payment	foreign	operation	executive	state
economic	supervision	notes	settlement	exchange	operations	appointment	congress
macro-economic	oversight	banknotes	paying	reserve	statistics	governor	party
price	regulation	circulation	payments	reserves	data	directors	ministry
rate	supervisory	issue	settlement	currency	research	members	president
market	macro-prudential	issued	securities	intervention	debt	member	parliament
money	prudential	digital	security	liquidity	asset	council	federal
	macroprudential	deposit		swap	statistic	chairman	republic
	prudent				consumer	person	audit
	lender				services	board	minister
	resort				service		
					publication		
					publications		

Dependent Variable: Document-Topic Distribution

Our dependent variable is *document-topic distribution* which requires us to decide on the number of topics of interest and on a set of keywords related to the topics. First, referring to the classification by Ortiz (2009), we identity six categories of policy functions: *Monetary policy* function, *Financial stability and regulation* function, *Currency provision* function, *Payment and settlement* function, *Foreign exchange and reserve management* function, *Other operations* function including economic research, statistics, debt and asset management, consumer service. Second, because central bank laws also define the form of governance and management in addition to policy functions, we include two topics related to governance: *Appointment* and *Relation to government*. The selected 7-13 keywords to identify each topic are listed in Table 1. Moreover, we include topics without keywords to exclude the themes in texts that we cannot identify with the keywords. We estimate six topics without keywords. Finally, we pre-process all text by excluding country names, country-specific abbreviations, English stop words, and terms and verbs related to the structure of laws in general[2].

Figure 1 shows that the estimated document-text distributions across countries. Countries are sorted by the share of governance topics, the sum of *Appointment* and *Relation to government*. For instance, Belarus, at the top of the vertical axis, shares 58.1%

[2]For instance, these words are “article,” “section,” “paragraph,” “laws,” “amended,” “may, “and “shall.”

for the governance topics, whereas the share of *Monetary policy* function, *Financial stability and regulation* function, *Currency provision* function, *Payment and settlement* function, *Foreign exchange and reserve management* function, and *Other operations* are 3.5%, 10.2%, 3.9%, 3.1%, 5.8%, and 12.1%, respectively. The estimated topics without keywords are aggregated in *Others* in Figure 1.

Explanatory Variables: Political Regime and State Capacity

We introduce two core explanatory variables: political regimes and state capacity. For political regimes (Hypothesis 1), we employ a couple of measures of political regimes. Our main variable is the Varieties of Democracy's "liberal democracy index" (*v2x_libdem*), which integrates various ingredients of democratic regimes, including free and fair elections, freedom of associations and expression, and institutional checks and balances (Coppedge et al. 2022). This continuous index quantifies the granular differences between and within democratic countries and autocracies. We also use another the Varieties of Democracy's "regime of the world scores" (*v2x_regime*), which classifies political regimes into the four types: (0) closed autocracy, (1) electoral autocracy, (2) electoral democracy, and (3) liberal democracy. Finally, we use Boix, Miller, and Rosato (2013)'s binary measure of democracy and dictatorship. They define a country as democratic if the country satisfies the following three conditions and otherwise authoritarian: (1) The executive is directly or indirectly elected in popular elections and is responsible either directly to voters or to a legislature, (2) The legislature (or the executive if elected directly) is chosen in free and fair elections, and (3) A majority of adult men has the right to vote. In our data, 68 out of 103 countries are democratic.

For state capacity (Hypothesis 2), we use the Worldwide Governance Indicators (WGI). The WGI prepares five components that illuminate various aspects of state capacity, namely, government effectiveness, corruption, regulatory power, political accountability, and the rule of law. To avoid our state capacity measure overlapping with political regimes, we only aggregate three components: government effectiveness, the regulatory power of states, and corruption. Higher score indicates stronger state

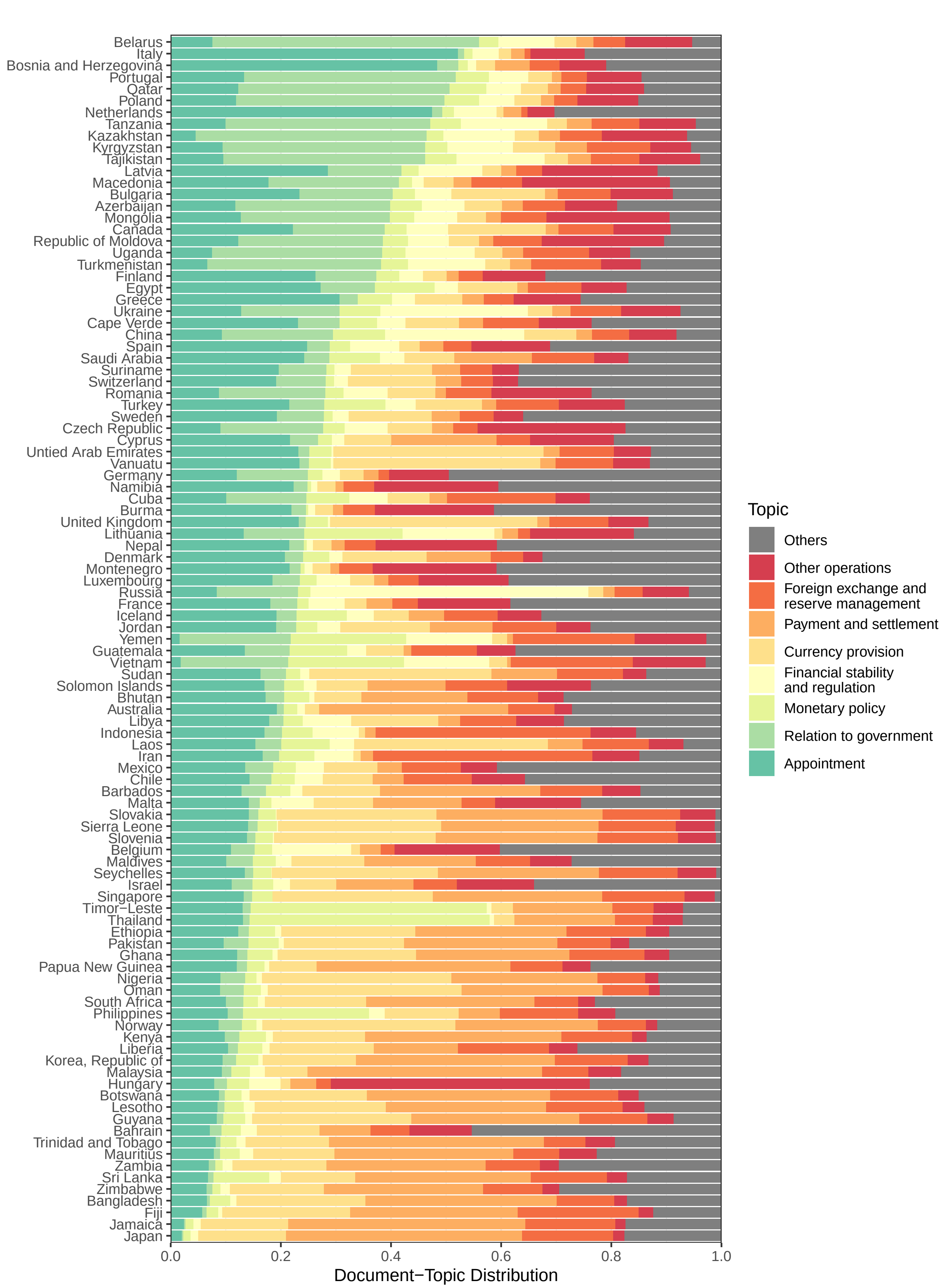

Figure 1: Document-Topic Distribution by Country

capacity.

Using these variables, we estimate the correlates of political regimes and state capacity on *Document-Topic Distribution* of six policy function topics and two governance topics. Because the size of observations is small, we regress political regimes and state capacity on *Document-Topic Distribution* without any other covariates that could avoid omitted variable bias in this preliminary analysis.

Preliminary Results

Figure 2 presents the results for the relations between political regimes and functions of central banks. As mentioned, we hypothesize democratic governments are less likely to delegate a wider range of policy functions to central banks than their autocratic counterparts. Thus, the hypothesis expects that the estimates of the liberal democracy index on policy function topics except for *Monetary policy* would be negative, suggesting autocratic countries are likely to have a higher distribution of text related to five non-monetary policy functions.

Of the six topics related to policy functions, three policy functions – *Financial stability and regulation*, *Foreign exchange and reserve management*, and *Monetary policy* – are less likely to be refereed in democratic countries in statistically significant ways, whereas the other three functions – *Currency provision*, *Payment and settlement*, and *Other operations* – political regimes do not make statistically significant differences. These results largely hold the expectation of Hypothesis 1. In particular, *Financial stability and regulation* and *Foreign exchange and reserve management* functions could conflict with other ministries and interest groups more that other functions, so that democratic countries are reluctant to delegate these powers. On the other hand, *Currency provision* and *Payment and settlement* are the fundamental functions of central bank operation that could not be differentiated by political regimes. However, the estimate on *Other operations* conflicts with our expectation that it would take a negative coefficient. Also, we expect the estimate on *Monetary policy* would take a positive coefficient or statistically insignificant, but the result shows the estimate is negatively significant at the 5% level.

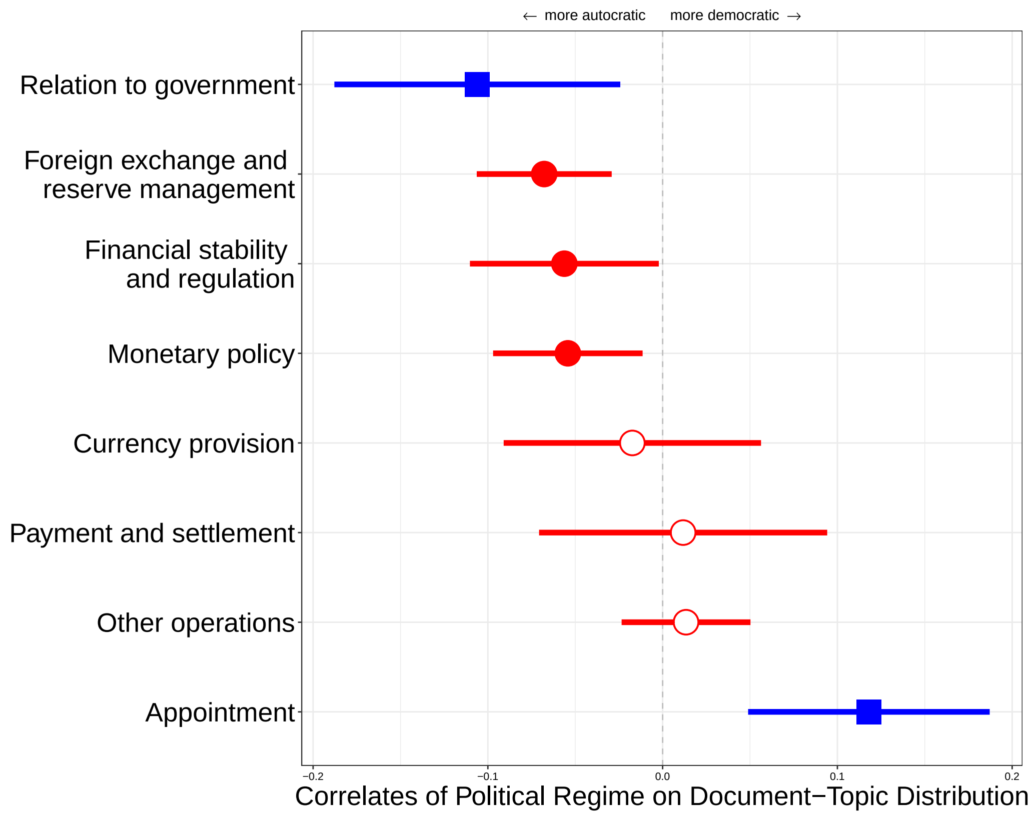

Figure 2: Correlates of Democracy and Central Banks' Functions
Note: Red circles indicate topics related to policy functions; blue circles indicate governance topics. Horizontal lines are 95% confidence intervals. Solid and open symbols indicate significance at the 5%level and nonsignificance, respectively.

Likewise, in two governance topics, central bank laws in democracies are more likely to refer to texts related to the appointment of central bankers, while the topic of government relations is less likely to mention in democratic countries. It is reasonable for democracies to have a higher distribution of texts about appointments because the form of delegation to unelected officials is critical to democratic accountability. On the other hand, authoritarian countries are more likely to weigh the topics of relation to government. We need to investigate more about the related texts in the laws and whether these topic words define the relationship between central bank and executive powers or not, but one possibility is that authoritarian legislatures could intend to strengthen the tie between government entities and their central bank.

Finally, as a sensitive test, we also estimate the correlates of political regimes using other democracy variables: the ordinal index by the Varieties of Democracy and the dichotomous variable by Boix, Miller, and Rosato (2013). The figure in the appendix

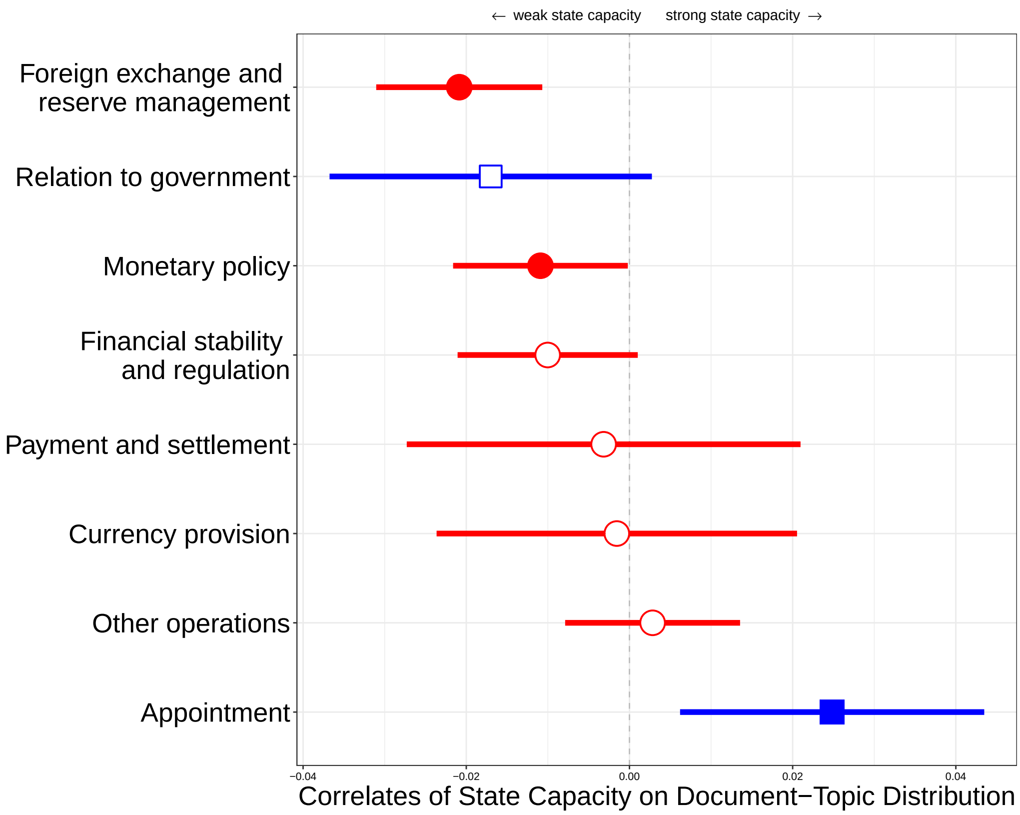

Figure 3: Correlates of State Capacity and Central Banks' Functions.
Note: Red circles indicate topics related to policy functions; blue circles indicate governance topics. Horizontal lines are 95% confidence intervals. Solid and open symbols indicate significance at the 5% level and nonsignificance, respectively.

shows that the results are largely consistent with those of the continuous liberal democracy score.

Figure 3 presents the results for the correlates of state capacity and functions of central banks. Hypothesis 2 expects that the estimates of state capacity index on policy function topics would be negative, suggesting countries with weak state capacity are likely to have a higher distribution of text related to five non-monetary policy functions.

Regarding the five non-monetary policy functions, all but *Other operations* have a negative association with high state capacity, which is in line with Hypothesis 2. However, only *Foreign exchange and reserve management* are statistically significant at the 5% level. *Other operations* function has slightly positive coefficients, and the confidence intervals are overlapped with zero, indicating the estimate is not consistent with our hypothesis.

Likewise, the figure indicates that, on the one hand, central bank laws in countries with higher state capacity are positively correlated with *Appointment* of central bankers. On the other hand, central bank laws of countries with high state capacity become less likely to mention the topic of government relations, but the correlation is not statistically distinguishable from zero. These governance topic estimates suggest that because countries with a higher state capacity could establish clear mandates and delegation forms of each economic institution, they would have a higher distribution of Appointment topic.

Conclusions

This paper has explored the conditions under which governments delegate various policy functions to central banks. Despite the fact that the growing number of central banks come to have a wider range of policy mandates, extant research has exclusively focused on price stability and monetary policy as the main object and policy tool of central banks. In this paper, we illuminated the non-monetary objectives and policy tools of central banks by focusing on the two factors that are likely to affect the diversification of central banks' functions – political regimes and state capacity. Applying the keyword-assisted topic models, we found that democracies are negatively correlated with some of the important policy functions such as foreign exchange and banking regulations. Our finding also indicated that, albeit less clear high state capacity is negatively correlated with policy mandates like foreign exchange operations.

To the best of our knowledge, this paper is the first scholarly attempt to illuminate the diverse policy mandates of central banks. That being said, we need to address further issues to improve this project. The first primary task is that beyond cross-sectional data, we need to expand textual data of central bank laws temporarily. In so doing, it becomes possible to increase the number of observations and more effectively control for relevant confounding factors, which is difficult in the current data structure. Second, We need to check the validity of our measurement by comparing the results of human coding. Also, the frequency of keywords may not necessarily mean the fact that the central bank has strong policy-making and decision-making power on the issue. By increasing those issues of measurement validity, we will be able to examine the determinants of central bank functions more systematically.

References

Adolph, Christopher. 2013. *Bankers, Bureaucrats, and Central Bank Politics: The Myth of Neutrality*. New York, NY: Cambridge University Press.

Aklin, Michaël, and Andreas Kern. 2021. "The Side Effects of Central Bank Independence." *American Journal of Political Science* 65(4): 971–987.

Alesina, Alberto, and Lawrence H. Summers. 1993. "Central Bank Independence and Macroeconomic Performance: Some Comparative Evidence." *Journal of Money, Credit and Banking* 25(2): 151–162.

Barro, Robert J., and David B. Gordon. 1983. "Rules, discretion and reputation in a model of monetary policy." *Journal of Monetary Economics* 12(1): 101–121.

Besley, Timothy, and Torsten Persson. 2010. "State Capacity, Conflict, and Development." *Econometrica* 78(1): 1–34.

Block, Steven A. 2002. "Political business cycles, democratization, and economic reform: the case of Africa." *Journal of Development Economics* 67(1): 205–228.

Bodea, Cristina, and Masaaki Higashijima. 2017. "Central Bank Independence and Fiscal Policy: Can the Central Bank Restrain Deficit Spending?" *British Journal of Political Science* 47(1): 47–70.

Bodea, Cristina, and Raymond Hicks. 2015. "Price Stability and Central Bank Independence: Discipline, Credibility, and Democratic Institutions." *International Organization* 69(1): 35–61.

Bodea, Cristina, Carolina Garriga, and Masaaki Higashijima. 2019. "Economic Institutions and Autocratic Breakdown: Monetary Constraints and Fiscal Spending in Dominant-Party Regimes." *The Journal of Politics* 81(2): 601–615.

Boix, Carles, Michael Miller, and Sebastian Rosato. 2013. "A Complete Data Set of Political Regimes, 1800–2007." *Comparative Political Studies* 46(12): 1523–1554.

Buch, Claudia. 2021. "Central Bank Independence: Mandates, Mechanisms, and Modifications." Deutsche Bundesbank.

Cantu, Carlos, Paolo Cavallino, Fiorella De Fiore, and James Yetman. 2021. "A global database on central banks' monetary responses to Covid-19." BIS Working Papers No. 934.

Coppedge, Suggested, John Gerring, Carl Henrik Knutsen, Staffan I Lindberg, Jan Teorell, David Altman, Michael Bernhard, M Steven Fish, Adam Glynn, Allen Hicken, Kyle L Marquardt, Kelly Mcmann, Pamela Paxton, Daniel Pemstein, Brigitte Seim, Rachel Sigman, Svend-erik Skaaning, Jeffrey Staton, Agnes Cornell, Lisa Gastaldi, Haakon Gjer, Valeriya Mechkova, Johannes Von Römer, Aksel Sundtröm, Eitan Tzelgov, and Luca Uberti. 2022. "V-Dem Codebook v12." *Varieties of Democracy Project* (March).

Cukierman, Alex, Steven B. Webb, and Bilin Neyapti. 1992. "Measuring the Independence of Central Banks and Its Effect on Policy Outcomes." *The World Bank Economic Review* 6(3): 353–398.

Eshima, Shusei, Kosuke Imai, and Tomoya Suzuki. 2021. "Keyword Assisted Topic Models." arxiv.

Franzese, Robert J. 2002. "Electoral and Partisan Cycles in Economic Policies and Outcomes." *Annual Review of Political Science* 5(1): 369–421.

Garriga, Ana Carolina. 2016. "Central Bank Independence in the World: A New Data Set." *International Interactions* 42(5): 849–868.

Geddes, Barbara, Joseph Wright, and Erica Frantz. 2014. "Autocratic Breakdown and Regime Transitions: A New Data Set." *Perspectives on Politics* 12(2): 313–331.

Geraats, Petra M. 2002. "Central Bank Transparency." *The Economic Journal* 112(483): F532–F565.

Gerring, John, Carl Henrik Knutsen, and Jonas Berge. 2022. "Does Democracy Matter?" *Annual Review of Political Science* 25(1): 357–375.

Grilli, Vittorio, Donato Masciandaro, and Guido Tabellini. 2014. "Political and monetary institutions and public financial policies in the industrial countries." *Economic Policy* 6(07): 341–392.

Grimmer, Justin. 2010. "A Bayesian Hierarchical Topic Model for Political Texts: Measuring Expressed Agendas in Senate Press Releases." *Political Analysis* 18(1): 1–35.

Grimmer, Justin, and Brandon M. Stewart. 2013. "Text as Data: The Promise and Pitfalls of Automatic Content Analysis Methods for Political Texts." *Political Analysis* 21(3): 267–297.

Hansen, Daniel. 2022. "The Economic Consequences of Banking Crises: The Role of Central Banks and Optimal Independence." *American Political Science Review* 116(2): 453–469.

Hibbs, Douglas A. 1977. "Political Parties and Macroeconomic Policy." *The American Political Science Review* 71(4): 1467–1487.

Johnson, Juliet. 2016. *Priests of Prosperity: How Central Bankers Transformed the Postcommunist World*. Ithaca, NY: Cornell University Press.

Masciandaro, Donato, and Davide Romelli. 2018. "Central bankers as supervisors: Do crises matter?" *European Journal of Political Economy* 52: 120–140.

Musthaq, Fathimath. 2021. "Unconventional central banking and the politics of liquidity." *Review of International Political Economy* 0(0): 1–26.

NGFS. 2020. "Survey on Monetary Policy Operations and Climate Change: Key Lessons for further Analyses." Technical Document.

Noble, Ben. 2020. "Authoritarian Amendments: Legislative Institutions as Intraexecutive Constraints in Post-Soviet Russia." *Comparative Political Studies* 53(9): 1417–1454.

Ortiz, Guillermo. 2009. "Issues in the Governance of Central Banks." BIS Working Papers.

Polillo, Simone, and Mauro. Guillén. 2005. "Globalization Pressures and the State: The Worldwide Spread of Central Bank Independence." *American Journal of Sociology* 110(6): 1764–1802.

Roberts, Margaret E., Brandon M. Stewart, and Edoardo M. Airoldi. 2016. "A Model of Text for Experimentation in the Social Sciences." *Journal of the American Statistical Association* 111(515): 988–1003.

Rogoff, Kenneth. 1985. "The Optimal Degree of Commitment to an Intermediate Monetary Target." *Quarterly Journal of Economics* 100: 1169–1189.

Romelli, Davide. 2022. "The political economy of reforms in Central Bank design: evidence from a new dataset." *Economic Policy* .

Tucker, Paul. 2018. *Unelected Power: The Quest for Legitimacy in Central Banking and the Regulatory State*. Princeton University Press.

Appendix

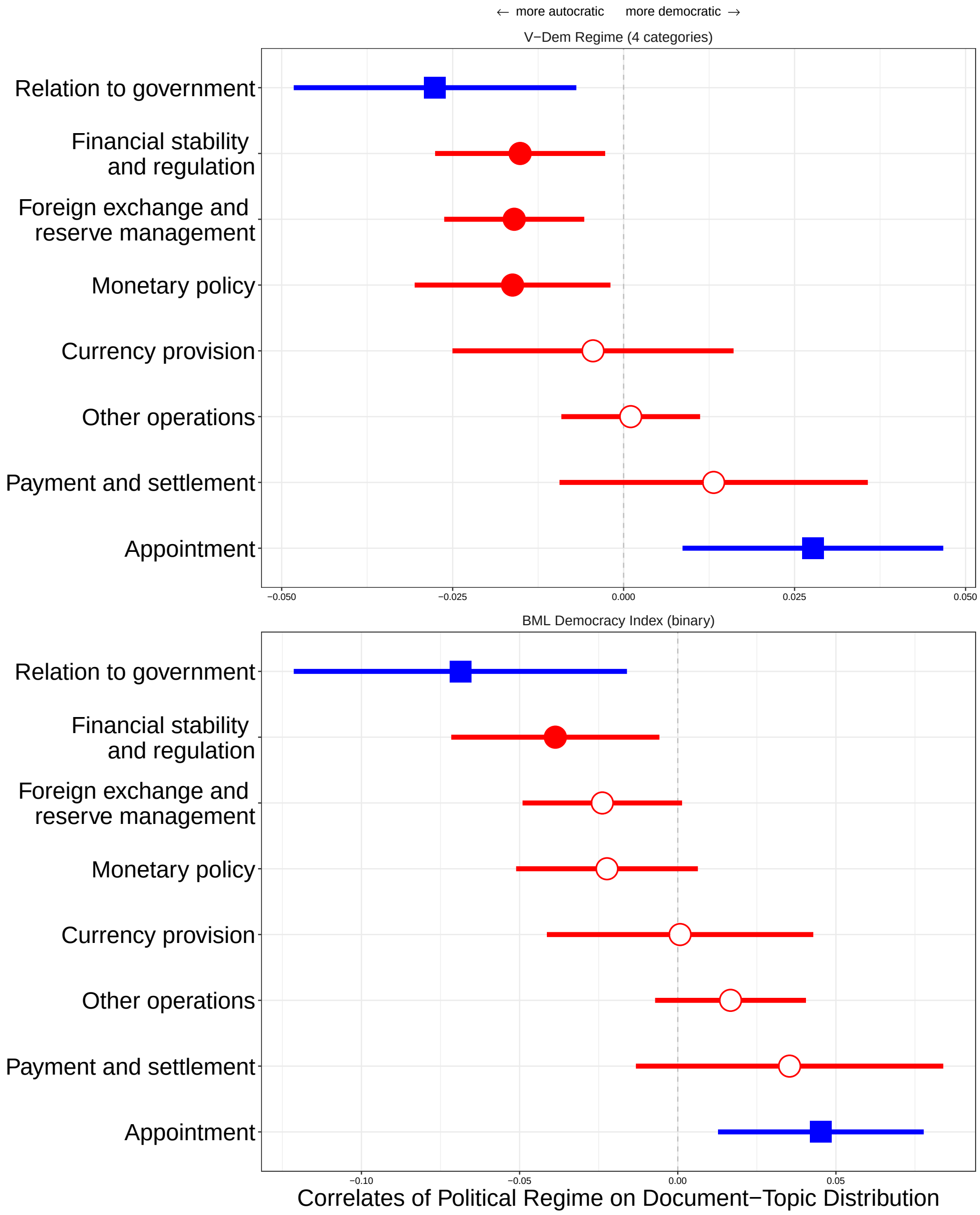

Figure A1: Sensitivity Test: Correlates of Democracy and Central Banks' Functions
Note: Red circles indicate topics related to policy functions; blue circles indicate governance topics. Horizontal lines are 95% confidence intervals. Solid and open symbols indicate significance at the 5% level and nonsignificance, respectively.