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The top-heavy shape of authoritarian bureaucracy: evidence from Russia and China

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Abstract

The prevalence of top-heavy bureaucracies in non-democracies cannot be explained by the theories of Parkinson, Tullock, Niskanen, or Simon or by classical managerial theories. When bureaucracy positions carry rents, the competition for promotion becomes a rent-seeking process. Borrowing the career-tournament theory framework from managerial scholarship, we argue that top-heavy bureaucracy resembles a tournament with too many finalists. When rent is centralized at the top (i.e. power centralization), as is the case in many non-democracies, the optimal bureaucracy should be top-heavy, accommodating and encouraging relatively more finalists at the top to compete for the final big prize. We provide suggestive evidence by analyzing ministry organizations in China (1993–2014) and Russia (2002–2015). After some fluctuations, the shape of Russian ministries eventually converged with that of China. In the steady state, their ministry shapes are far more top-heavy than what is prescribed by managerial theories. At the micro-level, ministry power centralization, measured by the perceived influence of the ministers, is correlated with ministry top-heaviness in Russia.

Points for practitioners

Our theory suggests that a top-heavy authoritarian bureaucratic structure naturally follows from a back-loaded sequential career tournament and an effort-maximizing bureaucratic leader. Our findings also suggest that Chinese and Russian ministries both converge to a highly top-heavy structure in the long run. We demonstrate that the

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top-heavy structure first arose during the planned-economy experiment in the Soviet Union. Our research sheds new light on public-sector reforms that aim to reduce bureaucracy top-heaviness in autocracies.

Keywords
top-heavy bureaucracy, communist legacy, career tournament, China, Russia

Introduction

Bureaucracies in authoritarian regimes are often highly top-heavy. We define the span of control (SOC) as the number of subordinates under one superior. We call a bureaucracy top-heavy if the SOC is relatively wider at the top of the hierarchy. Consider China, for example. There are usually so many vice ministers that the minister's SOC (i.e. the number of vice ministers) is much wider than the average SOC of a vice minister (i.e. the number of department heads).[1] In Nunberg's (1999) words, there are too many "chiefs" directing too few "Indians." As "chiefs" usually enjoy discretionary power and extravagant lifestyles, such obvious inflation of their numbers invariably inflames public discontent, which has found its way into media outlets in China, as well as many other countries with a communist or authoritarian legacy, such as Bulgaria, Kosovo, Poland, Ukraine, the Dominican Republic, Armenia, Libya, Zambia, and Vietnam.[2]

The SOC is a classic topic of managerial theories (for a comprehensive survey of earlier studies, see van Fleet and Bedeian 1977), and it has also become a useful dimension when studying public bureaucracies empirically (Kim, 2016; Meier and Bohte, 2003; Theobald and Nicholson-Crotty, 2005). A top-heavy organizational structure in authoritarian bureaucracies, if substantiated, clearly defies the standard prescriptions that SOC should either remain constant or increase when one moves down the levels of the hierarchy (Gulick, 1937; Williamson, 1967). Such a normative prescription dates back at least to Sir Ian Hamilton, who developed the concept of SOC a century ago.

The influential theories of Tullock (1965, 1974) and Niskanen (1971) on bureaucracies—being developed in the context of the United States—focused on the overall size of the bureaucracy rather than its SOC. The focus seems to be mis-placed. The overall federal employment has not changed much in 35 years (Niskanen, 2012). On the other hand, many policy observers perceived bureaucracy top-heaviness to be a more serious public issue in America.[3]

There are two existing explanations of bureaucracy top-heaviness, neither of which can easily explain away our puzzle. Parkinson (1957) suggested that declining bureaucracies may become more top-heavy, which was furthered by Breton and Wintrobe (1979) by modeling bureaucrats as power-maximizing. Yet top-heavy authoritarian bureaucracy appears to be a persistent problem. The convergence results in our paper will further substantiate this intuition. Simon (1976) provided a more systematic argument, which was formalized in Qian's (1994) agency model of hierarchy. According to Simon and Qian, there is a tradeoff between SOC and the number of tiers in a hierarchy—

bureaucracies with lower numbers of tiers, which could be a consequence of delayering administrative reforms, often end up with wider SOC at the top. However, empirical evidence shows that authoritarian bureaucracies are not only more top-heavy but also taller than their democratic counterparts (Li, 2019). Treating top-heavy bureaucracy as a technical phenomenon proves to be futile in understanding authoritarian bureaucracy. There is an unfilled need to better understand the theoretical root of top-heavy bureaucracy. The existing theories only treat it as a sideline topic, ignoring the pervasiveness of the issue in non-democracies.

To fill the gap that exists between persistent top-heavy authoritarian bureaucracy and those unconvincing theoretical explanations by Parkinson (1957), Breton and Wintrobe (1979), Simon (1976), and Qian (1994), this paper constructs a stripped-down theory of a two-stage elimination contest and characterizes the optimal SOC at the top as an increasing function of power centralization. Our theory is designed to capture a fundamental tradeoff of top-heavy bureaucracy, namely, a more top-heavy bureaucracy tends to increase competition at the top and simultaneously decrease competition at the bottom. Despite our theory's simple setup, it is not a trivial application of any existing research in the literature.

To provide suggestive evidence to our theory, we hand-collected several hundred ministry organization charts from China (1993–2014) and Russia (2002–2015), two countries whose bureaucracies have similar Soviet roots. While China did not experience big political shocks during this period of study, Russia went through more turbulent political events. For the purpose of comparison, we also obtained ministry organization data for 22 European countries from Li (2019). To provide a micro-level measure of ministry power centralization, we used the ranking data of the 100 Most Influential (Leading) Politicians in Russia as a proxy (Baturo and Elkink, 2014). We discovered that Chinese and Russian ministries are far more top-heavy than the prescriptions of managerial theories, and that there is a highly stable form of top-heavy authoritarian bureaucracy. There is no evidence that Chinese and Russian ministry bureaucracies are declining. Moreover, the minister power index is correlated with ministry top-heaviness in Russia.

The remainder of this paper is organized as follows. Section 2 introduces our theory and derives the implications. Section 3 discusses our data. Section 4 reports the empirical results for China and Russia. Section 5 discusses the historical origin of top-heavy bureaucracy. Section 6 concludes the paper.

Top-heavy authoritarian bureaucracy as a career tournament

A general yet still meaningful way to model authoritarian bureaucracy appears to be a rent-seeking model following Tullock (1980). Motivated by rents being attached to bureaucratic positions, in particular the senior bureaucratic positions, bureaucrats on the same tiers of an authoritarian bureaucracy compete to be promoted to positions of higher tiers.

The competition for promotion among bureaucrats is often fierce. The leader of a bureau himself is also competing for some bigger prize. The leader is not simply a "sponsor" of the bureaucrats; he is the patron and the master, whereas the bureaucrats

form the master's critical power base. In order to climb the "slippery pole," the leaders must be "efficient in disposing of their rivals" (Tullock, 2004). A political leader who cannot fully mobilize the bureaucrats under his control tends to lose his own bid for power. A loser of a power struggle in authoritarian regimes is at the mercy of the winner. Thus, different from the theories of Tullock (1965, 1974) and Niskanen (1971) on the explanation of bureaucracy expansion (at the top), which emphasizes the budget-maximizing motivations of senior bureaucrats, in our theory, the driving force is effort-maximizing rather than budget-maximizing. Here we have an effort-maximizing authoritarian leader instead of the budget-maximizing senior civil servant from Niskanen's book.[4]

To model the shape of a hierarchy, we use an elimination tournament that treats the number of bureaucrats in different hierarchy layers as tournament competitors in different rounds of the elimination tournament. There is a branch of tournament theory that treats the organizational hierarchy as a form of contest and derives the optimal number of agents for each layer of that hierarchy for the purpose of maximizing overall contest effort (for a review of the field in managerial research, see Connelly et al., 2014).

The central elements of a tournament model include the number of stages, the number of contestants at each stage and the prize allocation across stages. Motivated by the puzzling observation that CEOs often earn a great deal more than their direct subordinates, existing corporate tournament models are often designed to understand how prize allocation across stages affects the desirability of a tournament (Conyon et al., 2001; O'Reilly et al., 1988). Contrastingly, motivated by cross-country variations in bureaucracy shapes, our theory is designed to understand how the number of players at various stages affects the desirability of a tournament.

For simplicity, suppose that a three-layer bureaucracy has a chief, k deputies and N department heads, where $1 < k < N$. N identical department heads first expend costly efforts to vie for k identical positions of deputies; k deputies then compete for one chief position. We assume that all rent/power belongs to the chief in an authoritarian bureaucracy. This is a winner-take-all bureaucracy/tournament, with no rent distributed to the deputies. Deputy jobs are valuable only as a step-stone to the chief position.

Even if deputies serve no productive purpose, such as monitoring subordinates or coordinating activities, their mere existence can increase the aggregated contest efforts by creating an extra round of competition. Thus, for a winner-take-all bureaucracy, a three-layer bureaucracy tends to induce higher total efforts than does a two-layer bureaucracy. Experimental evidence supports the theoretical prediction (Sheremeta, 2010).

However, should the number of deputies increase indefinitely? A simple answer is no, because there is a tradeoff of increasing the number of deputies. More deputies will engage in more intense competition for the chief position, contributing to increased total contest efforts. For department heads, however, a larger number of deputies indicates a greater chance of promotion and a lower expected option value associated with being promoted, both of which drive down the department heads' contest efforts. To maximize total efforts, the number of deputies should not increase after the marginal benefit equals the marginal cost.

The optimal number of deputies to maximize the total efforts in a bureaucracy tends to be larger than what is prescribed by managerial theories. When more prizes are allocated to the final stage, an effort-maximizing bureaucracy can accommodate more competitors who will engage in intensive competition for the final prize. In other words, we should allow for more competitors when there are more incentives/prizes for them. The existing tournament theories also predict a correlation between prize concentration and the number of competitors (Smeets and Warzynski, 2008).

From this theoretical perspective, a top-heavy structure makes intuitive sense. Authoritarian bureaucracy, with its extremely centralized power structure, resembles a winner-take-all tournament. If most or all prizes are concentrated in the last round of the tournament (i.e. a back-loaded compensation deal), the optimal number of finalists in a sequential tournament should be relatively high to fully exploit the existence of a large final prize (Bognanno, 2001; Main et al., 1993; Rajan and Wulf, 2006; Smeets and Warzynski, 2008). The existence of a large number of finalists tends to intensify competition at the pinnacle of power—a recurring theme in communist or authoritarian regimes.

What will happen to our theory predictions if we relax some of the model assumptions? For example, players could be heterogeneous, have private information, have outside options, or their efforts may have externalities or complementarities. These theoretical questions are largely unsolved. Take player heterogeneity for example. A dynamic contest game with heterogeneous prizes and players is complex (for a survey of the literature, see Sisak, 2009). Only a three-player special case was solved by Szymanski and Valletti (2005). The theoretical problem is complex because multiple players can win prizes (or opportunities of promotion) in an intermediate stage and multi-winner contest games is still "one area that is under-researched and emerging" (Corchón and Serena, 2018).

The Chinese and Russian ministry data

We hand-collected all available Chinese ministry organization charts (or equivalent information) in nine different years from 1993 to 2014, and all available Russian ministries from 2002 to 2015. Except for historical data in China, all information was obtained from official web pages. The details of the data sources are shown in the Appendix.

We first define a top-heaviness index based on the number of positions in the top three layers of an organization. To illustrate, consider a Soviet-type ministry with one minister, three vice ministers and six department heads.[5] We set $k = 3$ and $N = 6$. The SOC of the head, k, is not a good measure of bureaucracy top-heaviness, because bureaucracies with a larger N also tend to have a larger k. To overcome this problem, we normalize k with $\sqrt{N}$ and define an H index as follows:

$$H = \frac{k}{\sqrt{N}}$$

A higher H index corresponds to a more top-heavy bureaucracy regardless of the size of

the bureaucracy as measured by N. According to Sir Ian Hamilton, k—the SOC of the chief—should not exceed N/k—the average SOC of the deputies. $k \leq N/k$ is equivalent to

$$\frac{k}{\sqrt{N}} \leq 1$$

In other words, Hamilton's principle of SOC is equivalent to $H \leq 1$. If $H > 1$, the bureaucracy is more top-heavy than what is prescribed by Hamilton (Gulick, 1937) and Williamson (1967).

We calculate the H index for all Chinese and Russian ministries in our data. For purpose of comparison, we also construct the H index of 22 European countries based on ministry hierarchy data from Li (2019). We then collect the data of perceived minister power index by making use of the 100 Most Influential (Leading) Politicians of Russia by Vox Populi in collaboration with Nezavisimaya Gazeta (Baturo and Elkink, 2014). We merge the minister data to our ministry data. We use the power of ministers as a proxy of ministry power centralization in Russia.

We also construct a few control variables that are potentially related to the number of vice ministers in China. *Year* is the year of the observation. *Cycle* measures the number of years between the year of observation and the year of the most recent Chinese Communist Party National Congress, which takes place every 5 years in post-reform China. It is a measure of the political cycle. The terms of the Chinese government and National People's Congress are both synchronized with the Party Congress.[6] It is often believed that the Chinese bureaucracy follows a vicious cycle of "streamlining" (*Jingjian*) and "expansion" (*Pengzhang*) corresponding to its political cycle. *Merge* takes the value of 1 if the ministry absorbed another ministry or was merged from two ministries in the past 3 years (including the year of observation), and 0 otherwise.[7] The government branch responsible for controlling bureaucracy size, the Central *Bianzhi* General Office, blames ministry merging and other related activities as a major cause of the inflated number of vice ministers.[8] Vietnam's Ministry of Home Affairs advocates a similar view.[9]

Empirical results

Visual evidence

Figure 1 shows the average H index of 22 European states together with Russia and China. It is clear that Western European countries tend to have less top-heavy ministry bureaucracies in terms of the H index. China, Russia and the Eastern European states tend to have similarly high H indices far exceeding 1. In other words, the former and current communist states have more top-heavy ministry bureaucracy than what is prescribed by managerial theories.

The top-left, top-right and bottom-left panels of Figure 2 plot the trend of the number of vice ministers, the number of department heads, and the H index over time in China and Russia, respectively. The numbers of vice ministers and department heads have gradually increased in China, yet the H index has largely remained stable at around 1.4. The

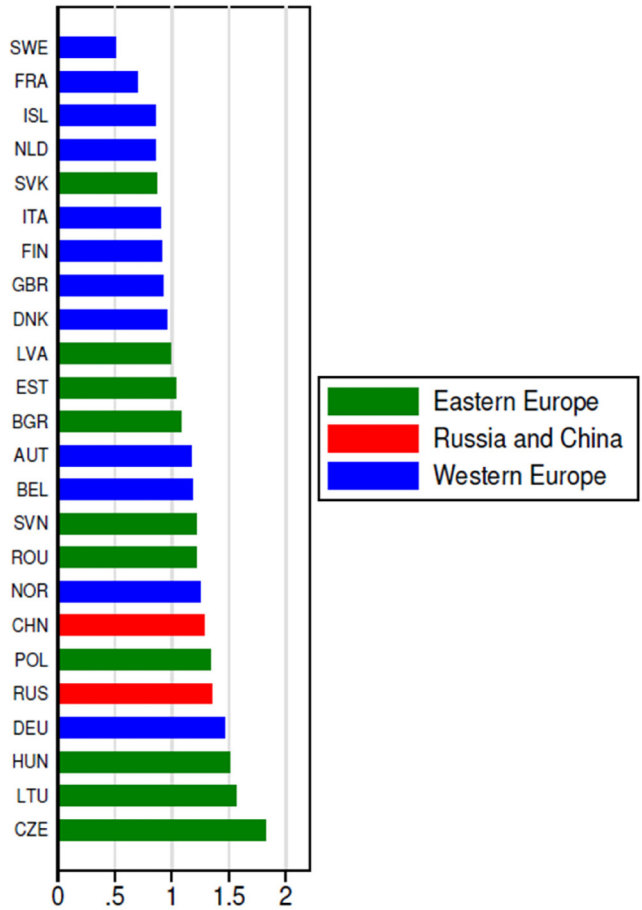

Figure 1. The average *H* index of ministry bureaucracy structures in China, Russia and 22 European states. Data source: the number of officials at the top three ministry bureaucracy layers in China (2014), Russia (2013–2015), and 22 European states (2013). The political layers (such as junior ministers in Western Europe) in elected democracies are not included. Authors' own dataset compiled from official sources. The *H* index is defined as the number of deputy bureaucracy heads divided by the square root of the number of department heads in each ministry. A more top-heavy ministry has a higher *H* index.

corresponding numbers in Russia fluctuated around that of China. The data demonstrate that the *H* index better captures the essence of Soviet-style bureaucracy structure than the SOC at one particular layer, although the *H* index and the SOC of the leader tend to be correlated.

The differences between the data for Russia and China lend support to our theory. First, the three indices in Russia all experienced a big drop in the early 2000s, gradually recovered some of the losses from 2005 to 2010, and then stabilized again at a level that is

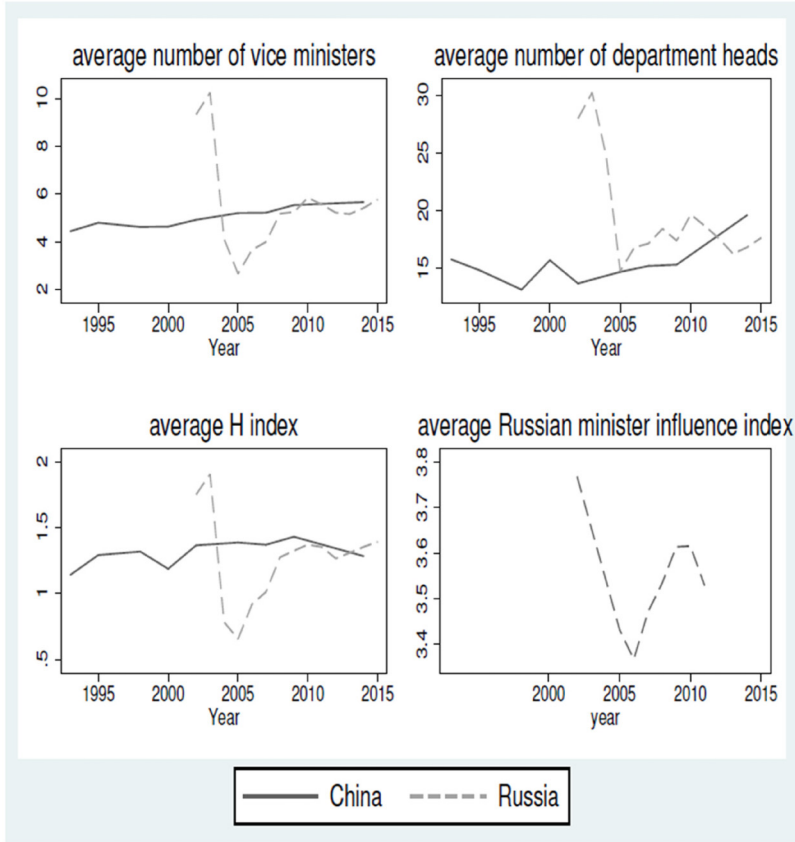

Figure 2. The trend of ministry bureaucracy structures in China and Russia. Data source: the number of officials at the top three layers in the Chinese (various years from 1993 to 2014) and Russian ministries (2002–2015). Authors' own dataset compiled from official sources. The data of Russian minister power index (2002–2011) are from Baturo and Elkink (2014).

quite similar to that of China, whereas the indices in China are more stable. This pattern is consistent with our theory, as the degree of power centralization fluctuated a lot more in Russia than in China. Second, in early 2000s, Russian ministries were a lot bigger (in terms of the number of vice ministers and department heads) and also more top-heavy than Chinese ministries. The organizational difference reflects the difference in centralization legacies. It is well known that the Soviet Union planned economy was more centralized and had a larger scale than the Chinese one (Maskin et al., 2000). It is also consistent with our theory prediction that bureaucracies with more power centralization have more top-heavy forms.

The bottom-right panel of Figure 2 plots the trend of average minister power index in Russia. We discover that it followed the same trend of the Russian ministry hierarchies.

The plot provides preliminary evidence that the power structure and organizational structure of Russian ministries are related.

Is it possible that our data happen to pick up some formal organizational rule that was used by the Soviet Union and was inherited by both China and Putin's Russia? This alternative hypothesis enjoys no empirical support. Russian ministries were a lot more top-heavy to start with. To the best of our knowledge, there is only one relevant formal organizational rule in China. Under China's State Council Organization Law (1982), which remains in force today, the number of vice ministers per ministry should be between 2 and 4. For example, in 1998 the number of departments per ministry varied from 7 to 21. It is easy to determine that the law effectively requires that the minister's SOC should be smaller than that of the vice minister.[10] The Chinese organization rule implicitly requires its ministry H index to be lower than 1, fully conforming to the prescription of the managerial theories. Accordingly, our results cannot be explained by the existence of a formal organizational rule. Our theory actually predicts reality much better than does the existing formal rule.

How similar are Russian and Chinese ministries today?

Our plots show that the Russian and Chinese ministries end up with similarly high H indices. The finding alone does not provide direct evidence for our theory—it merely suggests that these two countries end up with similar levels of ministry power centralization. However, the stability of a highly authoritarian form of ministry hierarchy does provide confidence to our theory and cast doubt on Parkinson's argument that declining bureaucracies tend to be top-heavy. This subsection will demonstrate that the H indices of Russian and Chinese ministry hierarchies in the long run converge to extremely similar values.

Our empirical strategies are borrowed from Barro and Sala-i-Martin (1992), who have offered a highly influential test of neoclassical economic growth theory, namely, that poor countries grow faster than rich countries so that all of them will eventually converge to the same income level. This method is superior to a simple t-test of the H index being equal to a particular value because we can identify the value of the steady state and control other confounding factors. We specify the Barro convergence equation as the following GLS random-effects model:

$$Growth_{i,y_t} = \alpha_0 + \alpha_1 H_{i,y_{t-1}} + \alpha_2 \mathbf{X} + \epsilon_{i,y_t}, \tag{1}$$

where $Growth_{i,y_t}$ represents the average growth rate of H for ministry i at year y_t, and $\mathbf{X}$ includes a list of control variables: *Year*, *Cycle* and *Merge*. ϵ_{i,y_t} is the error term. Robust standard errors are clustered at the ministry level for both China and Russia.

There is stable convergence when $-1 < \alpha < 0$ (Sala-i-Martin, 1996). To test whether H converges to a value $\bar{H}$, we can test whether the predicted interval of the average growth rate of H includes 0 when the lagged H value is exactly $\bar{H}$.

The left panel of Figure 3 shows the scatter plot of $Growth_{i,y_t}$ against $H_{i,y_{t-1}}$, together with the fitted simple regression line with the 95% confidence interval for China. There

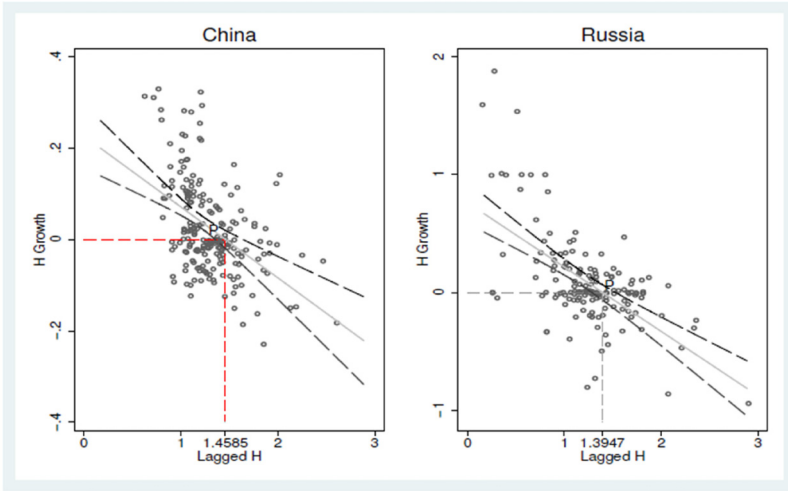

Figure 3. The *H* index of ministry bureaucracy structures in China and Russia almost converges to the same point. Data source: the number of officials at the top three layers in the Chinese (various years from 1993 to 2014) and Russian ministries (2002–2015). Authors' own dataset compiled from official sources. *P* (the intersection of the red lines) is the predicted steady state. Fitted values of the regression lines and the 95% confidence intervals are plotted.

Table 1. Summary of English-language media reports of the high number of deputy ministers in selected countries

State	Title	Source
Bulgaria	Bulgaria trims number of deputy ministers from 72 to 59	*The Sofia* Echo, 2 May 2008
Kosovo	KWN calls for a reduction of the deputy ministers number and the implementation of the law on gender equality	Kosovo Women's Network, 3 July 2020
Poland	Poland has over 90 deputy ministers	*Warsaw Business Journal*, 3 July 2013
Ukraine	President calls for cut in number of deputy ministers, regional state administration deputy heads	*Ukraine Business Report Daily*, 28 September 2010
Dominican	More than 80% of deputy ministers are "inorganic"	*Diariolibre*, 26 March 2012
Armenia	Government to cut the number of deputy governors	ARKA News Agency, 1 November 2016
Libya	Zidan appoints over 45 deputy, assistant deputy ministers	*The Tripoli Post*, 13 January 2013
Zambia	Too many deputy ministers, says NAREP	*Zambia Report*, 17 February 2015
China	Experts call for fewer deputies in government	*China Daily*, 1 August 2007
Vietnam	Some ministries have more than enough deputy ministers	Vietnamnet, 6 December 2010

Table 2. Convergence test for China and Russia

	Dependent variable: *Growth*		
	China		Russia
	(1)	(2)	(3)
H_{-1}	−0.220***	−0.195***	−0.546***
	(0.0290)	(0.0286)	(0.0691)
Year		−0.000670	
		(0.000900)	
Cycle		0.00470	
		(0.00470)	
Merge		0.0846†	
		(0.0460)	
Constant	0.315***	1.606	0.761***
	(0.0356)	(1.799)	(0.0900)
95% CI of *Growth* (at $H_{-1} = 1.4585$)	[−0.029, 0.018]	[−0.025, 0.017]	[−0.102, 0.033]
Observations	203	203	157

Standard errors in parentheses.
†$p < 0.10$, *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

appears to be a strong negative correlation between these two variables, a pattern that is consistent with the convergence prediction.

The steady state predicted from the data is *P*, with the lagged *H* value of 1.4585 and the corresponding average growth rate of *H* of 0. In other words, the *H* index converges to 1.4585 in China. Similarly, we find that the *H* index converges to 1.3947 in Russia (right panel of Figure 3).

The results of Equation 1 are reported in Table 2 (see online for Tables). Column 1 reports the results without the control variables. The estimated α_1 coefficient is −0.220 and is statistically significant at the 0.1% level. When the *H* index equals 1.4585, the predicted interval is [−0.029, 0.018], which includes zero in the middle. Accordingly, we know that the Chinese ministry *H* index is converging to 1.4585 in the long run. This is a highly top-heavy organizational shape. If we use 1.3947—the observed convergence target of Russian ministry *H* index—to generate the predicted interval in China, the interval still includes zero. On the other hand, we can easily reject the null hypothesis that $H \leq 1$ at any conventional statistical level. The Chinese ministry shapes converge to a highly top-heavy form that violates the principles of managerial theories.

Column 2 of Table 2 reports the results with the control variables. The estimated α_1 coefficient is −0.195 and remains statistically significant at the 0.1% level. The estimated 95% confidence interval of the predicted growth rate when the lagged $H = 1.4585$ is [−0.025, 0.017], which still includes zero.

None of the coefficients of the three control variables—*Year*, *Cycle* and *Merge*—is statistically significant at the 5% level, although the *Merge* variable is significant at the

10% level. The sign of the *Merge* variable is consistent with our field knowledge about Chinese politics. When two ministries merge, the new ministries tend to have relatively more vice ministers.

Column 3 of Table 2 reports the results using the Russian data. We obtain very similar convergence results, which are graphically represented in the right panel of Figure 3. Our Russian and Chinese results combined demonstrate the existence of very similar and highly top-heavy ministry organizational shape in these two countries in the long run. The *H* indices of Russia and China both converge to a point around 1.4. There appears to be a highly stable form of top-heavy authoritarian bureaucracy.

Does our conclusion apply to today's ministry bureaucracy in Russia and China? We collected comparable data of Chinese and Russian ministries in 2021 to verify whether our conclusion still holds.

According to the new data, the average top-heaviness index of Russian ministries today is 1.742, whereas the average top-heaviness index of Chinese ministries today is only 1.112. However, the Chinese result underestimates the real top-heaviness level of Chinese ministries today. When we collected data from Chinese ministry webpages, we noticed a major change. The official webpages before 2015 always listed the minister and vice ministers as clearly above other ministry officials. Instead, the official webpages in 2021 mix vice ministers with several vice-minister-level officials. The number of effective vice-minister-level officials has nearly doubled over the past few years. After taking into account all vice-minister-level officials, the revised top-heaviness index of Chinese ministries today becomes 1.746, which is almost identical to the index in Russia today. The jump probably reflects further power centralization under Putin and Xi.

It is not the first time that the Chinese government has increased the SOC in essence but not in name. The State Council Organization Law (1982) set the maximum number of allowed vice ministers at four. In the early 1980s, the numbers of vice premiers or vice ministers were way above four. To set a role model for the ministries, the State Council was under pressure to cut the number of vice premiers. Yet it was hard to do so given the vast power in the hands of the State Council. The Chinese government solved the

Table 3. How does minister power affect bureaucracy size and shape in Russia

	(1) No. of departnent heads	(2) No. of vice ministers	(3) *H* index
Minister power	2.848†	1.299*	0.266†
	(1.435)	(0.599)	(0.144)
Constant	9.261	1.557	0.509
	(5.081)	(2.122)	(0.509)
Ministry fixed effects	Yes	Yes	Yes
R^2	0.020	0.033	0.043
Observations	102	107	102

Clustered robust standard errors in parentheses.
$^{\dagger}p < 0.10$, $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$.

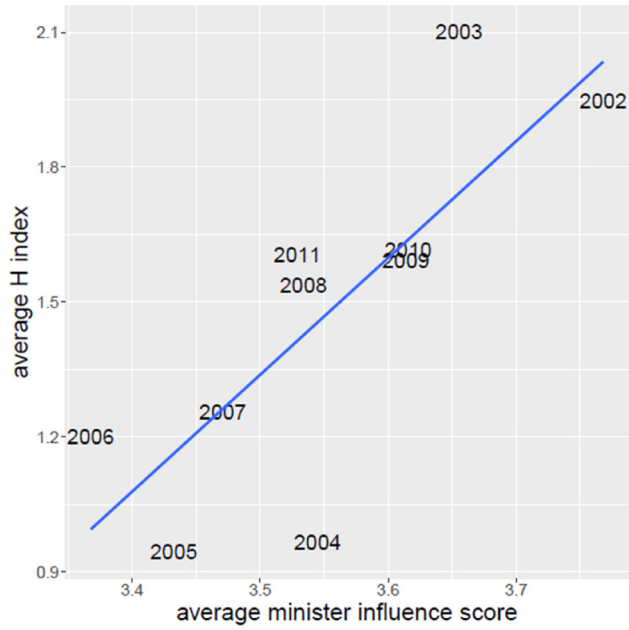

Figure 4. The correlation between minister power and ministry bureaucracy *H* index in Russia. Data source: the number of officials at the top three layers in the Russian ministries (2002–2015) compiled from official sources, and Russian minister power index (2002–2011) from Baturo and Elkink (2014).

dilemma by setting the number of vice premiers at four, and at the same time appointing several vice-premier-level officials called state councilors. In essence, the central leaders (principal) want to keep the high number of vice premiers but want the ministries (agents) to reduce the number of vice ministers. No wonder the implementation of the Organization Law proved to be difficult, as is shown in our data.

In summary, Chinese and Russian ministries have effectively become a lot more top-heavy since 2015, yet their levels of top-heaviness remain remarkably similar to each.

Micro-level evidence from Russia

If we use the power of Russian ministers as a proxy of ministry power centralization, we can provide more direct evidence for our theory prediction. Figure 4 shows that the average minister power index is highly correlated with the average ministry *H* index over 10 years. The estimated coefficient of the underlying simple regression is positive and statistically significant at the 5% level.

We then used ministry-year-level data to estimate the effects of minister power on the number of vice ministers, the number of department heads, and the ministry *H* index. The ministry-level fixed effects are also included and the robust standard error is clustered at

Figure 5. The total number of vice premiers in the Soviet Union, the Russian Federation and China. Data source: the total number of deputy premiers of the Soviet Union (various years from 1922 to 1991), the total number of deputy prime ministers of the Russian Federation (various years from 1992 to 2021) and the total number of vice-premier-level officials of the Republic of China (various years from 1912 to 1949) and the People's Republic of China (various years from 1950 to 2021). Authors' own dataset compiled from Wikipedia sources. Notes: in China, the position state councilor was created in 1982 to cut the nominal number of vice premiers, but the position holder had the same administrative rank as vice premiers. Thus after 1982 both vice premiers and state councilors were counted.

the ministry level. We report the findings in columns 1–3 of Table 3. We discovered that ministries with more powerful ministers tend to be bigger—in terms of the number of vice ministers/department heads—and also more top-heavy—in terms of the *H* index. All estimated coefficients are statistically significant at at least the 10% level. Only the effect on the number of vice ministers is significant at the 5% level.

The historical origin of top-heavy bureaucracy

In this section, we will demonstrate that the top-heavy form of bureaucracy was created as an organizational solution to economic power centralization during the Soviet planned-economy experiment. We will demonstrate evidence from the number of vice premiers/ministers in the Soviet Union and China. The historical evidence is consistent with our theory.

Because of the difficulty of assembling long-run data at the ministry level, we first focus on the historical data on the number of vice premiers in the Soviet Union and

China. The time-series data make it possible for us to approximately track the rise and the fall of bureaucracy top-heaviness at the national government. We can then relate the organizational form to the centralization of economic power during the planned-economy experiment.

The top panel of Figure 5 shows the total number of vice premiers of the Soviet Union by year from 1922 to 1991. The number of vice premiers was relatively low in the early years of the Soviet Union. When the Council of Ministers of the Soviet Union—the central administration to manage the planned economy—was created in 1946, we observe the largest surge in the total number of vice premiers in the Soviet Union. Then the number started to decline when Stalin died in 1953 and soon dropped to its historical low record of only two when Khrushchev radically decentralized economic power by replacing industrial ministries with regional economic councils in 1957. When Khrushchev's decentralization reform was reversed, the number of vice premiers rebounded and eventually climbed back to the historical high record of 12 in the early 1980s, and then declined again under Gorbachev's reforms. The history of the number of vice premiers in the Soviet Union shows that the number of vice premiers is correlated with the degree of power centralization.

The bottom panel of Figure 5 shows the total number of vice-premier-level officials by year in China from 1912 to 2021. The number was not high in the early years of the People's Republic of China. The first 5 year plan (1953–1957) and the establishment of the State Council in 1954 marked the full adoption of a Soviet-style planned economy and bureaucratic system. The number of vice premiers started to surge after 1954. Throughout the history of the People's Republic of China, the number of vice premiers has remained high and the degree of fluctuation has been relatively small.

The number of vice ministers in China shows a similar pattern. Imperial China organized its central government into ministries, which usually had no more than one vice minister. In the Ming (1368–1644) and Qing (1644–1912) dynasties, the number of vice ministers increased to two per minister. During the period of the Republic of China (1912–1949), the number of vice minsters was usually only one. The number of vice ministers only surged under the rule of the People's Republic of China. For example, there were seven vice ministers in the Ministry of Education in 1954 and 11 vice ministers in the Ministry of Forestry in 1980.

In summary, we conclude that top-heavy bureaucracy is not an ancient political tradition in either Russia or China. It emerged in the Soviet Union as an organizational solution to power centralization during the planned-economy experiment. The legacy was passed to China after 1949 and has persisted in both societies, where ministry bureaucracies remain extremely powerful despite economic reforms that officially disbanded the planned economies.

Conclusion

Existing theories of bureaucracy cannot easily explain the widespread phenomenon of top-heavy bureaucracy in non-democracies. Our theory suggests that top-heavy authoritarian bureaucratic structure naturally follows from a back-loaded sequential career

tournament and an effort-maximizing bureaucratic leader. By analyzing an original dataset of Chinese and Russian ministry organization charts, this paper provides empirical evidence to demonstrate that Chinese and Russian ministries both converge to a highly top-heavy structure in the long run. The stability of the authoritarian bureaucratic form lends confidence to our theory. The variations of bureaucratic forms in China, Russia and Europe are consistent with our theory prediction. At the micro-level, the power of Russian ministers is correlated with ministry top-heaviness.

Our empirical evidence is suggestive but not conclusive. The measures of power/rent centralization within bureaucracy in our paper are still imperfect. We hope that future research can provide better research designs.

Our research sheds new light on public-sector reforms that aim to reduce bureaucracy top-heaviness. Without deep structural reforms in authoritarian regimes, it is difficult to reduce bureaucratic top-heaviness, a lesson that many countries have failed to learn after repeated failures of public-sector reforms. China is a good example. It passed a strict law to limit the number of vice ministers in the early 1980s. In 1998, a powerful central leadership, relying on its personal authority, rolled out a massive bureaucracy-reduction plan. However, neither strict laws nor the political commitment of powerful leaders had a permanent effect on its top-heavy structure, as seen from our study of Chinese ministry bureaucracies over the past two decades. The "equilibrium" shape of authoritarian bureaucracies remains highly top-heavy.

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Notes

1. Authors' calculations based on data reported in this paper.
2. See Table 1 in the Appendix, online, for details about media reports on the excessively high number of deputy ministers in these countries.
3. In a testimony before the US Senate in 2011, a non-partisan government watchdog—the Project on Government Oversight—pointed out that "the Air Force has a historically low number of planes per general and the Navy is close to having more admirals than ships for them to command."
4. Of course, both theories can complement each other.
5. Sometimes there is a first deputy minister or executive vice minister between the minister and other deputy/vice ministers. Our empirical results are robust to the inclusion or exclusion of this official as part of the vice-ministerial team. The reported results treat such an official as part of the team.
6. In our data, $Cycle = 1, 2, 3, 5$, with the number of observations being 62, 48, 84 and 54, respectively.
7. Only six cases of *Merge* exist for the studied period. See the Appendix for details.
8. See interviews with Bianzhi General Office Vice Director Huang Wenping, Xinhua news, 16 October 2008.
9. Some ministries have more than enough deputy ministers, 6 December 2010, vietnamnet.
10. The smallest ministry (with seven departments) should get two vice ministers, whereas the largest ministry (with 21 departments) should get four vice ministers. For the smallest ministry, the vice ministers' mean SOC would be 7/2 or 3.5, which is bigger than 2, the minister's SOC. For the largest ministry, the vice ministers' mean SOC would be 21/4 or 5.25, which is also bigger than 4, the minister's SOC.

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