

Multiple Mechanisms of Policy Diffusion in China

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Abstract: An increased interest in policy diffusion research on China has emerged in recent years. However, the multiple diffusion mechanism in China has not been explored adequately. In this research, we employ the directed dyadic event history analysis (EHA), a new approach introduced into recent policy diffusion research, to examine the diffusion of China's provincial level administrative licensing reforms from 1999 to 2015. Our research provides consistent evidence that horizontal learning, competition, imitation, and the vertical top-down and bottom-up diffusion mechanisms can co-exist in China, which provides substantial empirical support for the application of policy diffusion theory in non-western countries.

Introduction

Numerous policy diffusion studies have been published in the past decades (Graham, Shipan and Volden 2013; Shipan and Volden 2012). Existing literature shows that government policies are diffused through vertical or horizontal mechanisms (Shipan and Volden 2008; Weyland 2005). However, most existing theoretical achievements are derived from America or other European countries, which have electoral democracies and developed economies (Boushey 2010; Desmarais et al. 2015). These achievements raise the question of whether the policy diffusion mechanisms identified in existing research apply to other contexts. If so, how can the specific mechanisms behind the diffusion process of a policy innovation in a non-western country be disentangled and verified?

Several researchers have noticed these problems and have begun to test the policy diffusion theory in an authoritarian context, such as China. Nevertheless, the present diffusion research on China has two general limitations. First, important mid-level provincial diffusion dynamics are often ignored. Former quantitative analyses on policy diffusion are conducted mainly at the city level (Ma 2013, 2014; Zhang 2012, 2015; Zhu and Zhang 2016), while only some case studies focus on provincial level diffusion (Zhu, Y 2012; Zhu, X 2014), except for Wu and Zhang (2016). The applicability of the policy diffusion theory in China can be substantiated further if the researchers have found additional systematic supportive evidence at the provincial level.

Second, previous empirical studies based on case studies or state-year event history

analyses (EHA) have rarely attempted to disentangle the multiple diffusion mechanisms behind the seemingly consistent diffusion evidence. Studies on western countries have identified typical horizontal and vertical diffusion mechanisms, such as learning, competition, and imitation (Shipan and Volden 2008), as well as top-down, and bottom-up diffusion mechanisms (Shipan and Volden 2006; McCann, Shipan, and Volden 2015). Hence, the conclusions from previous policy diffusion research in China can be easily confounded by the multiple diffusion explanations.

This research systematically tests both horizontal and vertical diffusion mechanisms in China by analyzing the diffusion of the provincial level administrative licensing reform between 1999 and 2015. Administrative licensing reform is one of the most important topics in China's policy agenda. China's central, provincial, and city governments have expressed support for the administrative licensing reforms in the last twenty years, thereby providing us with a good opportunity to examine the multilevel policy diffusion dynamics in China.

Based on directed dyadic EHA approach, a new method introduced by Volden (2006) and later refined by Boehmke (2009), we find that both learning and imitation mechanisms have significantly positive effects on the adoption of innovation across China's provincial governments. However, competition mechanism has a slightly negative effect on innovation diffusion, which confirms Zhu's (2014) argument that China's local governments have a neighboring "championship" mentality. Statistical evidence on the top-down effect shows that the policy signals of national government have a strong stimulating effect on provincial governments. Empirical results on the bottom-up effect indicate that a provincial government's likelihood of adopting an

innovation is at its lowest level when only half of the cities in each province have adopted the innovation.

In this paper, we first briefly describe provincial administrative licensing reforms in China, then present our theoretical framework, and discuss the operation of the subnational policy diffusion mechanisms. We test the arguments by offering empirical evidence obtained through directed dyadic EHA. Finally, we conclude with suggestions for future research.

Provincial Administrative Licensing Reforms in China

Administrative licensing reform is one of the most significant reforms in China's policy agenda in this modern era. In the last twenty years, every chairman of the Chinese Communist Party (CCP) would highlight the importance of streamlining administrative licensing procedures at the party's congress.¹ In addition, every premier, the leader of the State Council, would hold multiple meetings and issue multiple policy documents to facilitate the reform of the old administrative licensing system. For instance, in 2013, the current premier of China, Keqiang Li, specifically promised that the government under his leadership would reduce one third of the existing licensing procedures to create a more efficient market system. In March 2016, he stated that although he had already

¹ 16th Party Congress Report: http://language.chinadaily.com.cn/news/2013-11/26/content_17132209.htm;
17th Party Congress Report: http://language.chinadaily.com.cn/2007-10/31/content_6218870_2.htm;
18th Party Congress Report: http://language.chinadaily.com.cn/news/2012-11/19/content_15941774.htm.

achieved that goal in advance, he would continue cutting administrative procedures by half this year.²

China's administrative licensing system (ALS) emerged when Xiaoping Deng initiated the marketization reform process in the early 1980s. The government created the system to maintain market order and provide public service for citizens and enterprises. However, during the transitioning era, ALS degenerated into an obstacle in the development of the market economy (Zhu, 2014; Zhu and Zhang 2016). Licensing procedures were increasingly laborious and time-consuming, which dampened the incentives of market players because of the increased cost of time, resources, and lost opportunities. Moreover, little transparency existed in the decision-making process of the local government agencies, which created opportunities for bureaucratic corruption.

In the early 1990s, the central leadership reoriented China's efforts to "reform and open up" a socialist market economy. Many local governments started to simplify government functions and reform the existing administrative licensing systems to attract foreign investors and stimulate economic growth. The establishment of one-stop government service facilities (also known as administrative licensing centers, ALCs) soon became a core strategy of administrative licensing reform (Wu, Ma and Yang 2013). The creation of ALCs included the integration of traditionally distributed functions, restructuring of redundant agencies, and the establishment of office buildings. Shaanxi was the first province to create a provincial level ALC in 1999. As of 2015, 24 out of 31 provinces in Mainland China have adopted this policy instrument (see Figure 1).

² <http://finance.sina.com.cn/roll/2016-03-17/doc-ifxqnsty4399968.shtml>.

The creation of ALCs is an appropriate case for testing policy diffusion mechanisms for three reasons. First, during the last twenty years, China's central, provincial, and city governments supported administrative licensing reforms in different periods, which provides us with a good opportunity to examine the multilevel policy diffusion dynamics in China. Second, ALC is a common economic policy instrument that does not involve radical ideological or factional conflicts. China's subnational governments often have more autonomy in economic areas, which allowed them to choose different policy instruments according to their own requirements. Third, the entire process occurred within a well-defined period and a considerable variation in the timing of the adoption of ALCs across provinces could be observed, making the diffusion of China's provincial level ALC an excellent case to test the policy diffusion theory.

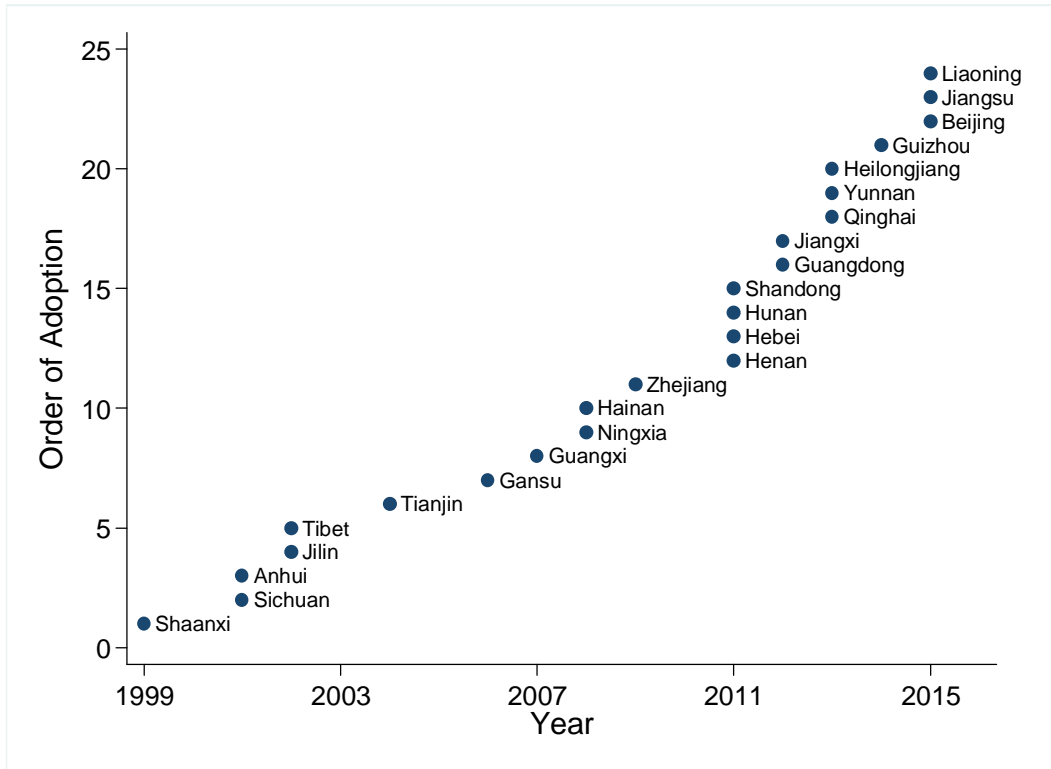


Figure 1: Diffusion Process of Provincial ALCs in China (1999-2015)

Multiple Diffusional Mechanisms

Since Jack Walker's seminal research on innovation diffusion among the American states (Walker 1969), a considerable number of research on policy diffusion have been conducted, thereby suggesting that the policy making process of a government can be affected by the policy choices of other governments (Berry and Berry 1990; Shipan and Volden 2012).³ The mechanisms of policy diffusion can be classified into two main categories: horizontal and vertical mechanisms. Horizontal mechanisms, such as learning, competition, and imitation, received the most attention in previous literature (Walker 1969; Gray 1973; Volden 2006; Gilardi 2010). Vertical dynamics in the subnational innovation diffusion process, such as coercion mechanism, bottom-up and top-down federalism (Karch 2006, 2012; Shipan and Volden 2006, 2008; McCann, Shipan and Volden 2015), have also drawn scholars' attention in recent years. However, most of these studies are still driven by the analogy of democratic laboratories such as the United States, and rarely focus on whether the current policy diffusion theory applies to non-western contexts.

A group of researchers have noticed this gap and attempted to apply the present policy diffusion theory to a non-democratic country such as China. For instance, Zhu (2014) found that vertical government intervention significantly stimulated the diffusion of economic policy instruments across Chinese cities. Zhang (2012) discovered that pressure from peer cities or provincial governments plays a crucial role in accelerating

³ This has also become a broadly accepted definition of policy diffusion in recent years (Graham, Shipan and Volden 2013).

the diffusion of China's land banking systems. Liu and Li (2016) showed that performance management spreads across Chinese cities when superior governments only set a policy goal rather than specific policy instruments.

Nevertheless, emerging literature in this area is not yet well developed. First, limited studies have examined provincial level diffusion dynamics systematically. Existing quantitative analyses have been conducted mainly at the city level (Ma 2013, 2014; Zhang 2012, 2015; Zhu and Zhang 2016), and only several case studies have attempted to explore provincial level diffusion (Zhu 2012, 2014), except for Wu and Zhang (2016). In recent decades, China's decentralized reforms have occurred mainly between the central government and the provincial governments (Lin and Liu 2000; Xu 2011). Most classic policy diffusion theories are developed based on quantitative evidence across states in America (Berry and Berry 1990; Gray 1973; Shipan and Volden 2006), which are actually more comparable to China's provinces particularly in terms of geographical size or administrative power.⁴ Hence, studying provincial level policy adoptions in China is an essential step to test and generalize current diffusion theories. We have observed that previous city-level diffusion research focuses on horizontal diffusion findings probably because of the absence of available data, which limits the research in examining the influences of vertical diffusion such as the top-down mechanism from the superior government, and the bottom-up mechanism from the subordinate governments (Shipan and Volden 2006; McCann, Shipan and Volden 2015).

⁴ Mainland China (excluding Hong Kong, Macao, and Taiwan, which are not under the direct control of Chinese Communist Party) has a unitary administrative system with five tiers of government organizations, including the unique central government, 31 provincial level governments, nearly 300 prefecture-level city governments, around 3,000 county-level government, and over 40, 000 town-level governments (Ma 2013). Note that all the governments below the central level are viewed as the local governments in China.

Although Wu and Zhang's (2016) recent research explored the diffusion of a performance-based reform program in Chinese provinces, knowledge on the applicability of the policy diffusion theory to most policy areas at the provincial level remains limited.

Second, the use of the traditional analysis methods (case studies or state-year EHA) constrained the researchers from analyzing the multiple horizontal mechanisms on policy diffusion in China. For instance, Ma (2013, 2014), and Wu and Zhang (2016), only demonstrated the Chinese local governments' tendency to adopt the policies of their peers, but failed to discuss the possibility of successful policies spreading more quickly or completely across governments (Volden 2006). However, horizontal diffusion is in fact characterized by multiple mechanisms, including learning, competition, and imitation (Berry and Berry 2014; Shipan and Volden 2008). Learning refers to the process of a government adopting a policy that has proven successful elsewhere. Economic competition occurs when policy adoption leads to economic spillovers across jurisdictions. Imitation means "copying the actions of another in order to look like the other" (Shipan and Volden 2008, p.842). The difference between learning and imitation mechanisms is that the former focuses on policy consequences whereas the latter focuses on the adopter (Shipan and Volden 2008, p. 842-843). Therefore, the horizontal diffusion findings of previous studies in China might have multiple theoretical and practical implications. Fortunately, the directed dyadic EHA can help identify the effects of various diffusion mechanisms in China, which will be discussed in detail in the methodology section.

We utilize an integrative approach to testing both horizontal and vertical diffusion hypotheses of the current theory empirically by analyzing the diffusion of ALCs across provincial level governments in China.

Horizontal Diffusion Mechanisms

In the post-Mao era, the goal of the central government became more outcome-oriented in the areas of economic growth and social stability. The Chinese central government incrementally reformed the highly centralized management style inherited from the former socialist-planned type of economy (Caulfield 2006; Edin 2003). The limited information and resources to establish a market economy prompted the central government to delegate economic authority to subnational governments, and encourage the adoption of appropriate policies to facilitate institutional innovation and avoid reformist leaps (Appleton, Song and Xia 2005; Pei 2012; Treisman 2006).

Hence, local governments have incentives and opportunities to search and adopt new economic policy instruments. For instance, local governments can remove inflexible and inefficient administrative procedures to attract foreign investments and increase local economic performance or revenue (Heilmann 2008; Treisman 1999). Furthermore, the successful implementation of a policy innovation of early adopters can influence other provinces to learn and adopt the same policy innovation.

Horizontal Learning Hypothesis: The likelihood of a province learning from an earlier adopter is positively associated with the latter's policy performance after innovation adoption.

People often expect neighboring provinces to have similar socioeconomic characteristics and need to compete for foreign enterprises and investments. Zhu (2014) found that neighboring Chinese local governments often competed with one another in all dimensions, and were reluctant to be regarded as “followers” by their neighbors. Hence, competition in China’s performance evaluation-based personnel system can lead to the divergence of policy instruments in neighboring local governments. Zhu (2014) provided qualitative evidence of this mechanism by comparing the administrative licensing reforms in the provinces of Sichuan and Tianjin. The following hypothesis is based on Zhu’s logic:

Horizontal Competition Hypothesis: The adoption of policy innovation by a neighboring province will negatively affect a province’s likelihood of innovation adoption.

In addition to the logic behind learning and competition, the bounded rationality in the decision-making process might lead political leaders to resort to inferential shortcuts (Weyland 2005). For instance, economic growth is often viewed as the most important indicator of government performance and the reason for policy legitimacy in China. Given the scarcity of resources and time during the decision making process, provinces with lower economic levels may view richer provinces as their role models and emulate the latter’s policy adoptions.

Horizontal Imitation Hypothesis: Provinces with higher economic level are more likely to be imitated by provinces with lower economic level.

Vertical Diffusion Mechanisms

CCP's party has maintained strict personnel control of the subnational governments since the establishment of the People's Republic of China (PRC). China's political leaders are not elected by citizens within their jurisdictions. Instead, they are selected and appointed by superior committees of the CCP based on economic performance, social stability, or political factions (Choi 2012; Shih 2008; Shih, Adolph and Liu 2012). The central government has full authority to determine the political careers of subnational leaders, including evaluation, monitoring, appointment, promotion, rotation, and demotion (Choi 2012; Edin 2003). The local governments have to pay serious attention to the central government's policy signals. For example, if the national government advocates a particular policy on business and investment, subnational governments may adopt that policy to gain praise or attention of the national leaders. Therefore, we have the following hypothesis:

Top-Down Coercion Hypothesis: The likelihood of the provincial policy adoption will increase when the national government advocates the same policy.

The so-called "snowball effect" and "pressure valve effect" under bottom-up federalism could also potentially exist in China (Shipan and Volden 2006). Theoretically,

China has no formal local lobbying groups and thus, provincial governments can ignore their subordinate governments' new policy signals. However, CCP's political evaluation and promotion arrangement provide strong incentives for provincial leaders to strengthen subordinate policy innovations that can help promote local economic development. In other words, subordinate governments are important information sources for the superior government to find appropriate ways to improve their performance.

However, the percentage of subordinate innovation often varies, which suggests the possibility that its effect on the superior government is not necessarily linear. For instance, at the beginning of the subordinate innovation diffusion process, the superior government is likely to adopt the same innovation to accelerate the subordinate innovation diffusion process. The superior government is also expected to adopt the innovation when most subordinate governments have already adopted it, because of the presence of lesser obstacles in adopting a popular innovation (Shipan and Volden 2006). In contrast, we expect the superior government not to adopt an innovation when only half of the subordinate governments have adopted it, either because a lesser need to facilitate a halfway diffusion process exists or the ultimate trend of subordinate innovation is still not clear.

Bottom-Up Nonlinearity Hypothesis: The relationship between cities' adoption of an innovation and the likelihood of provincial innovation adoption is U-shaped.

Data and Methodology

We collected the information about ALCs from 31 provincial level government websites, and the socioeconomic data from the websites of the China Statistics Bureau (CSB) and China National Knowledge Infrastructure (CNKI). We applied the directed dyad year EHA approach to identify potential diffusion mechanisms (Gilardi 2010; Volden 2006, 2015). As an alternative to traditional state-year EHA (Berry and Berry 1990), the dyadic approach has gained popularity in recent years because of its convenience in conducting a direct test of hypotheses regarding the specific mechanisms of policy diffusion (Gilardi and Fuglister 2008; Nicholson-Crotty and Carley 2016; Volden 2006, 2016). In other words, directed dyadic analysis can delicately demonstrate a correlation between the adoption of an innovation in province i and the adoption of an innovation in province j (Nicholson-Crotty and Carley 2016).

Specifically, we modeled directed dyads by pairing provinces with other provinces from which they may collect innovation information. Dependent variable equals 1, if province i adopts an innovation within year t after province j has adopted it by year $t-1$, and 0, if otherwise. The observations after i 's adoption were removed. Following Boehmke's (2009) advice on addressing potential sample bias, we eliminated the observations if province i in year t does not have a chance to emulate province j , when the latter has not adopted the innovation by year $t-1$ yet. For instance, Shaanxi and Tianjin established their provincial level ALCs in 1999 and 2004, respectively. Therefore, when we paired Tianjin (i) with Shaanxi (j), the observation period of Tianjin-Shaanxi dyad was between 2000 and 2004. In contrast, when we paired Shaanxi

(i) and Tianjin (j), because Shaanxi's ALC was established earlier than Tianjin and, has no chance to emulate Tianjin, no observation was made in the Shaanxi-Tianjin dyad.

The horizontal diffusion effects consist of three aspects. The increase in foreign enterprises is the main policy consequence of the creation of ALC as ALC is designed to attract external businesses. To measure the learning effect, a dummy variable was set, which equals 1 if the increase of foreign enterprises in the early adopter j is higher than i, and 0, if otherwise. To measure the competition effect, a dummy variable was set, which equals 1 if province i and province j are geographical neighbors, and 0, if otherwise. To measure the imitation effect, a dummy variable was also set, which equals 1 if the early adopter j has a higher GDP per capita than province i, and 0, if otherwise.

We included both top-down and bottom-up effects in the model to test the vertical diffusion mechanisms. The top-down effect was measured using the yearly number of administrative licensing policies documents issued by the State Council since 2001,⁵ which represents the level of central governments' support for the ALS reform. The bottom-up effect was measured by the accumulated percentage of city governments that have built city-level ALCs within each province.⁶ We further added a squared term of the bottom-up effect to test the possible nonlinear effects (Shipan and Volden 2006).

Other control variables included potential internal determinants. The socio-economic variables consisted of province i's economic level, economic growth, industry structure, and number of foreign enterprises. We also controlled the

⁵ The central government initiated its reform of the administrative licensing system in 2001, two years after the establishment of the first provincial level ALC in 1999. Note that the central policies never formally coerced the provincial governments to create ALCs.

⁶ Many city-level ALCs were established earlier than the creation of provincial level ALCs (Zhu and Zhang 2016). For instance, Jiangmen city of Guangdong province created the first city-level ALC of China in 1997, while Guangdong province built its provincial level ALC in 2012.

administrative categories of each provincial level unit, including normal provinces, minority autonomous regions, and municipalities directly under the central government. Compared with normal provinces, provincial level minority autonomous regions, such as Inner Mongolia, Xinjiang, Guangxi, Ningxia, and Tibet, are more tightly controlled by the central government to account for potential instability issues because of ethnic, religious, and border conflicts. In contrast, municipalities directly under the central government, such as Beijing, Shanghai, Tianjin, Chongqing, often enjoy more administrative and economic privileges because of their historically superior political status and geographical convenience.

We assumed that the subnational leaders utilized mainly the statistical and policy information of the previous year when they created the ALCs. Hence, all independent variables were lagged by one year.⁷ Table 1 provides the details of the operationalization of variables. Finally, Hong Kong, Macao, and Taiwan were excluded in the empirical analysis because the CCP government does not control them directly. We chose the logit model to conduct empirical analyses.

⁷ This could also help avoid potential reverse causation problems between the dependent variable and the independent variables.

Table 1: Variables Summary

Variables	Description of Measurements	Data Sources	Mean
Dependent variables			
<i>Adoption</i> _{<i>i,dyad</i>}	In a dyad-year, the dummy equals 1 if province <i>i</i> establishes an ALC after province <i>j</i> has established it; zero otherwise	Government websites	0.10
Horizontal Diffusion			
Learning effect	Dummy=1 if the increase of foreign enterprises in earlier adopter <i>j</i> was higher than <i>i</i> in the previous year	China Statistics Bureau	0.36
Competition effect	Dummy=1 if province <i>i</i> and province <i>j</i> are geographical neighbors	China Statistics Bureau	0.17
Imitation effect	Dummy=1 if the earlier adopter <i>j</i> had a higher GDP per capita than <i>i</i> in the previous year	China Statistics Bureau	0.30
Vertical Diffusion			
Top-down effect	Yearly number of policies with titles including “administrative licensing” from the State Council in the previous year	China National Knowledge Infrastructure	1.82
Bottom-up effect	Accumulated percentage of city governments that have built city-level ALCs within each province in the previous year	Government websites	74.28
Internal Determinants			
Province <i>i</i> 's economic level	Province <i>i</i> 's GDP per capita in the previous year (1000 yuan)	China Statistics Bureau	33.46
Province <i>i</i> 's economic growth	Province <i>i</i> 's annual GDP growth rate in the previous year	China Statistics Bureau	11.70
Province <i>i</i> 's proportion of service industry	The proportion of service (third) industry in the previous year. We only include this industry because of its collinearity with the manufacturing (second) industry and its relatively more prominent contribution to local tax and employment status.	China Statistics Bureau	42.08
Province <i>i</i> 's number of foreign enterprises	Province <i>i</i> 's number of foreign enterprises in the previous year (1000)	China Statistics Bureau	14.90
<i>i</i> =minority autonomous regions	Dummy=1 if <i>i</i> is a provincial level minority autonomous region	China Statistics Bureau	0.17
<i>i</i> =municipality directly under the central government	Dummy=1 if <i>i</i> is a provincial level municipality directly under the central government	China Statistics Bureau	0.14

Note: *i* indicates the focal province and *j* represents the dyadic province.

Empirical Results

Table 2 presents the directed dyadic logit analysis of the diffusion of provincial ALCs in China between 1999 and 2015. We report both the coefficients and percent changes in the odds ratio for a one-unit increase in each independent variable. The robust standard errors clustered by each dyad are presented in the parentheses. We conducted four regressions altogether. To ensure that our results are not contaminated by problems of multicollinearity and measurement error, Model 1 includes only key variables of horizontal diffusion. In Model 2, the variables that capture the vertical diffusion effects are added, whereas in Model 3, the internal social and economic factors are controlled. In Model 4, the duration and cubic splines of time to account for the potential time dependence problem are included (Beck, Katz and Tucker 1998; Nicholson-Crotty and Carley 2016). In general, Table 2 shows that both horizontal and vertical diffusion mechanisms substantially increase the goodness of fit. By contrast, the internal determinants play a less important role in explaining the adoption of ALCs.

Specifically, Model 1 shows that statistically, both learning and imitation mechanisms have significant and positive effects on the adoption of provincial level ALCs, which suggests that the specific policy performance and overall economic performance can become incentives for provincial governments to learn from others. In contrast, the competition mechanism has a negative effect, which is counter-intuitive compared with existing evidence on neighboring diffusion in western countries (Berry and Berry 1990; Shipan and Volden 2008). However, as previously mentioned, this finding is actually consistent with Zhu's (2014) recent qualitative diffusion research regarding China's administrative licensing reform, which argues that competition in the

performance evaluation-based personnel system contributes to the formation of the neighboring “championship” mentality, leading to the avoidance of emulating policy instruments across China’s neighboring governments.

Model 2 suggests that after controlling the vertical diffusion mechanisms, horizontal diffusion effects are still statistically significant and positive. This finding rules out the possibility that China’s horizontal diffusion is totally manipulated by the central government. Models 3 and 4 indicate that the learning and imitation effects are statistically significant and positive after controlling the various internal determinants and possible exogenous shocks, which provides further empirical support to the generalizability of the horizontal diffusion theory. However, the competition effect has smaller point estimates in Models 3 and 4, which implies that Chinese provinces are more willing to learn from a government with a higher policy performance or imitate a government with a higher economic level after establishing ALCs. Nevertheless, with a saturation sample, we are confident the observed effect of the competition mechanism is true for the statistical population (Konisky and Teodoro 2016).

The vertical diffusion dynamics are also confirmed by empirical findings. Table 2 illustrates that the policy signals from the central government (top-down mechanism) have significant positive effects on the diffusion of ALC. This is not a surprising finding in an authoritarian country with a strict party-state system. If the national government publicly expresses its support for a policy goal (e.g. government efficiency), subnational governments may take the policy innovation as a good opportunity to promote local economy and show loyalty to the national leaders.

We also find the bottom-up mechanism to have a significance effect on the adoption of provincial level ALCs. However, the positive sign of the squared term of the bottom-up effect suggests that the provincial government tend to create provincial level ALCs when the percentage of cities that created city-level ALCs within each province is very low or very high. If only half of the cities within each province have established the city-level ALCs, the likelihood of creating a provincial level ALC is at the lowest level.⁸ This is the first time that a nonlinear bottom-up diffusion mechanism has been tested in a nondemocratic context, which provides additional support to the generalizability of the policy diffusion theory.

Finally, similar to previous literature, we find that a province's economic level, economic growth rate, and service industry development have substantial positive effects on the adoption of innovation, which suggests that the overall social requirement is an important predictor of subnational policy innovation (Berry and Berry 1990; Ma 2013; Zhu and Zhang 2016). However, we observe no significant evidence that the existing number of foreign enterprises in Chinese provinces has an effect on their adoption of provincial level ALCs. In addition, the provincial level minority autonomous regions and municipalities directly under the central government are much less likely to adopt an innovation compared with the normal provinces, which confirms the special political and economic status of these administrative regions in China (Lu 2016).

⁸ Based on the variable coefficients in Model 4, the extreme value is obtained by $-\left(\frac{-0.0377757}{0.0003335 \times 2}\right) \approx 56.63$.

Table 2: Diffusion Mechanisms and the Adoption of Provincial level ALCs in China

	Model 1		Model 2		Model 3		Model 4	
	Coefficient (S.E.)	%Change Odds Ratio	Coefficient (S.E.)	%Change Odds Ratio	Coefficient (S.E.)	%Change Odds Ratio	Coefficient (S.E.)	%Change Odds Ratio
Horizontal Diffusion								
Learning effect	0.431*** (0.13)	+53.8	0.329** (0.14)	+38.9	0.489*** (0.15)	+63.1	0.533*** (0.16)	+70.5
Competition effect	-0.322* (0.17)	-27.5	-0.346* (0.20)	-29.3	-0.288 (0.19)	-25.0	-0.287 (0.19)	-25.0
Imitation effect	0.445*** (0.13)	+56.0	0.571*** (0.15)	+77.0	0.704*** (0.18)	+102.2	0.696*** (0.18)	+100.6
Vertical Diffusion								
Top-down effect			0.204*** (0.04)	+22.6	0.156*** (0.05)	+16.9	0.160*** (0.06)	+17.4
Bottom-up effect			-0.043*** (0.01)	-4.2	-0.038*** (0.01)	-3.7	-0.038*** (0.01)	-3.7
Bottom-up effect squared			0.000*** (0.00)	+0.0	0.000*** (0.00)	+0.0	0.000*** (0.00)	+0.0
Internal Determinants								
Province i's economic level					0.023*** (0.01)	+2.4	0.022*** (0.01)	+2.3
Province i's economic growth					0.076* (0.04)	+7.9	0.079* (0.04)	+ 8.3
Province i's proportion of service industry					0.058*** (0.01)	+5.9	0.058*** (0.01)	+6.0
Province i's number of foreign enterprises					-0.001 (0.01)	-0.1	-0.000 (0.01)	-0.0
i=minority autonomous regions					-2.593*** (0.50)	-92.5	-2.568*** (0.49)	-92.3
i=municipality directly under the central government					-1.226*** (0.41)	-70.60	-1.215*** (0.41)	-70.30

Controls of Duration Dependence

Duration				-1.040 (1.06)	-64.60
Cubic Spline 1				-0.196 (0.24)	-17.80
Cubic Spline 2				0.069 (0.10)	+7.1
Cubic Spline 3				-0.002 (0.01)	-0.20
Constant	-2.421*** (0.10)	-2.690*** (0.28)	-5.979*** (0.78)	-4.965*** (1.23)	
Observations	2207	2207	2207	2207	
Pseudo R-squared	0.02	0.08	0.12	0.13	
AIC	1464.44	1380.19	1323.63	1329.11	
Log Likelihood	-728.22	-683.10	-647.82	-646.56	
Wald ch2 (df)	27.76 (3)	98.33 (6)	156.78 (12)	164.19 (16)	

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$ (two-tailed), robust standard errors clustered by dyad in parentheses. The dependent variable is equal to 1 if province i adopts an innovation after province j has adopted it; 0, if otherwise. All the independent variables are lagged by one year.

Conclusion

In this research, we test multiple horizontal and vertical diffusion mechanisms in China based on a directed dyadic analysis of the diffusion of provincial level ALCs. Our research indicates that choosing an appropriate approach to identify specific mechanisms in the policy diffusion process outside the typical western context has important theoretical and practical implications. We find that learning and imitation effects can significantly and consistently accelerate the process of innovation diffusion among provincial governments. The negative competition effect confirms the suggestion from the previous research that the classic theoretical hypotheses on geographical proximity concerning innovation diffusion need to be modified (Zhu 2014).

The results also indicate that both top-down and bottom-up effects can significantly increase the probability of implementing economic policy tools in China, which makes the present research the first comprehensive study on multiple horizontal and vertical diffusion mechanisms in a nondemocratic government context. In particular, our research suggests that the effect of the bottom-up diffusion mechanism is not necessarily constant and a U-shaped relationship exists between a government's likelihood to adopt innovation and the percentage of adoption among its subordinate governments. We expect that more potential modifying conditions should be explored in future research.

Practically, our research implies that China's leadership needs to focus on policy signals from multiple directions, including peer, superior, and subordinate

governments. The policy environment in a transitioning country such as China is often highly uncertain and frequently changing, which suggests that local leaders need to be aware of various resources and opportunities to adopt an appropriate innovation.

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