

Article

Local Drivers of Municipal Consolidation: County-to-District Conversion in China

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Abstract

Municipal consolidation, a widespread form of local government restructuring, has attracted growing scholarly attention worldwide. The majority of research on municipal consolidation investigates impacts instead of motives. Using prefecture- and county-level data from China, this study comprehensively examines the local drivers of county-to-district conversion (CTD) events during the 2010s, a period marked by a significant wave of CTDs. The results show that cities with a developable land shortage, a single district, or a higher economic ranking within a province are more likely to implement CTD. All else equal, counties in closer proximity to the central city, more lagged behind the city in development, or having a higher fiscal revenue per capita are more likely to be consolidated. Together, these factors explain about 40% of the odds of CTD at both the city and county levels. These findings highlight the importance of local incentives and characteristics in shaping jurisdictional changes and provide guidance for mitigating selection bias in future impact evaluations of municipal consolidation.

Keywords: municipal consolidation; county-to-district conversion; local government; motive; China

1. Introduction

Municipal consolidation, a form of local government restructuring, has been widely adopted around the world over the past few decades [1]. Municipal consolidation is a centuries-old practice, exemplified by the 1873 unification of Budapest, Meiji-era mergers in Japan, and major U.S. city consolidations such as Philadelphia (1854), Boston (1870s–1890s), and New York City (1898). Beyond full annexation or amalgamation, it also includes functional consolidations (e.g., transit, water/sewer, electricity, waste, health, and education services) and softer forms such as regional councils and inter-municipal agreements that enable regional cooperation while preserving local autonomy in land-use planning and public safety. In China, consolidation most commonly takes the form of county-to-district conversion (CTD), which converts a relatively independent county to a municipal district of a city at the prefecture or higher levels. While the number and territorial boundaries of local administrative (sub)units often remain the same, CTD leads to centralization by shifting decision-making power from converted counties to city governments.

Academic attention to municipal consolidation has been on the rise since the 2010s, with much of the literature evaluating impacts [1,2]. However, determinants—why and where municipal consolidation happens—remain underexplored, especially at the local



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level [3]. Discussions of the motivations for municipal amalgamation mainly focus on international comparisons. Steiner, Kaiser, and Eythórsson (2016) conclude from their survey of 11 Western European countries that improving public service efficiency is the primary goal of recent municipal amalgamation waves [4]. Another expert survey by Swianiewicz, Gendźwiłł, and Zardi (2017) also find the 11 studied countries from Macedonia to Ireland cite improved capacity and reduced costs of public service delivery as motives for amalgamation [5]. Evaluating the occurrences of municipal consolidation in 17 European countries between 2004 and 2014, Askim et al. (2017) find that most occurrences correlate with at least one of four national-level factors—decentralization, urbanization, recent territorial reforms, and fiscal stress, although their sample size limits predictive power [6]. Using a larger panel of 39 European countries from 1990 to 2020, Askim, Gendźwiłł, and Klausen (2025) show that the predictive powers of urbanization and decentralization, while statistically positive, are conditional on decision rules—urbanization predicts consolidation only when decisions are made at regional or local levels, and decentralization predicts consolidation when decisions are centralized [7].

Only a few studies in Sweden, Denmark, Norway, Switzerland, and the US examine local drivers of municipal consolidation. Investigating the factors influencing the local acceptance of amalgamation proposals by the national government in Sweden's 1952 reform, Hanes, Wikström and Wångmar (2012) show that municipalities with comparable population sizes are less likely to accept amalgamation, while the relative level of income also matters, as high-income municipalities are more likely to refuse amalgamation with poorer partners [8]. Examining municipalities in Denmark's recent nationwide amalgamation reform, Bhatti and Hansen (2011) find that a higher societal connectedness and smaller aggregated population size are positively correlated with the likelihood of amalgamation [9]. Fitjar (2021) documents strong suburban resistance to city-led metropolitan mergers in Norway, where suburbs prefer to free-ride on central-city public goods rather than internalize externalities through consolidation [10]. Strebel (2025) analyses municipal merger referendums in Switzerland and demonstrates that voters' support for integration decreases when potential partners are poorer or larger than their own community; crucially, wealth and size asymmetries interact, reinforcing or offsetting one another depending on their direction [3]. Studying the importance of economic motives in determining annexation outcomes, Austin (1999) [11] finds that although some economic factors matter, fiscal motivation for an extra tax base does not influence annexation decisions. More importantly, the analysis reveals a significant influence of political factors that cities use annexation to boost white voter proportions and dilute the political power of minorities.

The initiation and approval process of China's CTD is somewhat unique and more complex, combining bottom-up proposals from local governments with top-down approvals by both provincial and central governments. A small number of empirical analyses on the determinants of CTD focus mainly on the roles of governments at levels above the county. Using data from 2001 to 2017, Kuang and Wang (2022) find that counties in nationally designated city clusters are more likely to experience an adjustment in administrative division structure like CTD [12]. Taking city-level data from 1999 to 2018, He and Jaros (2023) find that regional development priorities of national leaders influence CTD's spatial and temporal occurrences and the bargaining power of city government, measured by the city's administrative rank, whether the city's party secretary is concurrently appointed to the provincial party standing committee, and informal ties between the city and provincial leaders [13].

Overall, the literature has emphasized government efficiency as a key motivation in municipal consolidation [4,5], shaped by economic and political contexts [6,7]. Local political preference is also influenced by demographic and socioeconomic relationships

between involved jurisdictions, with municipalities favoring mergers if more disparate by population, compatible in income, socially connected, and limited in aggregate population size [8,9]. In China’s context of local initiatives amid strongly centralized power, studies on local jurisdictional adjustments and CTD suggest both the inducement by top-down priorities and the importance of local bargaining.

Using nationwide city- and county-level datasets, this research comprehensively investigates the local drivers of the recent wave of CTD in China with analyses of characteristics and interactions among local jurisdictions. It contributes to the literature by combining Western and Chinese studies’ emphases on local drivers of municipal consolidation in understanding CTD in China’s unique context. By identifying local selection mechanisms, this study helps mitigate non-random policy assignment biases in impact evaluation, a common problem facing quasi-experimental impact studies on municipal consolidation [2].

2. Local Governments and Their Consolidation in China

2.1. County, District, and Prefecture-Level City

Within China’s multi-tier administrative structure, at the prefecture level, a prefecture-level city administers both urban districts and counties or county-level cities. Districts function as extensions of the city government with limited autonomy, while counties retain independent bureaucratic departments, fiscal ties to the province, and authority over land-use planning. Started in 1983, the central government initiated a nationwide reform to convert prefectures (sub-provincial regions) into cities. Typically, one or two of the most developed counties (sometimes parts of counties), usually including where the prefecture government was located, were converted into urban districts of the newly established city, with the remaining counties of the former prefecture coming under the supervision of the new city government. By 2003, the reform had transformed most prefectures into prefecture-level cities (in comparison to province-level and county-level cities). This reform established the city-administered-county system (Table 1), laying the foundation for subsequent CTD reforms. While establishing a prefecture-level city involved converting counties to districts, this initial reform focused on creating a new administrative layer rather than consolidating existing jurisdictions.

Table 1. Current regional and local administrative structure for cities in China.

Province Level	Prefecture Level	County Level
Province-level city	District	
	County and county-level city	
Province	Prefecture-level city	District
		County and county-level city

The key distinction between counties and urban districts lies in the autonomy of their bureaucratic apparatuses. Whereas county governments maintain functionally independent departments, district agencies operate as extensions of city bureaus, except agencies directly controlled by the central government (e.g., customs, taxation, and national security). Relative to county governments, districts have limited authority over local matters and focus more on detailing and implementing city policies.

Supervised by the city, counties enjoy a more independent local administrative system. For instance, the Market Inspection Bureau of Chongqing’s website indicates that the city bureau directly administers all district market inspection departments but only provides guidance to county departments [14]. The county government has authority over critical public affairs such as spatial planning and supplying land for urban development. The

county government can have direct fiscal connections with the provincial government, while urban districts are fiscally part of a city. The fiscal autonomy is even greater for counties in provinces with fiscally province-administered-county systems, which remove the fiscal supervision of counties by the prefecture-level cities.

For example, the Hangzhou Municipal Government Document No. [2001] 18 [15], titled “Opinions on the Implementation of Institutional Reform in Hangzhou’s Urban Areas and Counties (Cities) (2001),” outlines the following principle regarding the relationship between the city, districts, and counties:

“The city takes the main responsibility of managing urban planning, economic integration, infrastructure construction, and environmental protection. Districts mainly deliver education, science, culture, health, and social services. Urban construction and other affairs shall be subject to unified leadership and hierarchical management. The county (and county-level city) government is relatively independent, with the authority to manage affairs when it can.”

2.2. County-to-District Conversion

Established within prefectures, cities started with limited space for urban development. Their desire for spatial expansion grew stronger following the 1994 tax sharing reform that imposed a greater financial pressure on local governments. As a natural solution to the limited land for urban development, CTD typically starts from a negotiated agreement between the directly involved parties—the city and the county, followed by a proposal to the provincial authority for its approval, and eventually a final consent by the central government. However, CTD’s identification, negotiation, and approval processes lack transparency¹ [16].

Since the prefecture-to-city reform, the number of counties has decreased, while the number of urban districts has increased. Figure 1 shows the annual number of CTD cases in prefecture-level cities from 2000 to 2020, highlighting two reform waves. During 2000–2004, 44 new urban districts were converted from counties during 2000–2004. The second wave started from 2011, reaching around 20 cases during 2014–2016. He and Jaros (2023) [13] attribute the temporal distribution of CTD cases to shifts in national development strategies under different leaders, with the Hu Jintao administration prioritizing spatially balanced development relative to administrations prior to and after it, resulting in few CTD cases between the two waves of CTD.

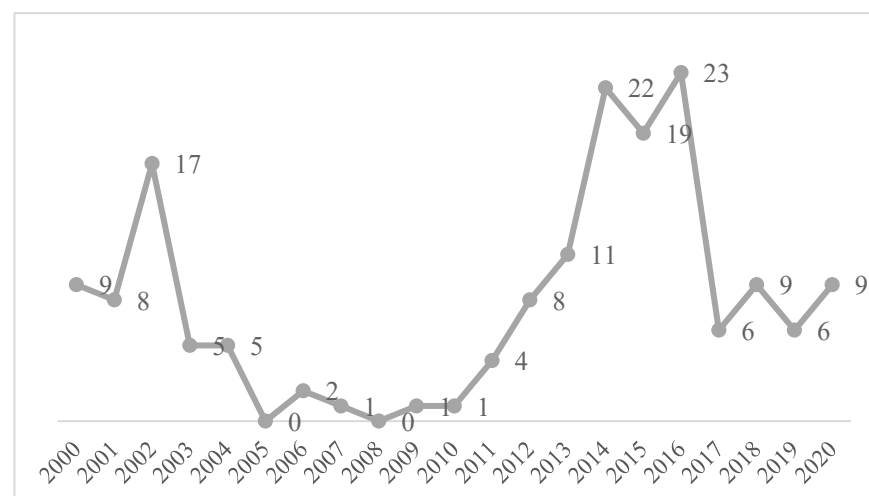


Figure 1. Annual number of CTD cases in prefecture-level cities during 2000–2020. Source: Authors’ calculation based on data from the Ministry of Civil Affairs.

The spatial distribution of CTD cases has also shifted from coastal to inland regions and from a few provinces to the rest of China, as shown in Figure 2 and Table 2. From 2000 to 2009, CTD cases were concentrated in coastal regions (75%), especially in the five most developed coastal provinces—Guangdong, Jiangsu, Zhejiang, Fujian, and Shandong (about 2/3). During the 2010–2020, CTD cases became more evenly distributed between coastal and inland areas and across provinces. CTD cases also shifted from cities of higher administrative ranks (e.g., sub-provincial cities and provincial capitals) to regular prefecture-level cities, as shown in Table 3.

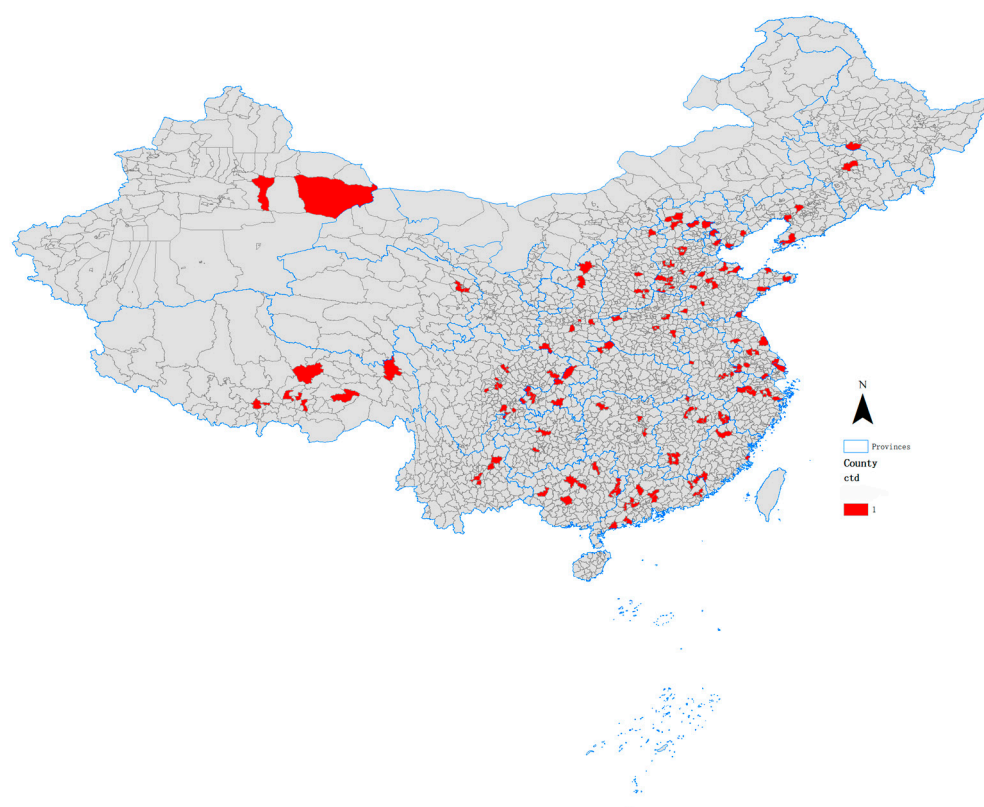


Figure 2. Spatial distribution of CTD cases during 2000–2020. Source: Authors’ calculation based on data from the Ministry of Civil Affairs.

Table 2. CTD cases by location.

Time Period	2000–2009		2010–2020	
Region	Coastal	Inland	Coastal	Inland
Number	36	12	65	53
Province	Five provinces	22 others	Five provinces	22 others
Number	32	16	42	76

Source: Authors’ calculation based on data from the Ministry of Civil Affairs.

Table 3. CTD cases by city administrative rank.

Time Period	2000–2009		2010–2020	
City rank	Capital or sub-provincial	Other prefecture-level	Capital or sub-provincial	Other prefecture-level
Number	17	31	30	88

Source: Authors’ calculation based on data from the Ministry of Civil Affairs.

3. The Case of Sichuan Province and Deyang City

This section uses Sichuan Province and its prefecture-level city Deyang as an illustrative case. Sichuan is representative of the broader spatial shift of CTD from coastal to inland provinces during the 2010s and exhibits substantial within-province variation in city economic rank and single-district status—key factors hypothesized to drive consolidation. Deyang’s experience further illustrates the negotiation dynamics between city and county governments, providing qualitative insight into the mechanisms underlying the quantitative findings.

Sichuan, an inland province in western China, comprises one sub-provincial (also its provincial capital) city, 17 ordinary prefecture-level cities, and three autonomous prefectures. Between 2010 and 2020, Sichuan implemented significant administrative adjustments related to districts in half of its cities. As shown in Table 4, there were seven CTD cases, of which five occurred in a single-district city in 2010. The remaining two cases involved cities starting with more than one district, Chengdu and Mianyang, the two most important cities in Sichuan in terms of economic weight. A similar pattern—CTD cases concentrated in single-district or high-GDP cities—is observed in the province of Jiangxi. Four of its six CTD cases involved single-district cities, with the rest of the cases happening in cities ranked first and third in GDP size within Jiangxi Province.

Table 4. Cities in Sichuan in 2010.

City	Single District	GDP (Ten Thousand Yuan)	CTD During 2010–2020
Chengdu	No	55,513,336	Yes
Mianyang	No	9,602,153	Yes
Deyang	Yes	9,212,679	Yes
Yibin	Yes	8,708,472	Yes
Nanchong	No	8,278,238	No
Dazhou	Yes	8,192,030	Yes
Leshan	No	7,439,150	No
Luzhou	No	7,148,088	No
Neijiang	No	6,902,791	No
Ziyang	Yes	6,579,017	No
Zigong	No	6,477,251	No
Meishan	Yes	5,522,508	Yes
Guangan	Yes	5,372,243	No
Panzhihua	No	5,239,883	No
Suining	No	4,952,288	No
Guangyuan	No	3,218,678	No
Yaan	Yes	2,865,379	Yes
Bazhong	Yes	2,809,074	No

Source: China City Statistical Yearbook.

Deyang is a prefecture-level city adjacent to Sichuan’s capital city, Chengdu. In 2010, the prefecture of Deyang comprised a single urban district, Jiangyang district, and five counties. Deyang’s economic standing in the province (third-highest GDP, only after Chengdu and Mianyang) was an apparent advantage when it came to obtaining the approval of CTD from the provincial government. In 2017, Deyang successfully converted Luojiang County into its second urban district, followed by an immediate announcement of the intention to convert Guanghan County into the third district. As shown in Table 5, at similar distances from Deyang city, Guanghan and Luojiang differ significantly in economic development level and population size, with Guanghan significantly larger in population, richer in GDP per capita, and more than four times the size of Luojiang’s economy.

Table 5. Counties within the Deyang Prefecture in 2010.

County	Distance from Deyang (km)	GDP (Ten Thousand Yuan)	Population	GDP per Capita (Yuan)
Zhongjiang	28.7	1,619,090	1,186,762	13,643
Guanghan	19.9	1,800,244	591,115	30,455
Shifang	22.1	1,357,819	412,758	32,896
Mianzhu	28.9	1,181,015	477,868	24,714
Luojiang	23.6	482,813	212,185	22,754

Source: Amap, Sixth Population Census, and China County Statistical Yearbook.

Unlike Luojiang, converting Guanghan into Deyang's district turned out to be a fight. The proposal faced strong opposition, triggering public discussions among Guanghan's citizens, including social media campaigns expressing fears of losing local resources and an economic slowdown. Under pressure, the Guanghan government issued two official announcements [17]. First, Guanghan would retain its administrative authority over the existing constructed area of the Deyang economic development zone (located in Guanghan), with its next phase financed by the city but revenue shared with Guanghan. Second, the CTD terms would include more land development quota and assistance from the city, given Guanghan's developable land shortage. To date, the CTD proposal for Guanghan County remains on paper. A similar example is the attempt of Huzhou, an economically lower-ranked city in Zhejiang Province, to convert Changxing County, a leading county in the province in terms of GDP and tax revenue, into an urban district. Huzhou's proposal met the strong opposition of the Changxing government, citing concerns about autonomy [18].

4. Hypotheses

While the CTD literature suggests the influences of national development planning and the city government's political bargaining power on the occurrence of CTD, our case analysis highlights the less understood roles of the characteristics of the counties and county-city relationship in the CTD process, echoing some of the findings in the international literature of municipal consolidation. The first three hypotheses address the incentives of cities, counties, and their interactions, while two additional hypotheses examine the roles of higher-level governments and administrative structure.

The hypotheses developed in this section are grounded in two primary theoretical perspectives on municipal consolidation: economic interests and political incentives. From an economic interest's viewpoint, consolidation is driven by efficiency in public service delivery, cost reduction, and resource expansion [4,5,11]. In China, this appears through local governments' reliance on land for fiscal relief amid inter-jurisdictional competition [19]. Meanwhile, development gaps particularly influence county willingness, making consolidation appealing to lagging counties by trading autonomy for enhanced growth support. Political incentives emphasize power dynamics, bargaining, and administrative restructuring [11–13]. In China's centralized governance, these are heightened by cities' provincial influence and administrative redundancies. Together, these perspectives guide CTD driver analysis, with economic motivations interacting with political factors to influence outcomes.

H1: *The scarcity of developable land in a city increases the probability of CTD.*

Since the mid-1990s, land has become a vital asset for local governments to ease fiscal pressures and support development in inter-jurisdictional competition [19]. Land development can generate revenues for public expenditure and leverage the financial resources for infrastructure and industrial development. A major benefit of CTD to the city

government is the centralization of the reformed county's planning and land management authorities. Through such reallocation of power, the city government can increase the amount of developable land. This need for additional land is stronger when existing urban districts face land scarcity. Higher-level governments are also more likely to support cities facing land scarcity in sustaining the development of a central city.

H2: *City-county geographic proximity increases the likelihood of consolidation.*

Geographical proximity between the city (urban core) and the county plays a significant role in CTD both ex ante and ex post. Geographical proximity reduces transport costs and makes socioeconomic connections easier to develop. It also facilitates closer administrative connections in China's top-down bureaucratic model [20]. Following the consolidation, proximity also leads to more cost-effective integration (e.g., lower infrastructure investment but more effective market integration) and potentially larger agglomeration benefits.

H3: *Larger gaps in GDP per capita and population size between the city proper and the county increase the likelihood of CTD.*

A county's relative (compared to the city) levels of economic development affect its likelihood of being consolidated. CTD benefits city governments through centralizing county administrative powers and expanding available land, thereby boosting fiscal and development resources. In return, the county usually receives additional administrative and financial support for development. Such a boost to the county, however, may be less attractive if there is no significant city-county gap in their levels of economic development, especially considering the county's loss of autonomy over fiscal and growth management. Similarly, a large county (in population size) relative to the city may also be concerned with the size of development gain through CTD.

H4: *A city's within-province economic ranking correlates with the probability of CTD.*

A powerful city is more likely to obtain approval from the province for what the city wants. As with most policy reforms in China, the actual selection of reform areas is biased toward more developed areas [21]. Cities with better economic performance attract more attention and support from the provincial government. The provincial government gives priority to the needs of these cities due to the reliance on the continued performance of those development engines to achieve overall growth. On the other hand, in negotiations with county and provincial governments, economic development level is associated with a city's political influence [22]. In fact, the leaders of more developed cities are more likely to be appointed to provincial party standing committees and other key leadership roles.

H5: *Single-district cities are more likely to undertake CTD.*

A city with a single district has the natural administrative duplication between the city and district governments. A single district may also be less efficient from the economic growth perspective [23]. CTD could improve both administrative and economic efficiencies.

5. Materials and Methods

To quantify the factors influencing the local decisions of CTD, we use a multilevel mixed-effect logistic regression model as follows:

$$Prob(CTD_{ic} = 1) = \Lambda(\beta_0 + \mathbf{Z}_c\gamma + \mathbf{X}_{ic}\beta + \alpha_p + \mu_c + \varepsilon_{ic}) \quad (1)$$

where $CTD_{ic} = 1$ indicates that CTD occurred for a county or city during the study period from 2010 to 2020, with c and i indexing city and county, respectively. $\Lambda(\cdot)$ is the cumulative distribution function of the logistic distribution. This method choice may appear unexpected given the temporal dimension of the data, spanning CTD events from 2010 to 2021. However, it is justified on several grounds. Standard time-series or panel procedures are unsuitable for these data, as CTD reform takes years to negotiate, apply, and approve, as discussed above. Determining the exact start year to establish accurate time lags is challenging. Moreover, event history analysis demands complete longitudinal data, which are unavailable for all indicators, especially spatial and institutional predictors. Given these constraints, this study adopts a cross-sectional strategy similar to that of Strebel [24]. The independent variables are constructed at individual city and county levels using data from 2010, three years before the sudden central approval of many local CTD reform requests in 2013 to capture pre-CTD conditions and avoid reverse causality. The CTD occurrence variable indicates whether a county underwent conversion during 2010–2021. This approach is defensible for two reasons. First, in substantive terms, this analysis does not aim at explaining when an event occurred during the period but only whether it occurred. Second, it focuses on structural indicators that do not vary substantially over such a short time period. Thus, 2010 data provide a representative snapshot of the longitudinal profile. α_p represents the province fixed effect. μ_c is a normally distributed random intercept at the city level. Finally, ε_{ic} is the error term that accounts for unobserved heterogeneity and random variation in the log-odds of policy conduction not explained by the predictors.

Variable selection was guided by the hypotheses developed in Section 4. City characteristics (Z_c) include the share of constructed land in the city proper, a binary indicator of a single-district city, and the city's within-province GDP ranking. County characteristics (X_{ic}) include city-county distance, gap in development levels, whether the county borders an urban district, fiscal revenue per capita, population size and density, industrial structure, and urbanization rate.

To avoid potential biases from unobserved regional-level factors, we apply restrictions to the population of prefecture-level cities (or urban regions, each comprising a city proper and its associated counties) in China. First, we exclude the cities in Xinjiang, Tibet, and Hainan and autonomous counties due to their ethnic autonomy and unique governance arrangements. Second, we drop cities from the three provinces (Gansu, Ningxia, and Inner Mongolia) without CTD during the study period. Third, we exclude cities from Qinghai province because it had only one prefecture-level city in 2010. Lastly, we drop counties involved in province-administered-county or county-to-county-level city conversions during the study period to ensure consistency in the county-city relationship. The final sample contains 241 cities and 1260 counties.

Tables 6 and 7 provide variable definitions and summary statistics, respectively. All data are publicly available. CTD occurrence data were obtained from the official announcements of the Ministry of Civil Affairs of the People's Republic of China. City- and county-level socioeconomic variables come from the publicly released China City Statistical Yearbook and China County Statistical Yearbook (National Bureau of Statistics). Population and urbanization data are from the Sixth National Population Census (2010). Government locations were identified from Amap 2021 edition (adjusted for known 2010–2020 relocations). No confidential or proprietary data were used.

Table 6. Definition of variables.

Variable	Definition
CTD	Dummy indicating if CTD occurred in a city or county during 2010–2020
Land_unavailability	Share of constructed land in the city proper
Single_district	Dummy indicating if a city has a single district
City_rank	The quintile of a prefecture-level city’s GDP ranking within the province
Development_gap	The ratio of GDP per capita between the city proper and the county
Size_gap	The ratio of the total population between the city proper and the county
Distance	Physical distance between county and city governments in kilometers
Boundary	Dummy indicating if a county borders an urban district
Fiscal_revenue	Ln (fiscal revenue per capita in yuan)
Pop_density	Ln (population density per square kilometer)
Pop_size	Ln (total population)
Industrial_structure	The GDP ratio between the tertiary and secondary sectors
Urbanization_rate	The ratio between the urban and the total population

Table 7. Descriptive statistics.

City-Level Variables	Obs	Mean	Std. Dev.	Min	Max
CTD	241	0.361	0.481	0	1
Land_unavailability	241	0.096	0.115	0.001	0.953
Single_district	241	0.311	0.464	0	1
City_rank	241	2.867	1.411	1	5
County-Level Variables	Obs	Mean	Std. Dev.	Min	Max
CTD	1260	0.093	0.29	0	1
Development_gap	1260	1.967	1.118	0.184	10.633
Size_gap	1260	3.451	4.65	0.332	88.369
Distance	1260	56.946	33.437	2.536	241.7
Boundary	1260	0.533	0.499	0	1
Fiscal_revenue	1260	6.716	0.831	4.648	9.432
Pop_density	1260	5.56	0.847	1.766	8.289
Pop_size	1260	12.96	0.644	10.311	14.536
Industrial_structure	1260	0.798	0.57	0.103	7.023
Urbanization_rate	1260	0.356	0.111	0.027	0.943

Source: Authors’ compilation from China City Statistical Yearbook, China County Statistical Yearbook, and Ministry of Civil Affairs.

6. Results

6.1. City-Level Analysis

Of the 241 cities in the sample, 86 cities experienced CTD during the study period. A logistic regression model was employed with three independent variables: land unavailability (ratio of constructed land), single-district dummy, and GDP quintile within province. Columns 1 through 3 of Table 8 present the univariate regression results, including province fixed effects. The coefficient for the constructed land ratio is positive and significant at the 1% level. This indicates that CTD is more likely in cities with land shortages within the city proper, supporting CTD as a policy reaction to developable land shortages in the urban core (Hypothesis 1). The coefficient for the single-district dummy is also positive and statistically significant at the 5% level, supporting Hypothesis 5. The estimated coefficient of the within-province quintile of prefecture GDP is negative and statistically significant at the 1% level, supporting Hypothesis 4. The multivariate regression results in

Column 4 are consistent with the univariate results, with an even larger marginal effect of the single-district dummy.

Table 8. CTD occurrence across cities.

	(1)	(2)	(3)	(4)
Land_unavailability	11.729 *** (2.703)			10.743 *** (3.158)
Single_district		0.748 ** (0.344)		1.887 *** (0.47)
City_rank			−0.507 *** (0.116)	−0.546 *** (0.148)
Province FE	Y	Y	Y	Y
_cons	−0.772 (0.679)	−1.175 (0.868)	0.817 (0.701)	−0.948 (0.859)
Observations	241	241	241	241
Pseudo R2	0.218	0.136	0.188	0.3

Note: Robust standard errors in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Y represents inclusion of the fixed effects controls.

6.2. County-Level Analysis

Analyzing CTD variations across counties, sample counties are nested within prefectures and analyzed in a multilevel mixed-effect logistic regression model, with the city characteristics at the city (prefecture) level and county characteristics and city-county interaction variables at the county level. Columns 1 and 2 of Table 9 present the estimation results using the baseline sample (Sample 1) for three county-city interaction variables: the county-city distance, development gap, and size gap, as well as county and city characteristics. Column 1 employs logistic regression, while Column 2 follows Multilevel mixed-effect logistic regression. To check for multicollinearity among predictors, we calculated correlation matrix and variance inflation factors (VIF), indicating no problematic multicollinearity (see Appendix A).

Estimates of the shared regressors are quite consistent between the columns. The results indicate that both larger development (in GDP per capita) and size (in urban population) gaps increase a county's likelihood of being converted into a city's district, confirming Hypothesis 3. It is also intuitive that the development level gap is about five times as strong as the size gap. The county-city distance coefficient is negative and statistically significant at the 1% level. That is, closer proximity increases the probability of consolidation, confirming Hypothesis 1. The estimated coefficients of city characteristics in Column 2 are consistent with Section 6.2's city-level analysis, except that the coefficient for land unavailability loses statistical significance, possibly due to the inclusion of county-city interactions, such as gaps in development level. Nevertheless, this suggests that when comparing counties' CTD probability, a city's number of districts and within-provincial rank are more important factors than the land scarcity of the city proper. All else equal, counties with higher fiscal revenue are more likely to undergo CTD. This seems intuitive as cities certainly prefer fiscally stronger counties when choosing to annex a new district. The estimated city-level random intercept variance is statistically insignificant, implying limited between-city differences beyond the fixed predictors.

Beyond the baseline sample, analyses of two distinct samples provide robustness checks given variations in political, temporal, and spatial factors that could potentially influence the results. Column 3 excludes sub-provincial cities. In these cities, CTD reform may involve promoting county leaders' political rank, which may introduce confounding effects tied to political incentives or administrative changes not present in other regions. Results remain consistent, confirming that the drivers hold outside these special cases.

Column 4 restricts the analysis to counties bordering an urban district. Although most CTDs occur in counties adjacent to the city proper, rare exceptions exist where non-adjacent counties were converted into districts². The findings are again unchanged, underscoring the robustness of proximity and development-gap effects even among the most likely candidates for consolidation. Overall, the subsample results reinforce that the identified local drivers are not artifacts of particular city types or adjacency conditions.

Table 9. CTD occurrence across counties.

	(1)	(2)	(3)	(4)
Development_gap	0.375 ** (0.147)	0.4 ** (0.163)	0.36 ** (0.183)	0.406 ** (0.164)
Size_gap	0.074 *** (0.025)	0.079 *** (0.027)	0.024 (0.036)	0.129 *** (0.043)
Distance	−0.071 *** (0.01)	−0.076 *** (0.011)	−0.096 *** (0.013)	−0.072 *** (0.011)
Boundary	2.058 *** (0.478)	2.182 *** (0.513)	1.879 *** (0.571)	
Fiscal_revenue	1.244 *** (0.276)	1.326 *** (0.308)	1.002 *** (0.324)	1.27 *** (0.312)
Pop_density	0.15 (0.258)	0.187 (0.281)	0.064 (0.287)	0.118 (0.287)
Pop_size	0.204 (0.346)	0.191 (0.368)	−0.291 (0.387)	0.335 (0.39)
Industrial_structure	0.442 (0.376)	0.47 (0.401)	0.585 (0.425)	0.252 (0.484)
Urbanization_rate	−1.304 (1.48)	−1.266 (1.565)	−0.904 (1.667)	−1.183 (1.591)
Land_unavailability	0.828 (1.024)	1.078 (1.244)	0.848 (1.141)	2.214 (1.565)
Single_district	1.712 *** (0.371)	1.908 *** (0.452)	1.671 *** (0.429)	2.007 *** (0.409)
City_rank	−0.441 *** (0.127)	−0.485 *** (0.147)	−0.362 *** (0.138)	−0.426 *** (0.139)
Random part				
City-level variance		0.408 (0.429)	0.015 (0.326)	0 (0)
Provinces FE	Y	Y	Y	Y
_cons	−14.606 *** (5.099)	−15.516 *** (5.544)	−5.203 (6.078)	−14.814 ** (5.806)
Observations	1260	1260	1134	672
Pseudo R2	0.398			

Note: Standard errors in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Y represents inclusion of the fixed effects controls.

7. Discussion

Examining cases and statistical evidence, this study shows how city and county characteristics, along with their interrelationships, influence the spatial distribution of county-to-district (CTD) reform in China between 2010 and 2020. Both qualitative and quantitative evidence support all five hypotheses. These city-level patterns indicate that higher-level governments approve CTD proposals to address practical constraints on urban expansion and to enhance regional coordination. This aligns closely with the efficiency-driven motivations emphasized in Western literature, where municipal amalgamations are often pursued to enhance public service delivery and reduce costs, and spatial mismatches [4–7]. CTD in China serves as a tool for optimizing urban land use and administrative efficiency

in rapidly urbanizing regions. The positive association with within-province economic ranking further echoes He and Jaros (2023), who link CTD likelihood to cities' bargaining power [13].

Shifting to the county-level analysis, geographical proximity emerges as a key predictor, with closer counties more likely to undergo CTD—an outcome intuitively linked to agglomeration benefits and reduced coordination costs. This parallels international studies on partner selection in amalgamations, such as Bhatti and Hansen (2011) in Denmark, where societal connectedness (often proxied by proximity) increases merger likelihood [9]. The development gap between cities and counties further influences outcomes: larger gaps correlate with higher CTD probability, reflecting counties' willingness to trade autonomy for access to city-provided development support, markets, and infrastructure. This contrasts sharply with Western evidence, where income disparities often deter mergers. High-income municipalities in Sweden [8] and wealthier or smaller jurisdictions in Switzerland [3] frequently resist partnering with poorer or larger coalitions to avoid fiscal burdens and loss of influence, whereas in China CTD is regarded as a redistributive tool that lagging counties can strategically use to attract resources. Controlling for this gap, counties with higher fiscal revenues are preferred, indicating cities' fiscal motivations in selecting partners. This fiscal selectivity mirrors Austin's (1999) findings on U.S. annexations [11].

Overall, this study contributes to the evolving literature on municipal consolidation by highlighting the role of local-level drivers—such as land scarcity, fiscal capacity, development gaps, and administrative structure—for the successful implementation of county-to-district conversion in China [12,13]. Specifically, it bridges Western emphases on fiscal and efficiency motives [3,6,7] with China's distinctive integration of economic development, urbanization pressure, and multi-level political economy. Unlike the predominantly top-down or voluntary Western cases, CTD reform as a bottom-up initiative in China's centralized system reveals hybrid motivations that transcend single perspectives. This hybridity matters because it illustrates how institutional contexts shape outcomes differently, leading to more targeted but uneven reforms.

8. Conclusions

This study offers systematic empirical evidence on how local incentives and inter-jurisdictional relationships drive county-to-district conversion in China during the 2010s. By combining case analysis with multilevel logistic regressions on nationwide city- and county-level data, it reveals a multifaceted decision-making process shaped by land needs, administrative efficiency, economic hierarchies, proximity, development disparities, and fiscal considerations.

The bottom-up approach adopted by this study extends the literature with a systematic perspective on local incentives and comprehensive data from China, providing explanations beyond national priorities and city political influence [7,12,13]. In addition, our identification of consolidation drivers contributes methodologically to the growing quasi-experimental literature on municipal consolidation effects, where non-random policy implementation can confound estimates [2].

Several limitations warrant acknowledgment. First, the reliance on 2010 local characteristics to predict CTD occurrences over the subsequent decade may overlook dynamic changes in socioeconomic and political factors during this period. Second, limited by data, the analysis may not fully capture the role of informal political negotiations in CTD decisions as suggested by qualitative evidence. Future research could address these gaps by employing longitudinal data to examine temporal dynamics and in-depth case studies or surveys of local officials to uncover the details of bargaining processes. Moreover, comparative studies between CTD and other forms of municipal consolidation internationally could

test the generalizability of findings, ultimately informing more effective urban governance reforms in China and beyond.

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Appendix A. Correlation Matrix and VIF for Regression

Matrix of correlations													
Variables	Development_gap	Size_gap	Distance	Boundary	Fiscal_revenue	Pop_density	Pop_size	Industrial_structure	Urbanization_rate	Land_unavailability	Single_district	City_rank	VIF
Development_gap	1.00												1.61
Size_gap	−0.01	1.00											1.58
Distance	0.10	0.12	1.00										2.26
Boundary	−0.16	−0.06	−0.55	1.00									1.9
Fiscal_revenue	−0.40	0.16	−0.11	0.12	1.00								3.09
Pop_density	−0.05	−0.15	−0.43	0.06	0.02	1.00							3.5
Pop_size	0.03	−0.40	−0.24	0.16	−0.07	0.65	1.00						3.19
Industrial_structur e	0.26	0.11	0.30	−0.16	−0.32	−0.27	−0.19	1.00					1.45
Urbanization_rate	−0.33	0.11	−0.04	0.04	0.60	0.15	0.00	−0.11	1.00				2.12
Land_unavailability	0.11	0.07	−0.20	−0.17	−0.02	0.36	0.11	−0.15	−0.03	1.00			2.28
Single_district	−0.16	−0.19	0.10	−0.06	−0.17	−0.21	−0.21	0.05	−0.11	−0.25	1.00		1.73
City_rank	−0.17	−0.25	−0.03	0.06	−0.09	−0.17	−0.15	0.06	−0.03	−0.24	0.35	1.00	1.68

Figure A1. Correlation Matrix and VIF for regression.

Notes

- Potential reasons for the lack of transparency in the decision process of CTD include first, there is no clear guideline from higher level governments, and second, city governments may treat CTD proposals as confidential to prevent possible public unrest (Zhao and Zhang, 2024 [16]).
- For example, in 2013, Nanjing merged two counties simultaneously: Lishui, which was adjacent to the urban districts, and Gaochun, which lies next to Lishui but lacks a direct boundary with the original urban area. In 2014, Nanping City, constrained by limited land in its fringe urban district due to natural geography, transformed the non-adjacent county of Jianyang into a district and relocated its city government there.

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