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Rasmus Broms
Elias Markstedt



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Department of Political Science

University of Gothenburg

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Local information capacity in Sweden

Rasmus Broms & Elias Markstedt¹

¹University of Gothenburg

Abstract

A growing strand of research revolving around the concept of legibility emphasizes the central function that information plays for state capacity accumulation. The bulk of these contributions remain focused on the existence of infrastructure supporting such information gathering rather than its actual content and quality. Further, attribution of agency in these narratives tends to remain at the level of the central state. Instead, we focus on local actors, specifically municipalities in Sweden. We use a publicly provided database of Swedish municipalities, containing around 5,000 miscellaneous indicators on various topics, to operationalize the propensity for producing missing data in a given municipality-year as a measure of (low) local legibility. The resulting “missingness”-index is devised through item-response theory modeling and covers all 290 Swedish municipalities between 1995 and 2022. Insofar, we make a methodological contribution by showing how public data repositories—often riddled by data issues endogenous to state capacity—can be leveraged as a valid empirical indicator of the same concept. Further, missingness is positively related to municipal capacity, measured by the administration size. Conversely, it is negatively related to local political autonomy, measured using voting patterns. These findings illustrate the importance of considering local government for the maintenance of state capacity in general.

1 Introduction

The historical narrative of capacity-building in European states is a story of centralizing authority and capacity from local peripheries to a central authority. A commonly overlooked feature of this process is that this central authority remained dependent on the stock of existing capacities at the local level, and has largely remained so since.

In particular, the collection and aggregation of localized information forms a crucial resource for the accumulation of state capacity. To effectively govern a society, the central ruler needs to know its shape and character. Through standardization, measurement, and data collection, central rulers have thus sought to make their realms "legible." But, as noted by Scott (1998), even the most intense phases of state centralization relied on local "trackers," tasked with assisting or independently extracting information. For instance, the development of the first modern censuses in Scandinavia – a paradigmatic tool for central information gathering – was based on local parishes' pre-existing information infrastructure (Brambor et al., 2020). In consequence, central states have always been forced to "see" their societies through a largely local prism.

Two problems arise in this principal-agent relationship between central and local authorities. First, a core insight from the state capacity literature is that polities are variably effective in extracting resources. Local polities and informational resources are no exception. Further, as Scott (1998) points out, the interests of local intermediaries running these local polities do not necessarily overlap completely with those of the central ruler. This creates a perpetual agency problem, whereby local agents may not be fully incentivized to comply with central directives.

Although these problems have been brought to the fore in relation to the concept of "indirect rule" (Gerring et al., 2011), usually relating to historical and/or colonial relationships (Lange, 2004), there is reason to reconsider them through a more general lens. Given recent, and still ongoing, global trends toward decentralization across the globe (Bardhan, 2002; Faguet, 2014; Rodden & Wibbels, 2019), the capacity and incentives of local actors as crucial intermediaries of information extraction are just as important for present-day governance and, arguably, state-capacity.

In this paper, we present a simple model where local legibility is the combined result of the bureaucratic capacity and political autonomy of the local polity tasked with information extraction. Specifically, local capacity is expected to increase legibility, while autonomy is expected to decrease it.

To explore this model in the real world, we create a novel measure capturing the quality of municipal statistical information across Swedish municipalities over the last quarter-

decade. Specifically, we leverage variation in the extent that information is missing for a given municipality and year in the country's primary municipal database, *kolada*, containing around 5,000 distinct indicators. The database is run by The Council for Municipal Analyses, a foundation co-founded by the central government and the Association of Local Authorities and Regions (SALAR). Our resulting empirical product is an index of *missingness* created using item-response-theory.

Sweden and its system of local government is an appropriate testing ground for the present purpose. For one, it combines a unitary structure that facilitates apples-to-apples comparison between municipal governments. Further, to any relevant degree, Swedish municipalities were not created in response to sectarian or regionalist calls for independence or local autonomy. Rather, their modern form is largely an administrative efficiency-enhancing measure to ascertain ambitious central-level political ambitions in building a comprehensive welfare state during the 20th century (Sundberg et al., 2011). As a consequence, Swedish municipalities are responsible for a large share of public goods provision, making the information it extracts have real stakes also for the central government. Institutionally, municipalities also display a comparatively very high level of *de jure* local autonomy (Ladner et al., 2016). Municipal rulers are directly elected, which leaves room for bottom-up accountability from the local electorates. This relationship can be contrasted by Sweden's *de facto* "nationalized" system of local government (Sellers et al., 2020), whereby strong central-local linkages within the party system provide robust countervailing networks of top-down accountability.

Our study makes a set of theoretical, conceptual, methodological, and empirical contributions of relevance for research on state capacity and multi-level governance.

Theoretically, despite a growing awareness of the multi-tiered structure of most states in the state capacity literature (e.g., Müller-Crepon, 2023), the existence of lower-level administrative units, such as the municipalities analyzed here, and their relation to the central state remains a poorly acknowledged and under-theorized study object in the field. In Harbers's (2015, p. 375)'s formulation, the state capacity literature remains subject to "center-centrism". Consequently, while plenty of research has investigated *sub-national* variation in state capacity, including collecting and disseminating information, we apply what we call a functionally *local* perspective, acknowledging a multi-level governance structure as a core feature. As an illustrative example of such theoretical-empirical tension in how to deal with the sub-national / local divide, we can consider the cautionary comment made by the architects of the EQI survey, which covers European regions and likely forms the most comprehensive data-gathering effort on sub-national state capacity to date:

this survey is designed to provide a general picture of the public services pro-

vided in a region. It is not designed to hold the providers of a specific public service accountable, nor is it designed to monitor the performance of sub-national administrative units. The EQI survey does, however, show the need for such surveys, particularly in countries and regions where quality is poor. (Charron et al., 2015)

As a result, although theorizing about state capacity routinely relies on a central-local dynamic, effectively illustrated by the importance of Scott's (1998) local trackers, only a few empirical attempts—e.g., Charasz and Vogler (2021) and Harbers (2015)—have considered the local administrative unit as an indispensable unit of analysis for understanding legibility and state capacity at large. Contributions regarding state capacity measures based on explicit considerations to match an administrative unit and the geographical area it inhabits are strikingly rare (see Ziblatt 2008 for one example). Therefore, our approach is not only placed to say something about the *subnational* dimension of state capacity but its *local* dimension as well.

Conceptually, our study follows several related contributions tying state capacity to the collection and dissemination of information; perhaps most clearly, the contributions of Brambor et al. (2020), D'Arcy and Nistotskaya (2017), and Lee and Zhang (2017). However, unlike Brambor et al. (2020) and D'Arcy and Nistotskaya (2017), whose measures primarily capture the *infrastructure* or *tools* for information gathering and dissemination, ours focuses on the quality of the actual *content* of the data collected. As such, our approach is comparable to Lee and Zhang (2017), who employ accuracy of data on population age, and Charasz and Vogler (2021), who analyze information capacity in Polish municipalities. Still, in contrast to these valid but narrowly defined operationalization strategies, our approach covers a much broader part of what the state effectively has deemed relevant information.

Methodologically, our strategy of leveraging missing data, an important source of uncertainty that plagues empirical research on state capacity, provides a productive direction for further studies of state capacity at the local level. As Luna and Soifer (2017) notes,

the quality of state capacity indicators is endogenous to state capacity itself, which leads to systematic measurement error. The pervasiveness of such measurement error is the first and most important problem with using state-generated data to measure state capacity.

Thus, the approach of explicitly estimating said measurement error turns a pervasive weakness in existing measures of state capacity into a feature in itself.

Our empirical analysis shows that, in line with the expectations derived from our theoret-

ical model, legibility increases with municipal bureaucratic capacity, defined in terms of administrative staff size, and decreases with political autonomy, captured in terms of how municipalities' parliamentary-level election results correspond with corresponding results at the municipal assembly level.

2 A brief model of local legibility, capacity, and autonomy

Like several other observers (Gerring et al., 2011; Harbers, 2015; Luna & Soifer, 2017), our theoretical model begins with the assumption that local institutions are functionally, and therefore analytically, separable from national counterparts. Subservient to a central authority, they can be considered local agents tasked with strengthening and maintaining the capacity of the state for the central principal. This role has been observed both during historical spells of state centralization (Gerring et al., 2011; Ziblatt, 2008) and decentralization (Pike et al., 2016).

Building on the two realizations that local institutions and legibility matter for state capacity, our theoretical model contains few qualitatively novel insights. Instead, we aim to structure and illuminate aspects already implied in the literature on state capacity about the relationship between decentralization and information. We generate two empirically testable hypotheses about how the concepts relate to each other.

2.1 Local capacity & legibility

The basic tenet behind multilevel governance and fiscal federalism is the expectation that local institutions are better equipped than the central state to handle many government functions. Information plays a key role in this relationship. For instance, Oates's (1972, 2005) decentralization theorem is underpinned by the inherent informational advantage of local governments in relation to the center. Similarly, for state capacity, the role of local information is perhaps most canonical in diminishing the cost of local revenue extraction (Garfias & Sellars, 2022).

Focusing on these subnational administrative polities (e.g. states, provinces or municipalities), i , we consider a model where central state s divides government functions and tasks between its own administrative apparatus (e.g. central government agencies or the military) and a set of i 's.

The stock of legibility in s , L_s can be additively summed up to its own and its admin-

administrative levels' distinct stock of capacities, C_s and $C_{i_{1...n}}$, weighted by D ($\in [0,1]$), the share of tasks devolved to the i 's. In a system where most government functions are consolidated within the central state, state capacity will almost exclusively depend on C_s , the capacities of its internal administrative entities, leaving C_i largely irrelevant. Further, contributions like Gerring et al. (2011) illustrate that variation in local government capacity may provide varying opportunities for state building and information extraction at the cross-country level. We note that C_i can vary also within a given state. In other words, different subnational units can extract different levels and quality of information for the state.¹

This relationship can be formulated as such:

$$L_s = C_s(1 - D) + \left(\frac{1}{n} \sum_{i=1}^n C_i \right) D$$

Translated into a hypothesis focusing on local units (i) as the unit of analysis, we expect that *greater local capacity predicts higher legibility in a local unit*.

2.2 Legibility & Local autonomy

The model outlined above assumes that the interests of subnational polities, i , align perfectly with those of the central state, s . This is a common conceptualization of the relationship between central and local institutions. Local government either tends to be described in technical terms as subordinate agents of, or as junior-level partners to (Harbers, 2015), the central state, tasked and willing to implement policies decided on by the central "dominant unit." (Gerring, 2011)

This view also underpinned the first generation of fiscal federalism, which considered the extent of devolution as a function of local capacity. However, the second generation of this literature (Weingast, 2014), as well as a burgeoning collection of studies concerned with state capacity (e.g., Boone 2003; Garfias 2018; Ricart-Huguet and Sellars 2023), acknowledges the fact that local agents possess distinct interests that imperfectly align to that of the central principal.

¹For clarity, we simplify our model in several ways from many real-world settings. For example, we assume that each i weigh equally. Should one prefer to weigh each i , this can easily be added by S , which could represent e.g. population size or strategic importance, as $(\frac{1}{n} \sum_{i=1}^n S_i C_i) D$. Further, most modern states have at least three administrative levels of relevance. While our example focuses on a two-tiered state for the sake of clarity, adding an additional administrative level, j , is commensurate with our model. Finally, we define D as constant over all i 's. This conforms to a system of symmetric multi-level governance. In asymmetric systems, D could vary over i 's.

As such, we conceive the central-local government relationship as a principal-agent problem involving agency costs. Consider, again, Scott’s (1998) account of local trackers sometimes cooperating and sometimes opposing the central state. As Scott notes, local intermediaries may have incentives to restrict legibility as a tool to retain their position at the beneficial side of an information asymmetry vis-a-vis the central state. Perhaps the most clear-cut case of this dynamic is when local government itself is the object of information gathering; just like citizens display an inherent resistance against being ”seen” or ”read,” the same argument can be made for intermediary actors, like local government agents. As Scott notes, ”[i]llegibility [...] has been and remains a reliable resource for political autonomy” (see also Garfias and Sellars (2021)). We argue that this relationship between local autonomy and legibility is endogenous. In our model, more autonomous local agents are better equipped and incentivized to limit legibility.

Indeed, there are plenty of cases where the central state requests information that is also of neutral or positive value to local government. In societies without intense center-periphery conflict, most information extraction likely benefits both local and central state government. Nevertheless, we posit that the relative legibility dividend is lower for the local government that provides it than for the central states that demand it, and maintaining an information asymmetry remains a prize on its own. With more autonomy, local governments will therefore be able to assign the needs of the central government lower priority. In contrast,

These insights lead to a complementary model of how legibility for the central state reduces with greater A ($\in [0,1]$), level of autonomy, of each local unit i :

$$L_s = -\frac{1}{n} \sum_{i=1}^n A_i$$

Consequently, we also hypothesize that *greater local autonomy predicts lower legibility of a local unit*.

3 Data

The remainder of our study attempts to empirically test these hypotheses using novel data on local-level legibility. Subjecting these hypotheses to empirical testing demands reasonable strategies to operationalize three complex concepts: legibility, capacity, and autonomy. In particular, our approach to devise an empirical measure of legibility is an extensive and data-intensive endeavor that forms its own independent contribution. Therefore,

we will describe this effort in more detail.

3.1 Constructing a legibility index from missing data

Throughout our empirical investigation, we will equate legibility with the absence of missing data or *missingness*. For this purpose, we need a fair amount of data. The Kolada database covers a wide array of information about local government, demographics, and finances in Swedish municipalities and regions. The database was founded in 2010, and it is run by the *Council for the Furthering of Municipal Analysis (Rådet för främjande av kommunala analyser [RKA])*, a foundation created as a joint venture between the Swedish central government and the Swedish Association of Local Authorities and Regions (SALAR) to facilitate analysis of municipal and regional operations. Its foundation was preceded by a series of public inquiries arguing for the need for such an infrastructure in the interest of disseminating data to municipal actors, policymakers, and the general public, as well as increasing efficiency and equity in municipal services (see SOU 2001:75, SOU 2005:111; SOU 2009:25).

As of 2024, the Kolada database contains around 6,000 distinct indicators concerning the country's 290 municipalities and 21 regions. Most of these, around 5,000, concern the municipal level, reflecting the Swedish municipality's extensive set of tasks, including social services, elder care, primary and secondary education.

The database mainly functions as an aggregate repository for data originally collected by other organizations. The principal source of data is Statistics Sweden, but many indicators also derive from other central agencies, like the National Board of Health and Welfare and the National Agency for Education. Some information stems from SALAR, while a smaller number are entered directly from the municipalities into the kolada framework.

At face value, the fact that most data sources are central government agencies risks invalidating any measure stemming from it as an operationalization of *municipal*-level factors. However, according to RKA, the original source of information is to be considered to stem from municipalities themselves, meaning that such information-gathering processes involve collaboration between providers (municipalities) and receivers (agencies) of source data. While missingness may, in theory, result from actions taken by the data receiver, we assume that such cause for missingness is modest and, more importantly, orthogonal to the specific municipalities.

As we illustrate below, there is one main exception to the principle that municipalities provide the initial data: Any information strictly concerning municipal denizens, like age

structure, is gathered from the central population register. Such information is thus, due to a high level of national statistical capacity (Brambor et al., 2020), not riddled with any considerable risk of missingness. Therefore, it does not cause variation in missingness, and thus empirically irrelevant for the present purpose.

Accessing and processing the degree of missingness in Kolada was carried out in multiple steps:

3.1.1 Data collection

For the initial data collection, we downloaded the totality of the information in the database through RKA's API,² resulting in a snapshot of the database as of April 2024. Data was available between 1995 and 2022 for all 290 municipalities, but since information for 2022 may not have been inserted yet, the final year of measurement was set to 2021. We excluded Gotland because of its unique status as both municipality and region, meaning it is subject to a partly different set of valid indicators.³ A small number of indicators (88) are available from the first year (1995), but the first substantial wave (543) contains data from 1998. Most indicators run up to 2022, although some have been discontinued or are not measured annually.

3.1.2 Defining missingness

The resulting dataset contained 5,065 distinct indicators and 15,812,324 observations at the indicator-municipal-year level. Among observations within the 1995–2021 coverage period, 83 % contain a value (in vector V in the API), leaving about 17 % of cells with initially missing data.

However, several modifications were necessary to assume that the absence of a value in a given cell implies 'missingness' rather than merely a 'non-value.' Fortunately, the source data offers information about the reasons for such non-values. Kolada contains a variable *Status*, that can take three values classifying the missing observations: "Missing" (5.3 %), "Not applicable" (3.3 %), and "Privacy" (2.2 %). In addition, several cells lack information in both V and *Status*, denoted here as "[Blank]" (0.19 %), while a non-trivial number has no entry at all (3.15 %) in the original API. These cells were labeled "Not in API." Finally, due to irregular nation-level data collection or idiosyncratic lapses, including a small number

²See <https://github.com/Hypergene/kolada> for more information about the API.

³Two other candidates, Älvdalen and Nykvarn, contain single years (1999 and 2012, respectively) where an unusually large share of information is missing. Although sensitivity checks were carried out with all these potentially suspect cases, the missingness is considered germane and left untouched.

of indicators not collected annually at the national level, 3.10 % of cells contain no data in a given year for any municipality.

Table 1: Distribution of data availability in raw data

Status	N	Share	Cumulative	Used in our analysis as:
Data exists	12,104,134	82.77	82.77	True value
Missing	693,713	5.27	88.04	True missing
Not applicable	450,902	3.34	91.38	Non-applicables
Privacy	297,211	2.18	93.56	Non-applicables
[Blank]	27,935	0.19	93.75	True missing
Not in API	457,234	3.15	96.90	True missing
Doesn't exist in t	490,521	3.10	100.00	Non-applicables
Total	15,812,324			

The variation in reasons for non-data displayed in table 1 calls for a more nuanced and restrictive classification of missingness at the cell level than just including all cells without data. The challenge here is to separate what cells are true values, missing, and non-applicables. The aim is to compare missing values with true values while excluding non-applicable entries since the latter results from different data-generating processes than the missingness patterns legibility produces.

1. Not applicable (N/A) and Privacy status imply a conscious data entry and should not be considered missing, but rather different hues of non-applicability. For example, concerns of anonymity to protect individuals in small municipalities lead data concerning segments of the population, like primary school pupils, to routinely be marked Privacy. Further, information about ports is substantively non-applicable in inland municipalities, warranting the N/A assignment. Inspecting how these categories were dispersed across the indicators and municipalities indicated that Privacy and N/A have sometimes been reported intermittently with missing data from year to year. It is difficult to systematically establish which category is more likely to be true. However, we chose a restrictive strategy by classifying any cell as non-missing if *either* N/A or Privacy is present in the same indicator. This classification was used since we consider the likelihood of erroneous missing status higher than the opposite since both the N/A and Privacy classifications imply an active data entry effort made by an administrator, much like a real value. Excluding these observations decreases the number of indicators from to 2,549 ($N(\text{observations}) = 9,299,853$).

2. A more complex problem stems from inconsistencies when a cell receives Missing or has a value of 0. While 0 is naturally a valid value for many indicators, visual inspection made clear that in many cases—for example, the per capita cost or the number of employees for a certain mandatory service—0 was an unrealistic entry and instead likely used as a shorthand for missingness. Conversely, in other indicators—including ports, ice hockey rinks, services purchased by non-profit actors, district heating, etc.—”missing” likely served as a shorthand for zero or, more aptly, non-applicable. For this dual issue, we made corrections at the indicator level based on its substantive area of focus, and the likelihood of that missing was zero, and vice versa. This step reduced the number of indicators from to 1,773 (N(observations)=6,708,377).
3. Finally, through information about initial sources for each indicator (provided in correspondence with RKA), we could discern that a small number of indicators belonged to data collection efforts that were not plausibly undertaken across the full population of municipalities. This category of indicators includes the population health survey (*folkhälsoenkäten*) issued on a regional basis. Given the exogenous source of this data-gathering process, it was excluded from the sample of indicators.
4. Contrastingly, we chose to exclude information from several surveys based on a common national template but undertaken voluntarily at the municipalities’ own expense, like a survey on resilient employee engagement (*Hållbart medarbetarengagemang*), or as a paid service, like the citizen survey, provided by Statistic Sweden in order to probe municipal denizens on their satisfaction with municipal services. This reduced the sample to 1,394 indicators and 5,965,719 observations.

3.1.3 Aggregation

To reiterate our operationalization strategy, the index is meant to capture the collection and data dissemination process within a given municipality. Ideally, we would have a clearly defined unit of observation for each data-gathering event at any given time and municipality. Unfortunately, this is not readily available. In theory, the web interface of Kolada contains information to identify the ”component data,” consisting of one or several distinct sub-indicators that underlie each given key indicator. An example of this component data is when the cost measure for some service is reported as per capita, and the component data consists of the raw cost and population size. These component data are, however, not available through the API.

In addition, and more importantly, even with full access to component indicators, these individual data sources, like published indicators, often derive from the same underlying

data collection process as other indicators. An extreme example is the range of indicators that captures the number of municipal inhabitants by age in years, with one variable for each age cohort. Since the focus here is on how data is processed rather than the informational value of each unique indicator, we wish to aggregate data to the level of each unique collection process.

One potential solution would be to collapse the missingness data to the level of each data source. A variable list RKA provided contains source information about each key indicator. This includes 74 distinct sources like Statistics Sweden, SALAR, a range of less frequently cited agencies and organizations, and sometimes multiple organizations. Still, this source information is broadly defined and thus aggregated at a level too coarse to use as a delineator here. For instance, although Statistics Sweden is a large and multifaceted organization carrying out many discrete data-gathering efforts, which end up in Kolada as indicators, many indicators simply denote the organization as the source.

As a reasonable compromise, we aggregate the indicators both by source and a categorization of type of activity, which is available in the variable list. These types number 57 and are coded at the level of, e.g., secondary education, recreation, and balance sheets. The resulting group of patterns number a set of 247 final aggregated indicator-groups. If any of the individual indicators in a municipal-year is missing, it is coded as 1 for that year. This means that the share of missing is higher in the aggregated data than the original data at the indicator level. While a majority of indicators (60 %) do not contain any missing data, this figure is only 20 % of the aggregated indicator-groups. In total, 51 % indicator group-years contain no missing data.

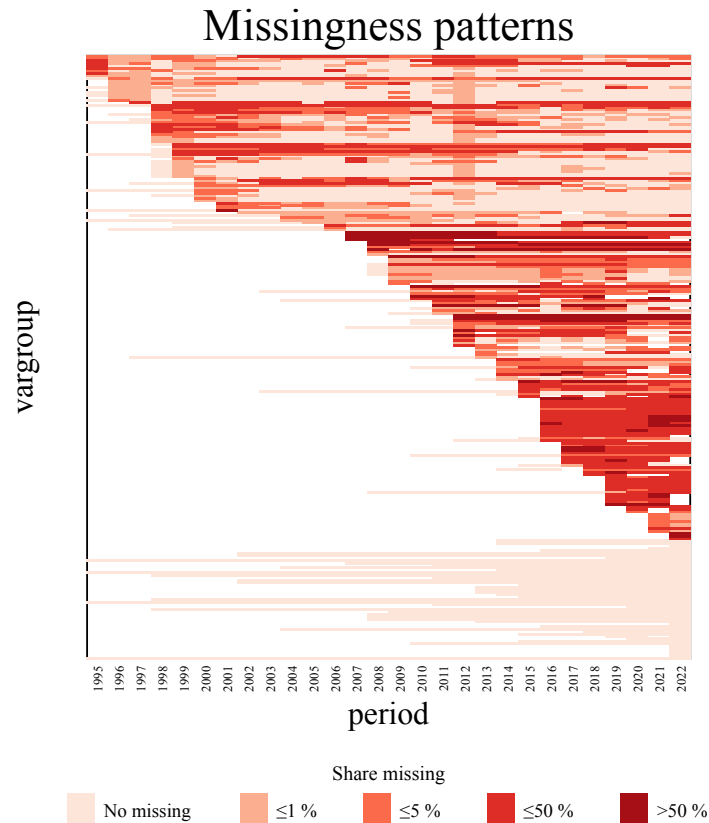


Figure 1: Missingness patterns

Note. Dark areas denote missing information in any municipality for a given indicator (panel a) or unique pattern of missingness (panel b) stacked on the vertical axis and year. Distinguishable patterns of missingness in 1999 and 2012 stem from extreme shares of missing information in Nykvarn and Älvdalen municipalities for these years.

3.1.4 Constructing an index of missingness using item-response-theory

After setting bounds on the definition of missingness, as well as which indicators to analyze for this purpose, we ran a series of item response theory (IRT) models to construct our index. IRT is a popular method for index construction when one has reason to expect that the observable subcomponents – the individual indicators in Kolada – collectively but differentially capture a certain, unmeasurable, latent concept, in our case, the latent concept being legibility.

Specifically, instead of assuming that each indicator is equally likely to accurately capture the concept of legibility, IRT allows the researcher to use the data to discriminate between each component. For this iteration, we used a one-parameter model. Compared to simple additive indices, this approach considers that some indicators require higher legibility to gather successfully.

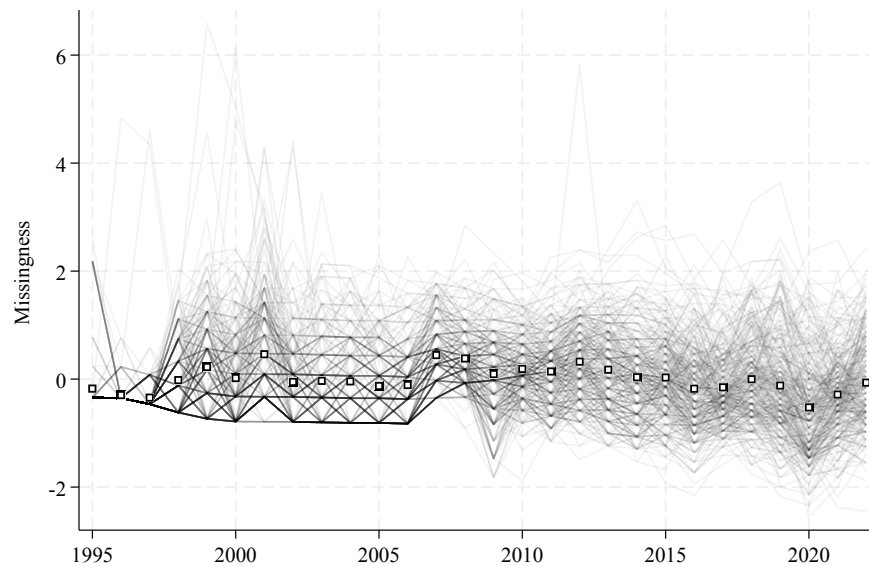
The 1PL IRT model can be formalized as follows:

$$P(Y_{itj} = 1 | \theta_i, \beta_j) = \frac{1}{1 + \exp(-(\theta_i - \beta_j))}$$

where $P(Y_{itj} = 1 | \theta_i, \beta_j)$ is the probability that the i -th municipality at time t provide information (non-missing values) the j -th indicator. θ_i is the latent trait (legibility) for the i -th municipality. β_j is the difficulty parameter for the j -th indicator.

Figure 2 draws the development of the missingness score for each municipality. See appendix A for further index diagnostics.

Figure 2: Missingness, by municipality and year



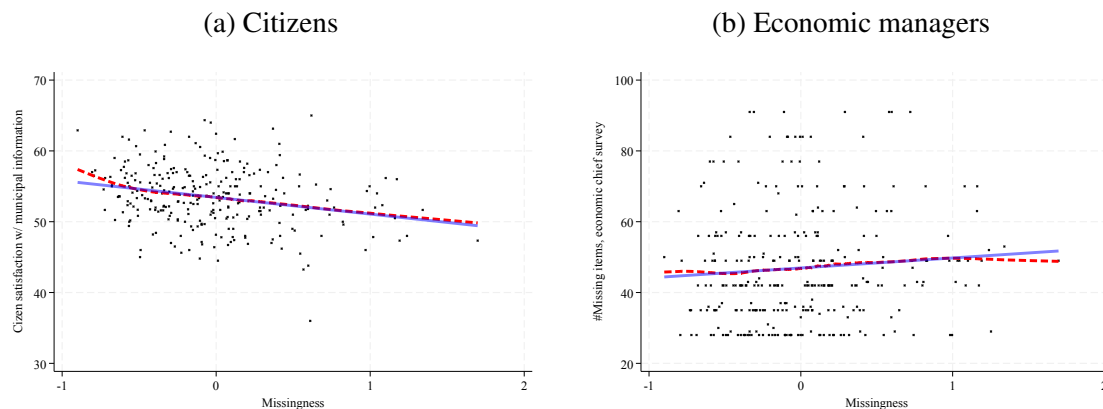
Note. Grey lines track the missingness score for each municipality. The annual mean score is shown as white squares.

3.1.5 Validation

We are curious to see whether missingness can be connected to visible indicators of legibility for local inhabitants. Indeed, there is a paucity of such information already in existence. However, our measure tracks with the best available data on relating topics. Panel (a) of figure 3 shows missingness correlating negatively with an index of citizen satisfaction with municipal information (derived from Statistic Sweden’s citizen surveys; $p < 0.001$).⁴

Further, although the relationship is weaker and statistically indistinguishable from zero ($p = 0.16$), missingness also correlates in the expected, positive direction with the number of missing items from an annual survey of municipal economic managers (2005–2017). This forms an out-of-sample measure capturing a similar phenomenon.

Figure 3: Missingness & correlates of legibility



Note. Missingness is set at its mean 1995–2022 value. The citizen satisfaction index is coded as the 2005–2020 mean and derives from four survey items: “How satisfied are you with the access to information about the municipality and its activities?”, “How satisfied are you with the clarity of the municipality’s information?”, “How satisfied are you with how timely the municipality provides information on important issues?” and “How satisfied are you with the municipality’s website?”. The index of items from the Economic manager survey is an aggregate of the 2005–2017 period and concerns whether the municipality employs any of seven common steering strategies.

⁴A reasonable reader may critique the usage of a measure that itself is subject to missing data and thus a part of the missingness index for a validation exercise. We hope to reassure this reader by pointing out the fact that by collapsing all individual observations for a municipality into an average index, we reduce the number of missing municipalities to 19 of 289. Thus, any selection bias would need to be severe to distort the general picture.

3.2 Capacity

Defining municipal capacity and related concepts has been a pervasive and unsolved issue as long as it has been empirically studied. An essentially unmeasurable latent concept, the main point of dissent is whether to focus on directly measurable factors relating to input, process, or output stages (Berwick & Christia, 2018). We prefer to operationalize capacity in the input stage. This strategy is particularly appropriate for our purpose, considering that our outcome of interest, legibility, can be considered an output-related capacity dimension in itself. Following Fukuyama (2013), we consider *resources* and *competence* complementary aspects covering a large portion of input capacity. The most common way of capturing the former is through fiscal resources, mainly tax revenue. Since Swedish municipalities do not implement tax collection, we instead use a measure of administrative personnel size. This approach of operationalizing municipal-level capacity is similar to Acemoglu et al. (2015), although we focus explicitly on administrators rather than the full municipal workforce since total staff size can be influenced by outsourcing and other demand-driven factors. We use publicly available data provided by SALAR of the number of employees in municipal administration with data coverage between 1999 and 2022. The mean number of administrators is 268 (SD = 519). Given a very wide variation (range 24 - 7,211) and strong skewness (median=130), we log-transform the measure (mean = 5, SD = 0.91).

Competence is defined by the share of municipal employees with higher education. Since this factor is strongly affected by the share of outsourcing in a municipality, we residualize this variable by the share of municipal services purchased from external parties. This data is available between 2010 and 2022.

3.3 Autonomy

Existing measures of local autonomy primarily focus on the institutional framework of local government autonomy at the country level (e.g., Ladner et al. 2016). Another approach leverages within-country variation in the number of competencies formally allotted to local governments (e.g., Ivonchik 2022; Wood 2011). These approaches are ill-suited for the Swedish unitary structure, with minimal de jure differences in competencies and formal autonomy between municipalities.

Barring variation in the assignment of autonomy from the top down requires a theory about bottom-up sources of local autonomy endogenous to municipalities. Our approach to identify such sources of de facto local autonomy is to study political dynamics. In particular, we consider the existence of multiple principals inherent to Swedish municipal organization. Constitutionally, the state governs municipalities from above, whose principal is the

entire electorate. Meanwhile, since the political leadership is directly elected, it has an additional, local, electorate functioning as another principal. We consider the main source of local autonomy to stem from the autonomy that has been found to arise from conflicting interests between these multiple principals (Voorn et al., 2019).

Empirically, this approach is especially well-suited for a context like the Swedish one, which Sellers et al. (2020) classify a "nationalized" local government system, whereby a considerable part of vertical central-local linkages runs informally through its national party system.

Based on this insight, we leverage the fact that municipal elections, which are held every four years, are not only concurrent across the country, but also with the elections for parliament. Specifically, we focus on how much the municipal-level election results in municipality i diverge from the parliamentary results. According to this model, local autonomy is defined as vote discrepancy, assigned each election t across every municipality i as the absolute mean difference of the eight national parties' (p)⁵ election results for municipal assembly and their national results in the parliamentary election:

$$\text{Vote discrepancy}_{i,t} = \left| \text{Vote share}_{p,i,t}^{mun.} - \text{Vote share}_{p,i,t}^{parl.} \right|$$

We interpret local electorates with low municipal-parliamentary differential in election results as having less localized electorates. As a result, elected representatives in these places have less leeway to operate autonomously from the central state. Conversely, large municipal-parliamentary discrepancies indicate that local electorate-principal is more aware, creating more autonomy vis-a-vis the central state for the municipal agent. Voting data is publicly available from Statistics Sweden. The average vote discrepancy is 2.7 percent (SD = 1.5) and holds fairly steady between 2.25 and 3.25 percent in the 1994–2018 election cycles under study.

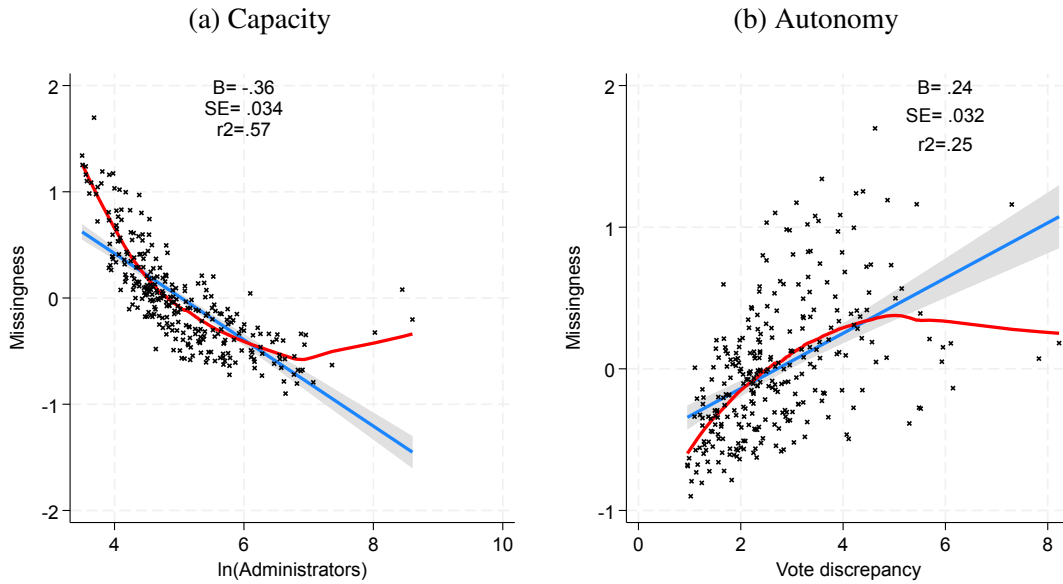
4 Analysis

We begin the empirical analysis of local legibility relates to municipal capacity and autonomy by looking at how the mean value of missingness (1995–2018) relates to corresponding means of our preferred measures for capacity (natural log of number of administrators) and autonomy (vote discrepancy in a municipality's results for municipal assembly and parliamentary elections).

⁵The Sweden Democrats are uncounted until the 2002 election.

These relationships are drawn in figure 4. Both align with our hypotheses that missingness (H1) diminishes with higher local capacity and (H2) increases with lower local political autonomy.

Figure 4: Legibility, capacity, & autonomy, bivariate results



Note. Missingness & Vote discrepancy calculated as z-standardized mean values for 1995–2022, and for ln(Administration) 1999–2022.

Particularly for number of administrators, a clear non-linear pattern also stands out. This non-linearity hints toward a crucial underlying part of the story: Population size, a factor that (in log-form) substantively affects vote discrepancy ($r^2=0.33$) and overwhelmingly affects log administrators ($r^2=0.96$). Although we do not consider the influence of this underlying factor as invalidating our observed prima facie relationships, since differences between large and small polities fit into our overarching theoretical model as an antecedent explanation. It is, however, illuminating to investigate whether this factor forms the singular force driving our observed links.

The results of these analyses are reported in table 2. As an additional feature of this analysis, accounting for population size changes the substantive interpretation of log(administrators) to another reasonable capacity measure, equivalent to a measure of administrators per capita. To ensure comparability between the models, both variables are standardized so that a one-unit change corresponds to a one-standard deviation increase.

The first two columns re-estimate the cross sectional analyses of figure 4, but include population and its squared term. This approach dramatically affects the autonomy argument, effectively reducing the vote discrepancy coefficient to zero. Conversely, it does little to reduce the coefficient for administrative size. The coefficient is reduced from -0.36 in the bivariate model of panel (a) in figure 4 to -0.31 when controlled for population.

Next, we leverage the full temporal and geographic variation in the data to consider whether the relationships observed cross-sectionally are affected not only by population size in particular, but unobserved municipal and temporal factors in general. Columns 3 and 4 report results from two-way fixed effect-regression, still including log population and its squared term. This approach leaves the negative link toward capacity largely unaffected ($\beta=-0.27$, $p<0.01$). Further, the coefficient for vote discrepancy is again statistically significant in the positive direction, although, unlike for administrators, the substantive size is considerably diminished.

Table 2: Legibility, capacity, & autonomy, after accounting for population, unobserved factors & trends

	Cross-section		TWFE	
	(1)	(2)	(3)	(4)
ln(Administrators)	-0.31*** (0.09)		-0.27** (0.11)	
Vote discrepancy		-0.02 (0.02)		0.05** (0.02)
ln(Population)	-3.30*** (0.27)	-3.39*** (0.23)	-4.82 (2.96)	-7.98*** (2.53)
ln(Population) ²	0.16*** (0.01)	0.15*** (0.01)	0.21 (0.15)	0.33** (0.12)
N	289	289	6,932	8,080
Municipality FE			✓	✓
Year FE			✓	✓

Note. * $p<0.1$ ** $p<0.05$ *** $p<0.01$. Standard errors (in parentheses) are robust in the cross-sectional regressions and clustered on municipality and year in the two-way fixed effects (TWFE) regressions. The dependent variable is Missingness.

5 Conclusion

Through focusing on information extraction and the concept of legibility, we have sought to illustrate the importance of local institutions in maintaining state capacity. In brief, we emphasize that local state capacity is not a simple function of the central state's "reach," or infrastructural capacity. Instead, it is in large part endogenous to the local institutional setting.

We devise a novel index of missingness in Swedish municipal data that we argue serves as a reliable and valid operationalization of local legibility.

The results point to a dynamic whereby stronger municipal administrations produce higher levels of legibility, while politically autonomous municipalities and outsourcing produce lower levels. By showing that measures of local government capacity positively correlate with local legibility, our results support this notion that local capacity is a crucial component in state building.

Further, we highlight the fact that, in order to carry out these tasks, these local institutions are awarded with agency and power. As a result, this devolution means that local governments are autonomous agents with their own incentives. This has consequences for state capacity. Specifically, our analysis indicates that more politically autonomous local governments are less incentivized to extract information. As a result, state capacity at the national level also does not simply equate to the sum of a country's local state capacities. This finding is underlined by the fact that our empirical context is municipalities in Sweden, whose system of multilevel government is not a result of demographic heterogeneity, but rather from concerns with expediency and government effectiveness in delivering public goods. The fact that we find evidence of these dynamics in this setting speaks to the likely universal importance of local political autonomy for state's construction of legibility.

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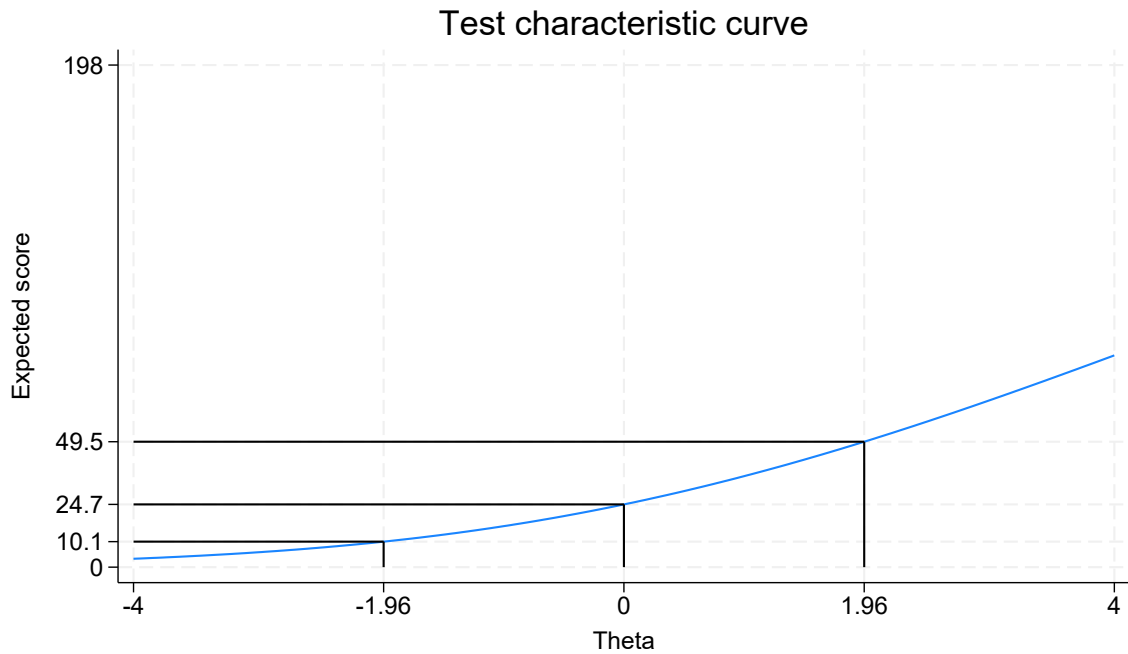
Supplementary information

Local information capacity in Sweden

A Index diagnostics

In Figure A1, we show the 1pl test characteristics curve. It shows that the index has a positively sloped curve indicating that the scale discriminates quite well, particularly, at the upper end of the scale. It performs less well at the lowest end of the scale (the curve is flatter) and, hence, is less well-equipped to measure the lowest legibility levels.

Figure A1: 1pl test characteristics curve



In Figure A2, we show the 1pl item characteristics curve. It shows a curve for each item and indicates that the items are distributed across the whole range of difficulties but somewhat fewer at the very lowest end of Θ (which is probably why the scale performs less well there; see Figure A1).

Figure A2: 1pl item characteristics curve

