

Applications

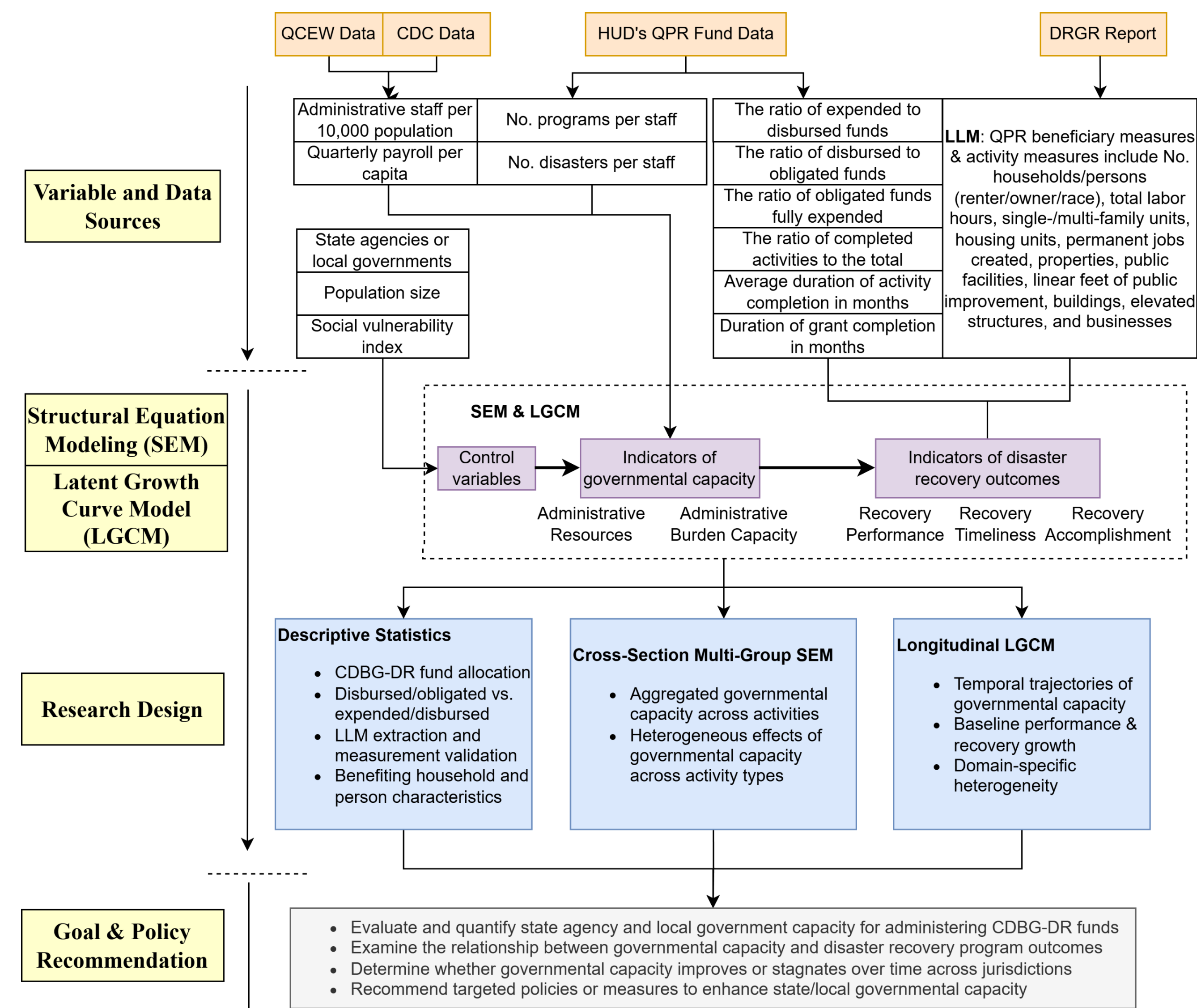
Motivation & Gaps

- As federal disaster recovery programs increase in **scale and administrative complexity**, understanding how **governmental capacity shapes recovery implementation and outcomes** has become increasingly important
- Existing studies largely rely on static indicators of governmental capacity and rarely capture the **dynamic and process-oriented nature of disaster recovery** across jurisdictions and activity types
- Administrative reporting systems such as HUD Disaster Recovery Grant Reporting (DRGR) remain underutilized despite containing rich information on recovery implementation and governance

Takeaways & Implications

- Advancing a **dynamic and multidimensional framework** for measuring governmental capacity
- Demonstrating the value of **LLM-assisted text extraction** for large-scale administrative policy analysis
- Highlighting the role of **activity-specific, adaptive capacity-building strategies** in improving disaster recovery governance

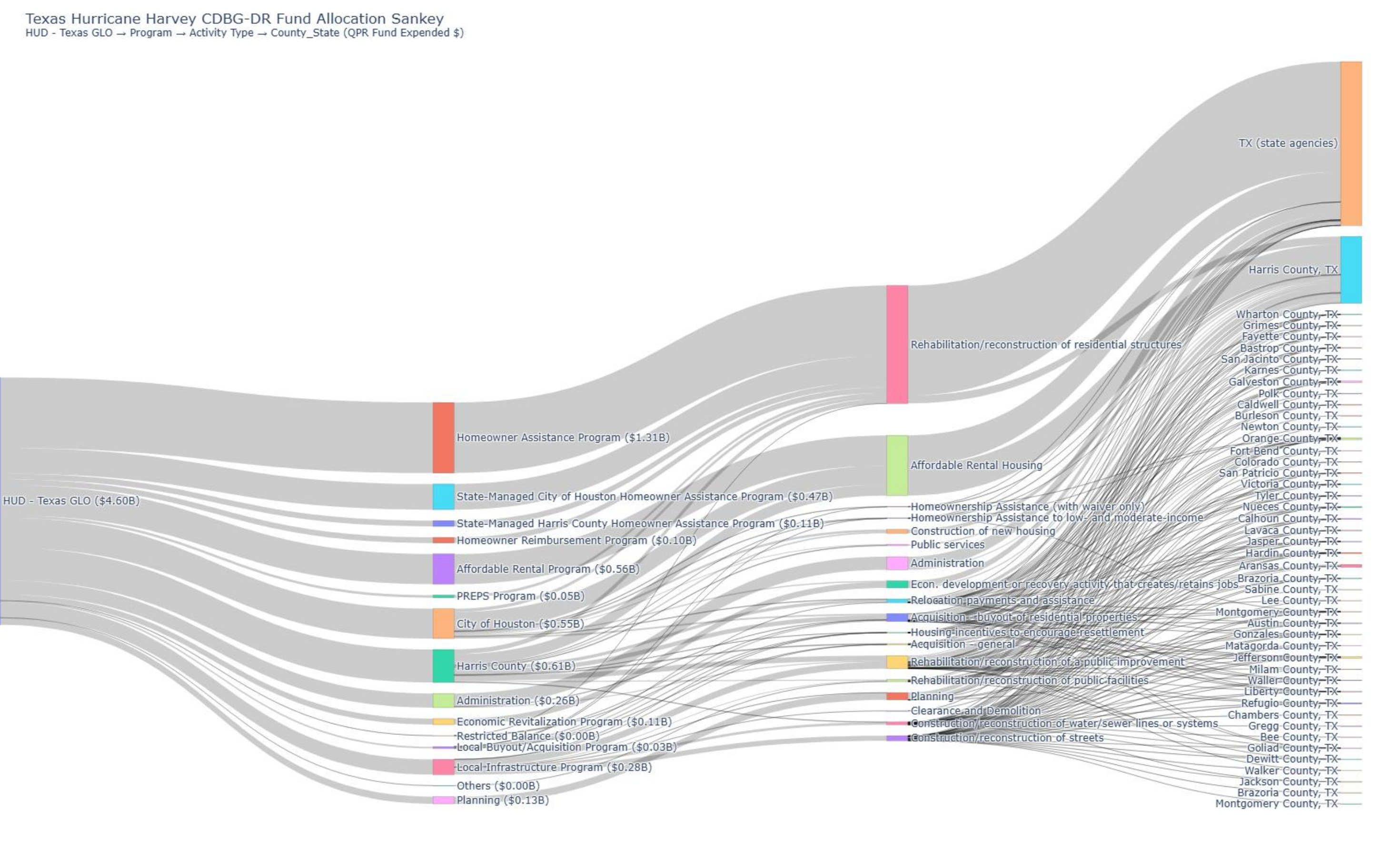
Research Framework



Hurricane Harvey: Texas CDBG-DR Fund Expenditure

Three Interrelated Patterns

- Programmatic concentration** within a small number of dominant housing recovery programs
- Functional concentration** in housing rehabilitation and rental recovery activities, supplemented by secondary investments in infrastructure and public services
- Institutional centralization** toward state agencies and major metropolitan jurisdictions



Texas's Governmental Capacity in Administering CDBG-DR

Two Ratio Indicators

- Disbursed-to-obligated ratio
- Expended-to-disbursed ratio

Key Findings

- Governmental capacity in disaster recovery is **stage-dependent and activity-specific**
- Disbursement** remains the primary implementation constraint, particularly for procedurally complex programs and lower-capacity jurisdictions

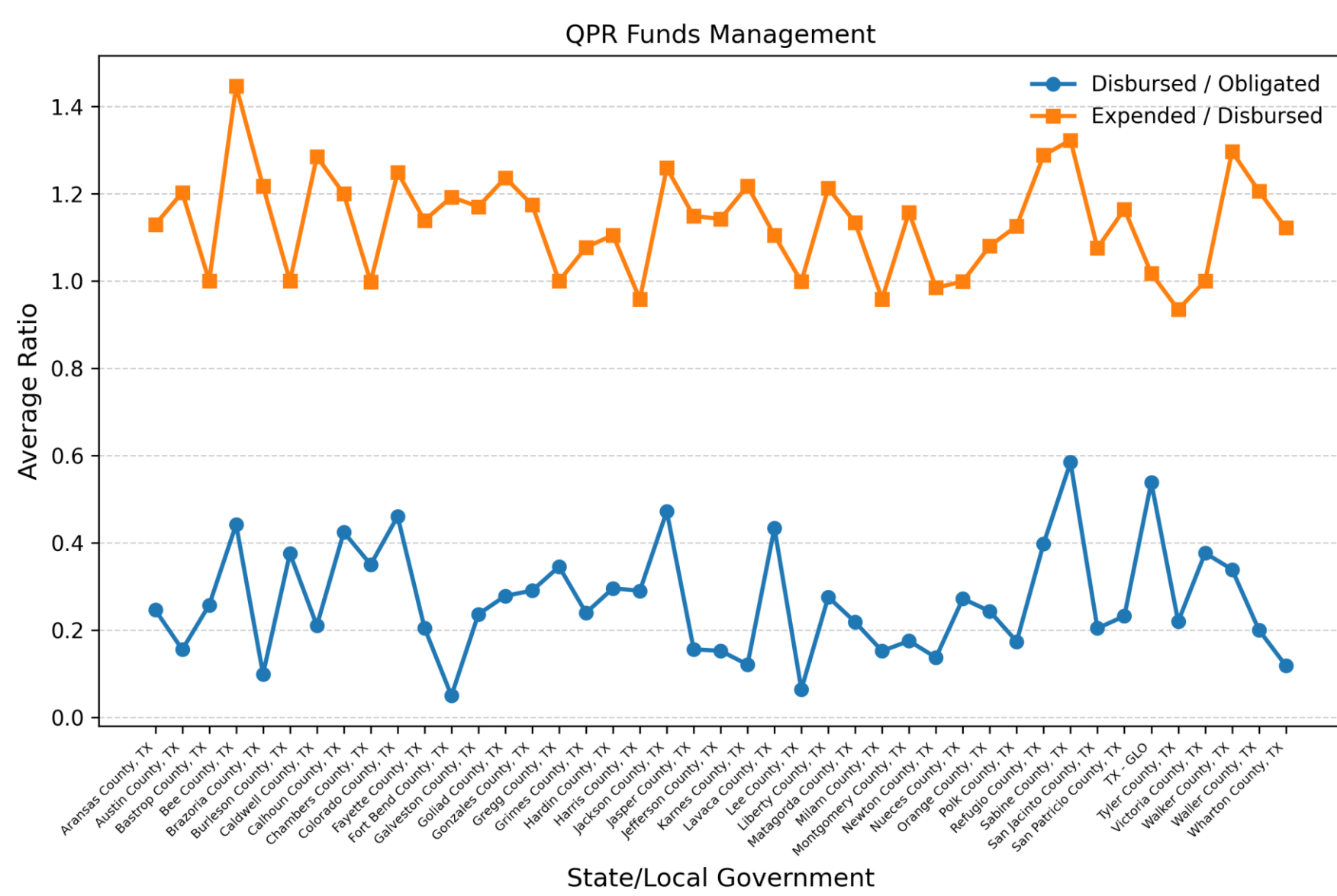


Illustration of Texas's governmental capacity in managing CDBG-DR funds across all activities

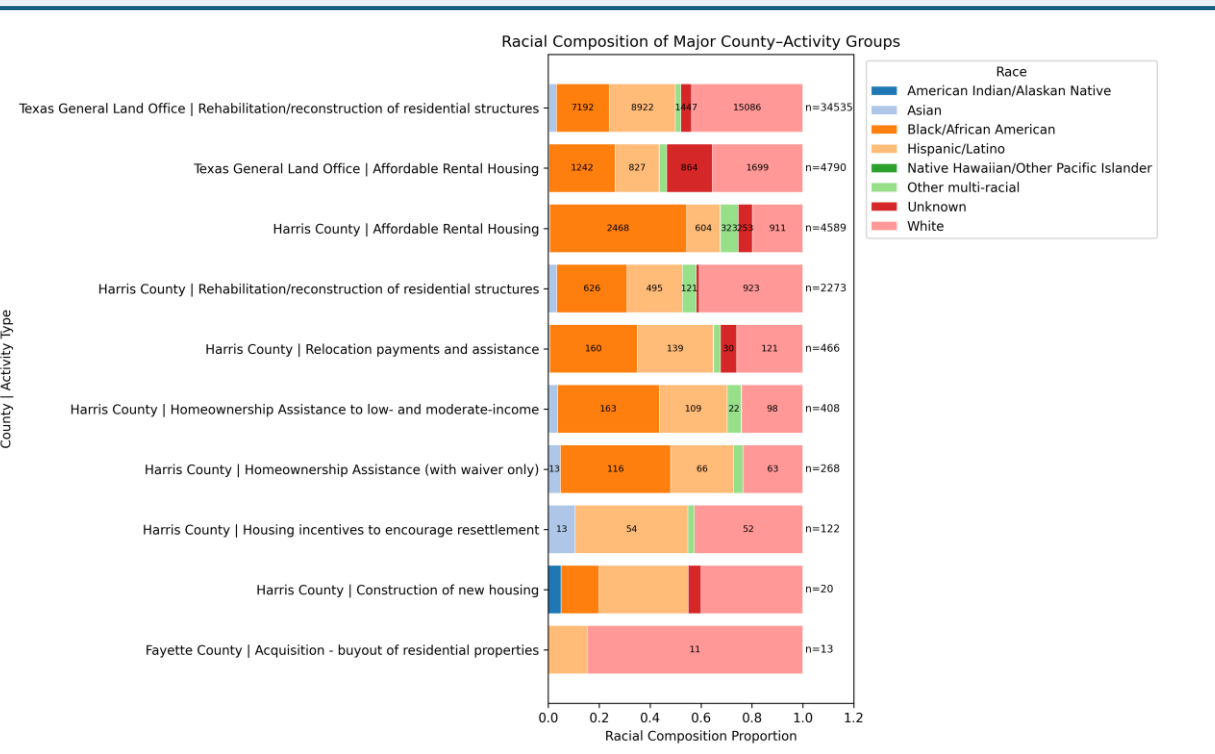
Implications

- Strengthening **upstream administrative capacity** > Focusing exclusively on **downstream expenditure efficiency**

Characteristics of Benefiting Households & Persons from CDBG-DR

Key Findings

- Majority:** High-capacity administrative entities and large-scale activities, i.e., GLO-led housing programs and Harris County public service programs
- Substantial variation** in beneficiary racial composition: Equity outcomes are closely associated with the specific mix of recovery programs implemented within each jurisdiction



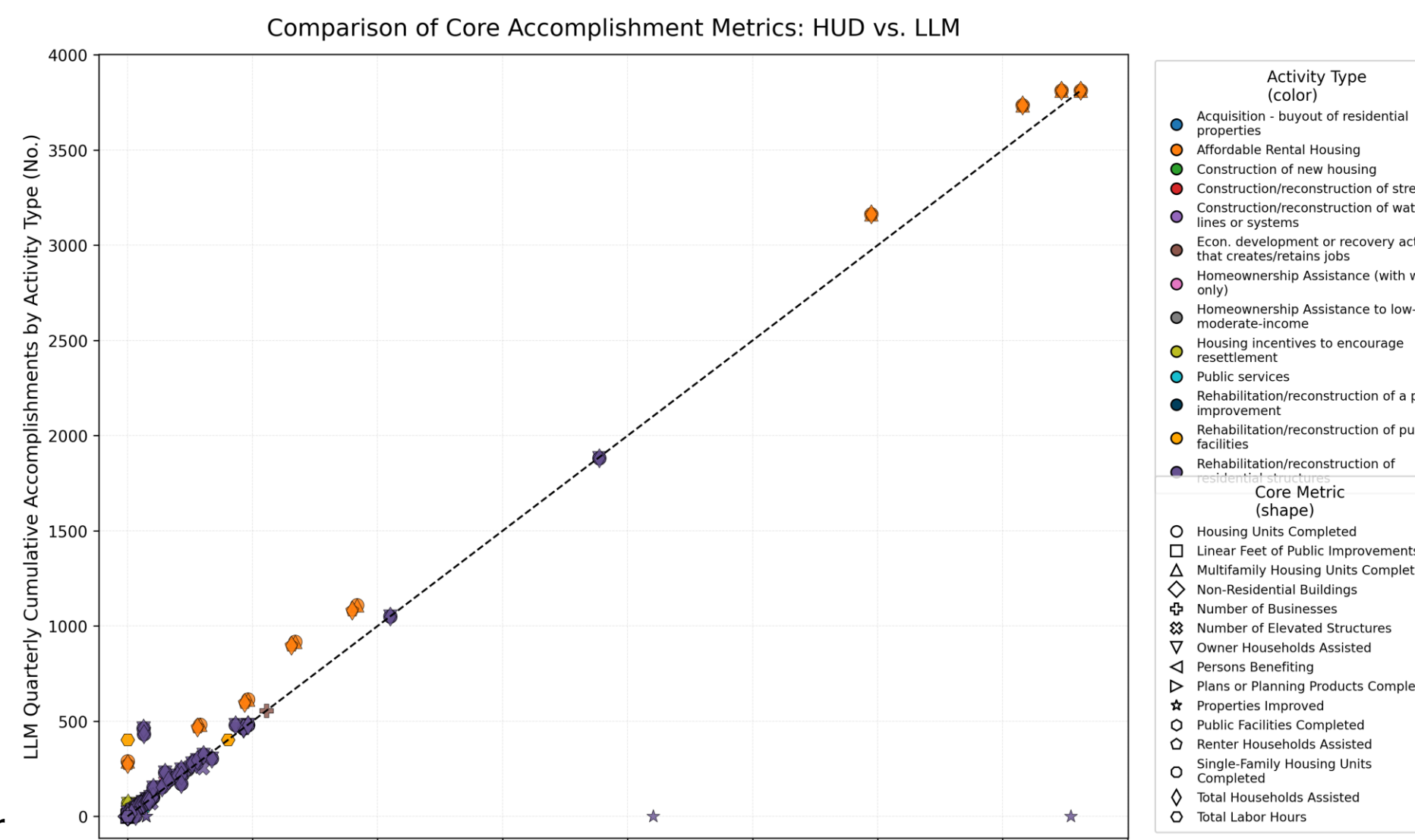
LLM-extracted vs. HUD Spreadsheet-based Quarterly Metrics

Key Findings

- $r=0.9575$: A strong agreement between the two data sources, with most observations clustering closely around the 45-degree reference line

LLM Implications

- Serve as a **reliable and scalable approach** for recovering structured quantitative information from semi-structured disaster recovery reports



SEM: Aggregated Government Capacity Across All Activities

A Multidimensional Structure of Disaster Recovery Governance

- Administrative resources** substantially improve recovery outputs but may reduce implementation efficiency
- Administrative burden** simultaneously reflects operational strain and program intensity, producing both constraining and output-enhancing effects
- Social vulnerability** influences recovery outcomes in highly domain-specific ways that are mediated by institutional and policy contexts

Table 3. Statistically significant SEM effects

Outcome	Variable	β (Std.)	p-value
Recovery Performance	Admin Resources	-0.465***	<0.001
Recovery Timeliness	Admin Resources	-0.628***	<0.001
	Burden Capacity	-0.231***	0.004
Housing Recovery	Admin Resources	0.573***	<0.001
	Burden Capacity	0.262***	<0.001
	State Level	-1.001***	<0.001
	Population	0.469**	0.022
Infrastructure Recovery	Admin Resources	0.416**	0.027
	Burden Capacity	-0.397**	0.035
	SVI Theme 1: Socioeconomic	-0.403**	0.022
	SVI Theme 2: Household composition & disability	0.243*	0.085
	SVI Theme 4: Housing type & transportation	0.329*	0.076
Socioeconomic Recovery	Admin Resources	0.583***	<0.001
	SVI Theme 1: Socioeconomic	-0.262**	0.020
	SVI Theme 3: Minority status & language	-0.438***	<0.001
	SVI Theme 4: Housing type & transportation	0.351***	0.003

Note: ***, **, and * denote statistical significance at the 99%, 95%, and 90% confidence levels, respectively. Insignificant coefficients are not shown.

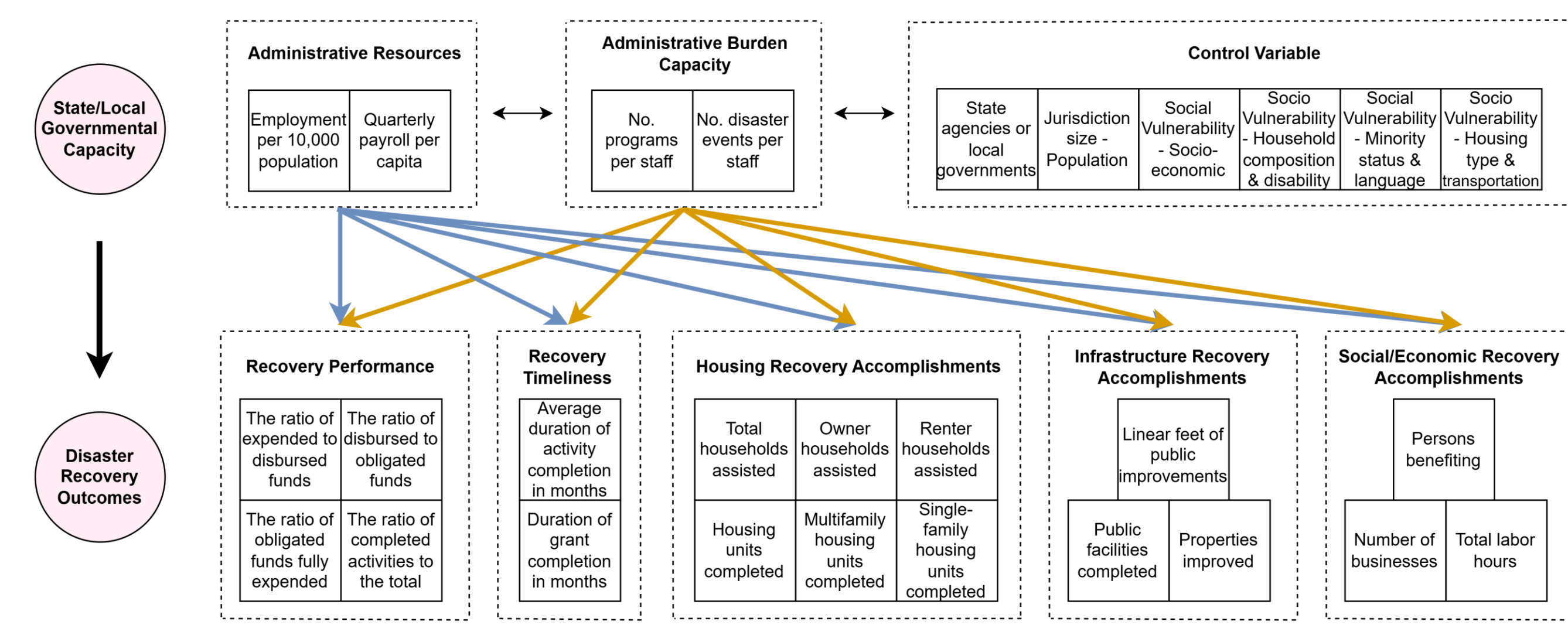
SEM: Activity Heterogeneity in Governmental Capacity Effects

Key Findings

- Administrative resources** as activity-specific enabling capacity
- Administrative burden** as a constraint on recovery implementation
- Cross-activity differences** in capacity sensitivity



Structural Equation Modeling (SEM)



Key Findings

- LGCM introduces a **temporal perspective**
- Governmental capacity plays a **dual role** in disaster recovery governance
 - A **structural role** in shaping initial recovery conditions
 - A **dynamic role** in influencing the pace of recovery progression across implementation phases.

Table 4. Significant reduced LGCM paths (standardized estimates)

Outcome	Path	β (Std.)	p-value
Performance	$L.Y. = S.ABC$	-0.548	0.015
	$L.Y. = SPL_THEME1$	-0.203	0.005
	$L.Y. = SPL_THEME2$	-0.185	0.004
	$S.Y. = L.AR$	0.752	0.059
	$S.Y. = S.AR$	0.171	0.004
	$S.Y. = S.ABC$	-0.108	0.028
	$S.Y. = SPL_THEME2$	0.123	0.004
Housing	$L.Y. = SPL_THEME1$	0.189	0.048
	$L.Y. = SPL_THEME2$	0.157	0.019
	$L.Y. = SPL_THEME4$	-0.297	0.003
	$S.Y. = SPL_THEME1$	-0.457	<0.001
	$S.Y. = SPL_THEME3$	-0.279	0.026
	$S.Y. = SPL_THEME4$	0.661	<0.001

Note: I = intercept (initial level), S = slope (growth trajectory), AR = administrative resources, ABC = administrative burden capacity.