





Name: Chong Yen Kiat, PhD Candidate

Advisor: Assistant Professor Tan Shin Bin

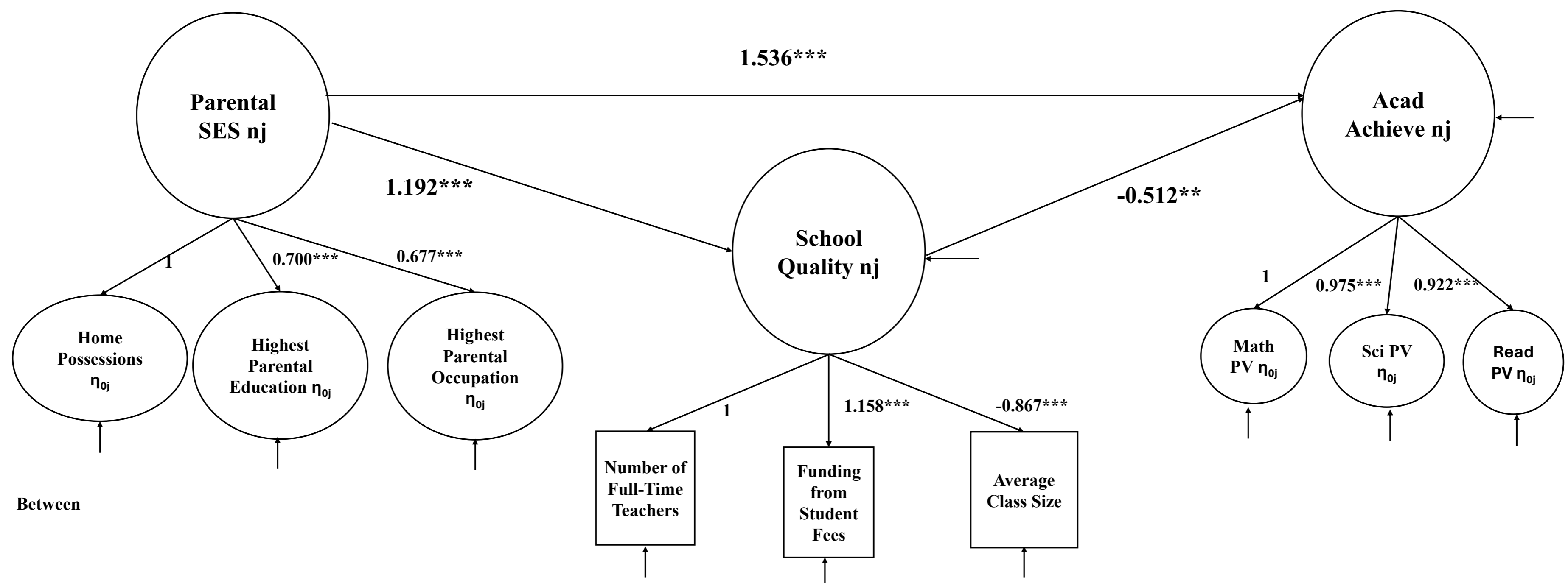
## Title: How do Differences in School Quality Mediate the Relationship between Parental Socioeconomic Status and the Academic Achievement of Children?

### Introduction

- The inequality of opportunity refers to the extent parental socioeconomic status influences the academic performance of children (Van De Werfhorst and Mijs 2010). A higher inequality of opportunity indicates a greater influence of parental SES and therefore wider socioeconomic disparities in the academic achievement of students.
- This poster investigates how school quality mediates the inequality of opportunity in the early tracking education of Singapore.
- Research has found that early tracking education systems exacerbate the inequality of opportunity (Contini and Cugnata 2020; Strello et al. 2021). Research has also found that differences in school quality have been found to either exacerbate or not influence the inequality of opportunity (Downey, Quinn, and Alcaraz 2019; Gruijters and Behrman 2020; Quinn 2015).
- However, recent research suggest that differences in school quality in an early tracking education system do not widen socioeconomic disparities in academic achievement (Skopek and Passaretta 2021).
- This counterintuitive finding leads to the following research question: do differences in school quality exacerbate the inequality of opportunity in an early tracking education system?

### Method

- Using multilevel structural equation modelling to analyse PISA 2022 Singapore data, I separate the latent variables parental SES and academic achievement into their within- and between-school components and investigate how between-school differences in quality mediate the relationship between school-level parental SES and academic achievement.
- The latent exogenous variable, parental SES, is indicated by three variables: home possessions, the highest educational level of a student's mother or father and the highest occupational status of a student's mother or father.
- The latent endogenous variable, academic achievement, is indicated by students' mathematics, science and reading scores.
- The latent mediating variable, school quality, is indicated by the following school-level variables: total number of full-time teachers, average class size, percentage of funding from student fees



### Discussion

- Results show that, at the between-school level, school quality negatively mediates the relationship between parental SES and academic achievement. Using the same multilevel structural equation model, the negative mediation effect of school quality was also found in PISA 2018 and PISA 2015, with the latter result being statistically insignificant. Together, these sets of results suggest that differences in school quality do not exacerbate the inequality of opportunity.
- These findings are unexpected given that Singapore is an early tracking education system and existing research suggests that differences in school quality in Singapore contributes to the widening of educational inequality (Ng 2014; Rolfe, Strietholt, and Yang Hansen 2021).
- One reason could be due to how the Singapore government invests heavily in the education system to ensure a high level of secondary school quality for all schools. For example, public school teachers in Singapore are required to spend 16-24 months to complete a government funded diploma in education before embarking on their teaching careers (Ministry of Education n.d.).
- In conclusion, findings provide support to the idea that schools in early tracking systems do not exacerbate the inequality of opportunity.

### References

- Contini, Dalit, and Federica Cugnata. 2020. "Does Early Tracking Affect Learning Inequalities? Revisiting Difference-in-Differences Modeling Strategies with International Assessments." *Large-Scale Assessments in Education* 8(1):14. doi: 10.1186/s40536-020-00094-x.
- Downey, Douglas B., David M. Quinn, and Melissa Alcaraz. 2019. "The Distribution of School Quality: Do Schools Serving Mostly White and High-SES Children Produce the Most Learning?" *Sociology of Education* 92(4):386-403. doi: 10.1177/0038040719870683.
- Gruijters, Rob J., and Julia A. Behrman. 2020. "Learning Inequality in Francophone Africa: School Quality and the Educational Achievement of Rich and Poor Children." *Sociology of Education* 93(3):256-76. doi: 10.1177/0038040720919379.
- Ministry of Education. n.d. "Postgraduate Diploma in Education (PGDE): Overview." Retrieved May 6, 2024 (<http://www.moe.gov.sg/careers/become-teachers/pri-sec-jc-ci/postgraduate-diploma>).
- Ng, Irene Y. H. 2014. "Education and Intergenerational Mobility in Singapore." *Educational Review* 66(3):362-76. doi: 10.1080/00131911.2013.780008.
- Quinn, David M. 2015. "Kindergarten Black-White Test Score Gaps: Re-Examining the Roles of Socioeconomic Status and School Quality with New Data." *Sociology of Education* 88(2):120-39. doi: 10.1177/0038040715573027.
- Rolfe, Victoria, Rolf Strietholt, and Kajsa Yang Hansen. 2021. "Does Inequality in Opportunity Perpetuate Inequality in Outcomes? International Evidence from Four TIMSS Cycles." *Studies in Educational Evaluation* 71:101086. doi: 10.1016/j.stueduc.2021.101086.
- Skopek, Jan, and Giampiero Passaretta. 2021. "Socioeconomic Inequality in Children's Achievement from Infancy to Adolescence: The Case of Germany." *Social Forces* 100(1):86-112. doi: 10.1093/sf/soaa093.
- Strello, Andrés, Rolf Strietholt, Isa Steinmann, and Charlotte Siepmann. 2021. "Early Tracking and Different Types of Inequalities in Achievement: Difference-in-Differences Evidence from 20 Years of Large-Scale Assessments." *Educational Assessment, Evaluation and Accountability* 33(1):139-67. doi: 10.1007/s11092-020-09346-4.
- Van De Werfhorst, Herman G., and Jonathan J. B. Mijs. 2010. "Achievement Inequality and the Institutional Structure of Educational Systems: A Comparative Perspective." *Annual Review of Sociology* 36(1):407-28. doi: 10.1146/annurev.soc.012809.102538.



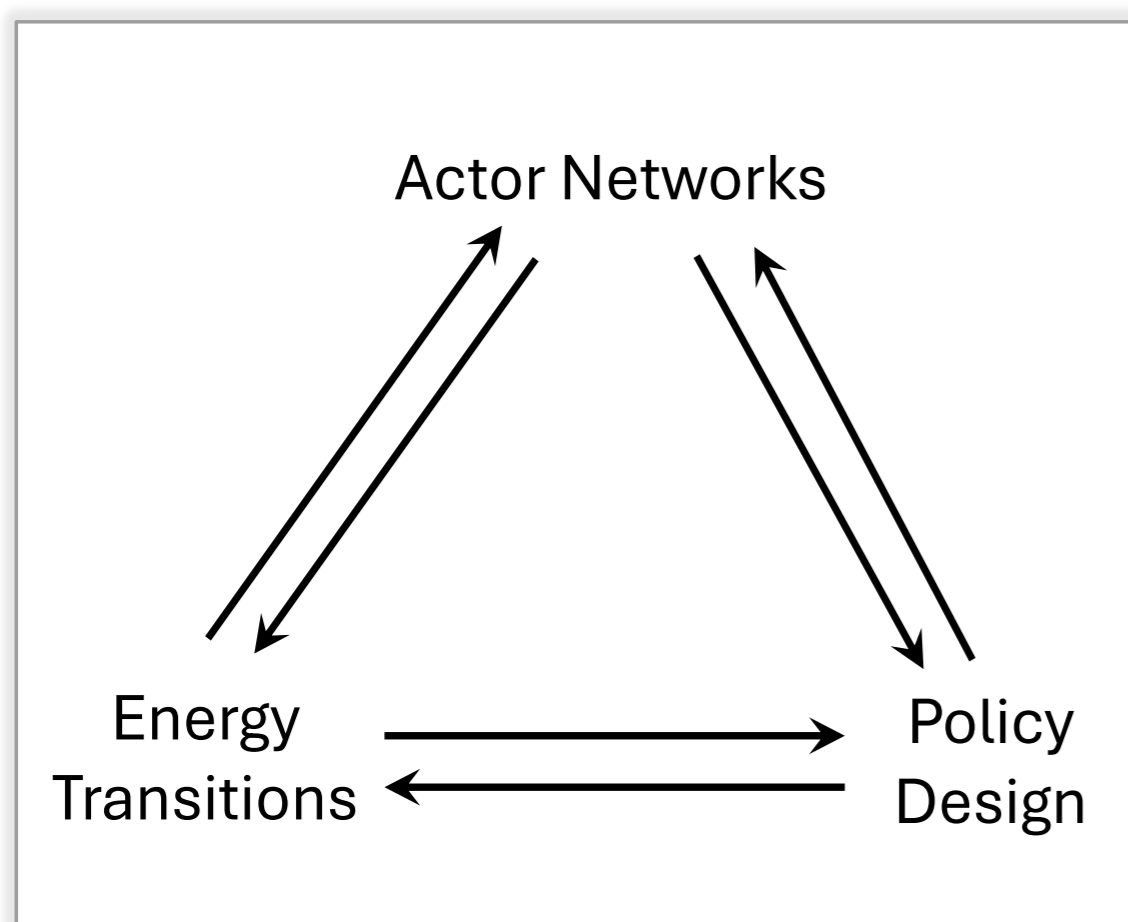
# Mapping the Nexus: Interconnections between Actor Networks, Policy Design, and Energy Transitions

Gabriel Chen, PhD Candidate

Thesis Advisor: Prof. Araz Taeihagh

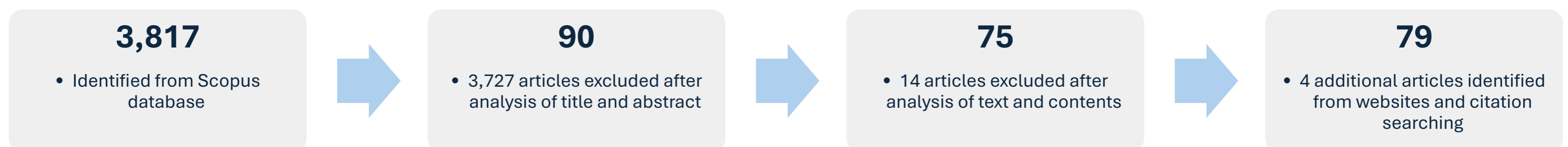
Email: gabriel.chen@u.nus.edu

Energy Transitions will be required to shift energy mixes away from existing carbon-intensive forms towards a low emissions energy mix. This process consists of socio-technical dynamics which are inherently political in nature and are shaped by actors and actor networks (Geels et al., 2017; Markard et al., 2016). Energy transitions will also involve the formulation, design, and implementation of policies, which affect and are affected by actor networks. For example, different types of policies can affect the likelihood of coercive politics within networks (Lowi, 1972). Additionally, the distribution of benefits and costs from a policy measure influences the political actions of individuals and groups as well as subsequent policy designs and decisions (Wilson, 1984).



Given that these dynamics between policy and politics influences the behavior and decisions of actors involved in socio-technical transitions, some policy science scholars have argued that incremental changes to existing energy policies are more suitable (Deyle, 1994; Heazle et al., 2013; Lindblom, 1959). Another perspective held by scholars such as Nair and Taeihagh (2017) argues for the integration of policy design thinking into the formulation of policy mixes and decision-making to enable socio-technical transitions under uncertainty. This includes policy design concepts such as policy packaging, policy experimentation, and network-centric policy design.

A scoping review was conducted to collate and synthesize evidence on themes and literature on actor networks, policy design, and energy transitions.



Key Findings	
<p><b>European bias present in the literature</b></p> <ul style="list-style-type: none"> <li>Of the 30 countries and regions used as case studies in the review, 18 were in Europe</li> <li>Many articles focused on Germany (14) and the Netherlands (6)</li> </ul>	<p><b>Wide variety of conceptual frameworks and methods used</b></p> <ul style="list-style-type: none"> <li>Concepts used include actor network analysis, policy network approach, Multi-Level Perspective (MLP), Advocacy Coalition Framework (ACF), discourse coalitions</li> </ul>
<p><b>Energy Transitions and changes in market structure</b></p> <ul style="list-style-type: none"> <li>Energy transitions creates new actors which restructures energy markets</li> </ul>	<p><b>Policy design concepts have been applied in a limited fashion in energy transition research</b></p> <ul style="list-style-type: none"> <li>Findings from the scoping review corroborates that of Goyal et al. (2022)</li> </ul>
<p><b>Significant variance in network structures and outcomes</b></p> <ul style="list-style-type: none"> <li>Variance in network structure affects the extent and role of the network in decision-making process</li> <li>Type of network structure affects outcome of energy transitions</li> <li>Temporal dimension of networks affect policy design</li> </ul>	

Areas for Future Research	
<p><b>More case studies needed on the Global South</b></p> <ul style="list-style-type: none"> <li>Understanding the dynamics of energy transitions in developing countries which have different institutional contexts</li> </ul>	<p><b>Towards a typology of network structures</b></p> <ul style="list-style-type: none"> <li>Developing typology of policy subsystems and networks for energy transitions</li> <li>Explore how different types of network structures may produce different policy mixes</li> </ul>
<p><b>Bridging interdisciplinary gaps: Applying policy design concepts in energy transition research</b></p> <ul style="list-style-type: none"> <li>Engaging the domains of socio-technical systems and transitions literature through applying policy design e.g. Policy tools for network management</li> </ul>	<p><b>Energy transitions and its effects on actor networks</b></p> <ul style="list-style-type: none"> <li>Exploring how mechanisms and processes created from energy transitions can affect the openness of actor networks to new actors and ideas, resulting in temporal changes to actor networks</li> </ul>
<p><b>Temporal changes in policy mixes</b></p> <ul style="list-style-type: none"> <li>Exploring the evolution of policy mixes for energy transitions</li> <li>What are the underlying patterns for energy transitions? E.g. is it layering, stretching, patching, or packaging?</li> </ul>	

## References

Deyle, R. E. (1994). Conflict, Uncertainty, and the Role of Planning and Analysis in Public Policy Innovation. *Policy Studies Journal*, 22(3), 457-473. <https://doi.org/10.1111/j.1541-0072.1994.tb01481.x>

Geels, F. W., Sovacool, B. K., Schwanen, T., & Sorrell, S. (2017). The Socio-Technical Dynamics of Low-Carbon Transitions. *Joule*, 1(3), 463-479. <https://doi.org/10.1016/j.joule.2017.09.018>

Goyal, N., Taeihagh, A., & Howlett, M. (2022). Mapping the Use of Public Policy Theories in Energy Transitions Research. In K. Araújo (Ed.), *Routledge Handbook of Energy Transitions* (pp. 332-349). <https://doi.org/10.4324/9781003183020-23>

Heazle, M., Tangney, P., Burton, P., Howes, M., Grant-Smith, D., Reis, K., & Bosomworth, K. (2013). Mainstreaming climate change adaptation: An incremental approach to disaster risk management in Australia. *Environmental Science & Policy*, 33, 162-170. <https://doi.org/10.1016/j.envsci.2013.05.009>

Lindblom, C. E. (1959). The Science of "Muddling Through". *Public Administration Review*, 19(2). <https://doi.org/10.2307/973677>

Lowi, T. J. (1972). Four Systems of Policy, Politics, and Choice. *Public Administration Review*, 32(4). <https://doi.org/10.2307/974990>

Markard, J., Suter, M., & Ingold, K. (2016). Socio-technical transitions and policy change – Advocacy coalitions in Swiss energy policy. *Environmental Innovation and Societal Transitions*, 18, 215-237. <https://doi.org/10.1016/j.eist.2015.05.003>

Nair, S., & Taeihagh, A. (2017, 28-30 June). *Preparing for socio-technical transitions: Opportunities and challenges for policy design* 3rd International Conference on Public Policy: ICPP3, Singapore.

Wilson, J. Q. (1984). The Politics of Regulation. In *The Political Economy* (pp. 82-103). <https://doi.org/10.4324/9781315495811-9>



## Beyond Tariffs: Unveiling the Geopolitics of Electric Vehicles (EVs) Through Supply Chains

Gao Peng (PhD Candidate), Zhang Zhen (MIA student), Mo Yayuan (MIA student)  
 Advisor: Prof. Benjamin Cashore



### Key Points

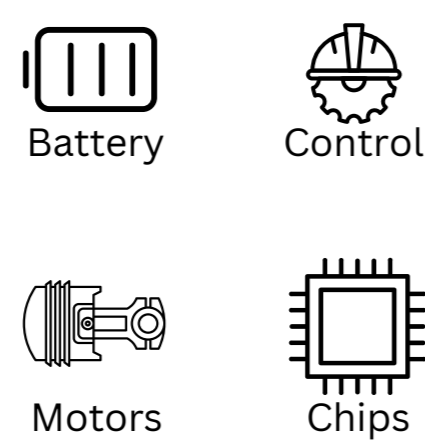
- Supply Chain Perspective:** Beyond tariffs and overcapacity concerns, a supply chain perspective depicts geopolitics of EVs more comprehensively
- Interconnected Supply Segments:** Distinct but interconnected EV supply chain segments offer distinct and sometimes, causal dynamics
- Technology as a Catalyst:** Adopting a future-oriented technological viewpoint reveals potential game-changers in the EV geopolitical landscape
- Green Aspect:** The "green" element of EVs is missing, highlighting a crucial area for further integration

### Supply Chain

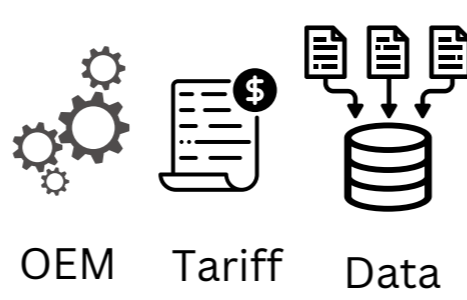
#### Upstreams



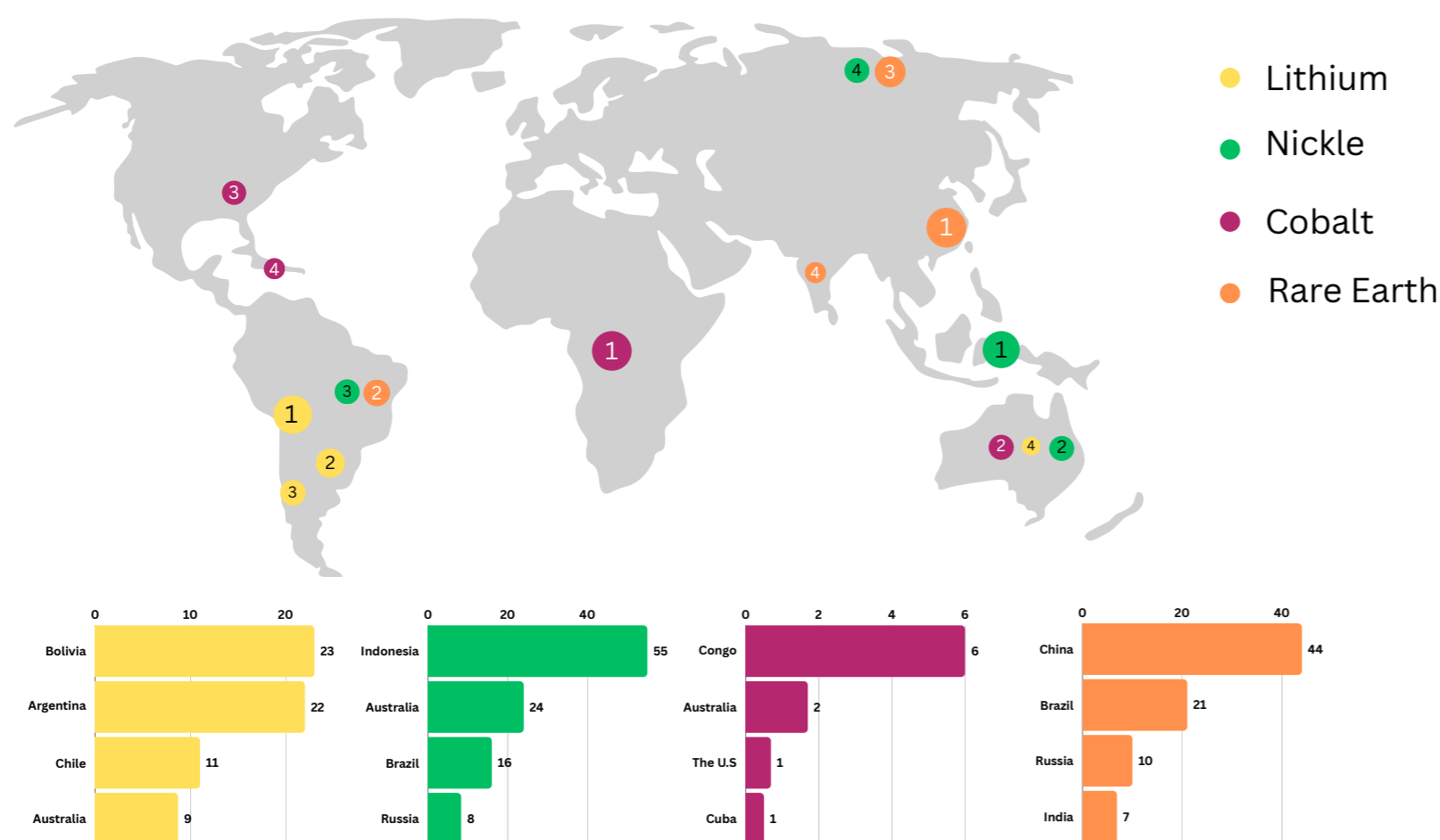
#### Midstreams



#### Downstreams



### Upstream: Raw Materials

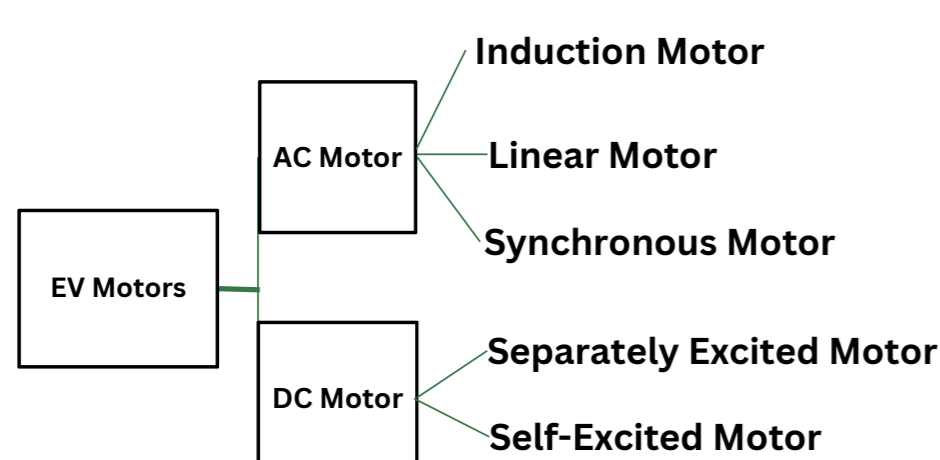


### Upstream Dynamics



### Midstream: EV Batteries & Motors

#### EV Motors' Type



#### EV Batteries

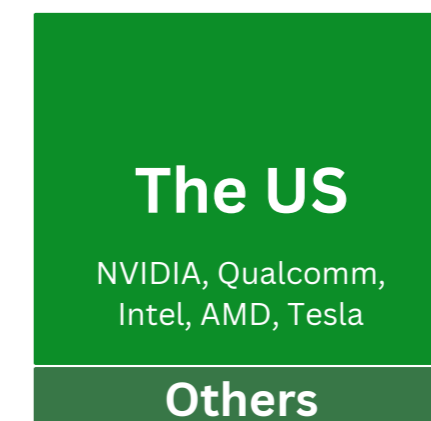
- Major Players:** Chinese, Japanese, and Korean companies dominate the EV battery manufacturing sector
- Main Types:** Lithium-ion, lead-acid, and nickel-metal hydride are the three primary types of batteries used in EVs
- Future:** Sodium-ion batteries and solid-state batteries have entered a critical stage of technological competition

### Midstream: Chips

#### Chips in EV, Especially AI chips

**56.96B**  
 USD Market Size of 2024  
 Automotive Chip Market

**1k-3k**  
 Chips used for EVs e.g.  
 sensors, control, FSD



- AI chips rank the highest in tech
- US Dominates the AI Chips Mkt
- Korea, China, EU, & Japan struggle

#### Chips Regulations regarding Geopolitical Considerations

- U.S.** Advanced Computing & Semiconductor Manufacturing Controls
- CHIPS and Science Act (US)
- Japan's** Export Control Regulations on Semiconductor Materials

**VS**

- China's** export controls on gallium and germanium
- Several policies to promote the high-quality development of the integrated circuit industry and the software industry in the new era

### Downstream: Trade Policy Tools

#### Comparison of EU and the U.S.'s Approach on Tariff

EU	U.S
<ul style="list-style-type: none"> <li>Remedial measures;</li> <li>EU decision-making is cautious and subject to multiple constraints (industrial and trade policy, internal cooperation, etc.)</li> </ul>	<ul style="list-style-type: none"> <li>Preventive measures;</li> <li>Align to localize full supply chain production capabilities.</li> </ul>

#### Data in EV's Geopolitical Concerns



### Future Implications

- Upstream:**
  - Advances in **alternative technologies** and **recycling practices** could reshape the geopolitical landscape, altering the dependencies on traditional raw material supplies.
- Midstream:**
  - The evolution towards **Intelligent Connected Vehicles (ICVs)** marks the "second half" of the competition in the automotive industry, with semiconductors becoming increasingly critical.
  - If the US extends **high-end chip** controls to EVs, Chinese manufacturers may face immediate challenges in maintaining supply, despite ongoing efforts to boost local production
  - Long-term viability of China's smart car industry may hinge on the capability of Chinese semiconductor firms to independently **develop and mass-produce advanced chips**.
- Downstream:**
  - Data compliance** has emerged as a crucial factor for market access (a non-traditional perspective)
  - Automakers are compelled to adapt their practices to different markets, leading to **tailor-made vehicle functions** for distinct regions
  - The **fragmentation** of data compliance guidelines may hinder automakers from efficiently allocating resources toward developing self-driving technologies



## Arable Land Protection Policy and Local Government Illegal Land Use: IAD Framework Approach

Caixin Jiang, PhD Candidate  
Caixin\_jiang@u.nus.edu

### Introduction

Despite China's vast territory, only 11% of the country's land is under cultivation, which means that China needs to feed 18.9% of the world's population with only 8.5% of the world's arable land. To curb the rapid conversion of arable land into construction land and ensure food security, China implemented one of the world's strictest land management policies in 1998. However, after the implementation of the quota control system for construction land, the problem of illegal land use has become serious and the amount of arable land has continued to decrease. It's surprising that local governments, which are supposed to be the implementers and enforcers of the arable land protection policy, actually violate the policy and actively engage in illegal land use themselves. This study seeks to understand why China's arable land protection policies have failed to achieve the desired results, and how institutional arrangements affect local government behavior and explain this implementation gap.

### Analytical Framework

This study employs the Institutional Analysis and Development Framework as the analytical framework (figure 1), which enables us to understand why local governments behave in ways that deviates from the central policy arrangements, and sheds some light on how institutions can be adjusted to bring local governments into compliance.

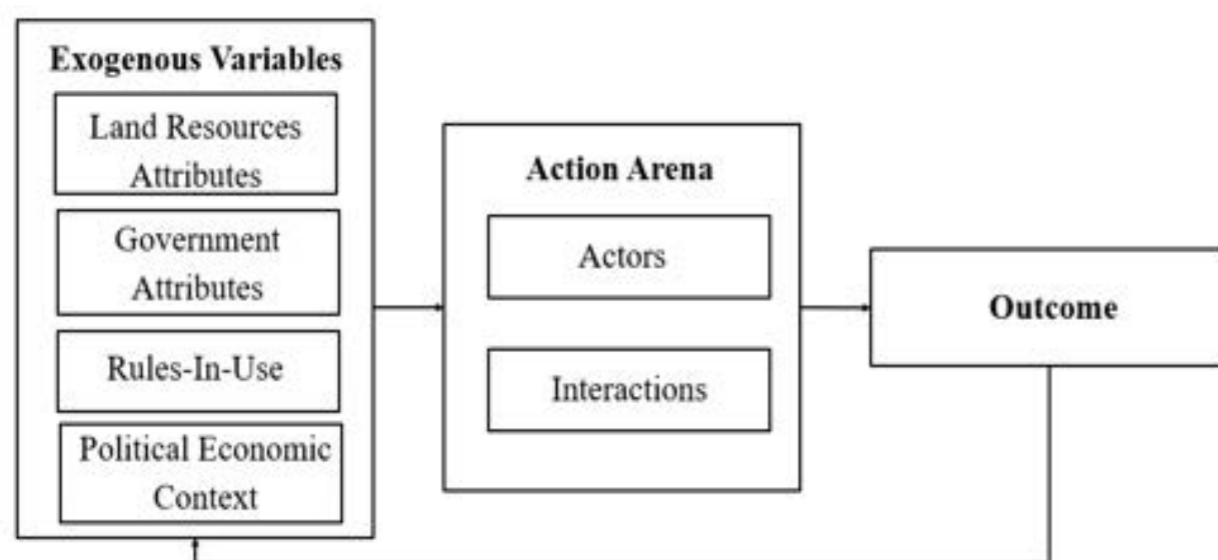


Figure 1: Analytical framework for arable land protection policy

### Applying IAD Framework into Analysis

#### 1. Exogenous variables

Exogenous variables include attributes of arable land, shared values between central and local governments, arable land protection policy (central control of new construction land quota system, department of land and resource responsible for oversight), “fiscal decentralization and political centralization” institutional arrangements.

#### 2. Actors and Interactions

The actors involved in the implementation of arable land protection policy include the central government, local governments, farmer collectives and private enterprises (figure 2).

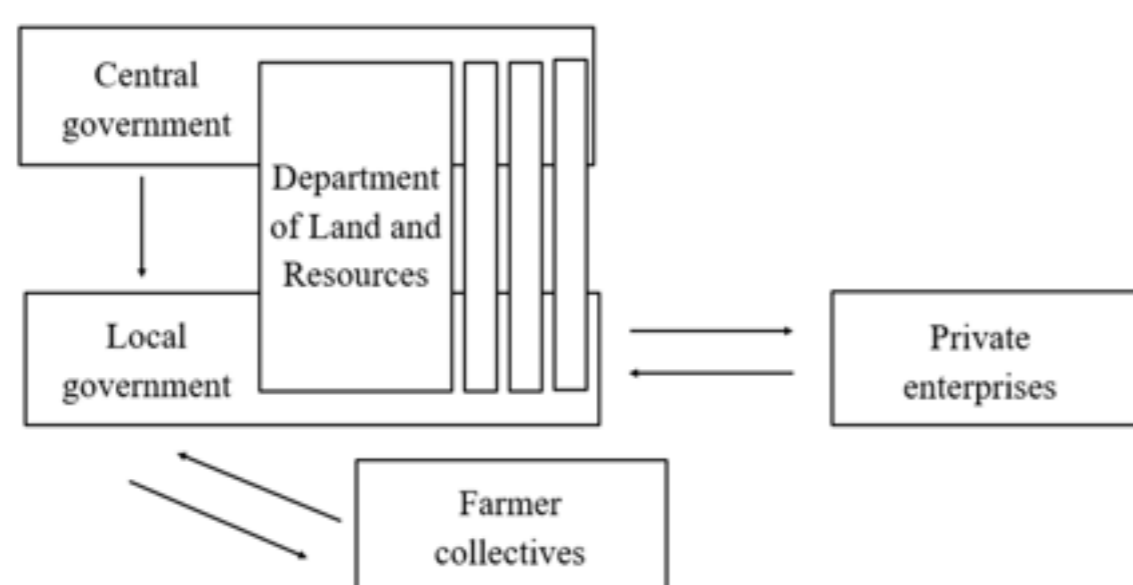


Figure 2: Actors in Arable Land Protection Policy

#### (1) Inconsistent goal preferences

There are inconsistent goal preferences between central and local governments. Central government is acutely aware of the importance of food security. However, local governments are more short-sighted and focus more on economic development, which can help them generate fiscal revenues and get promotion. Land is one of the most important economic resources that local governments can use to promote growth. As shown in Figure 3, there are generally more illegal land use in more developed regions, which could be explained by higher fiscal and political incentives in these regions.

### Conclusion and Discussion

This study uses the IAD Framework to analyze the implementation of arable land protection policy from 1998 to 2006 and attempts to explain the reasons for the implementation gap. The results show that the 1998 Land Administration Law and the political economic context created a structured interest for local governments to prioritize economic development, which conflicted with the central government's goal of protecting arable land. The institutional arrangements also incentivized local governments' illegal land use to interact strategically with each other and colluded with farmer collectives and private enterprises. Moreover, local regulatory agencies fell to fully monitor the implementation of arable land protection policy due to their dual leadership organizational structure. As a result, despite having one of the most stringent arable land protection policies in the world, there were massive amount of illegal land use and the area of arable land continued to decline. This implementation gap can be seen as a failure from the “top-down” view, but it could also be a success as all actors on the ground benefit from it.

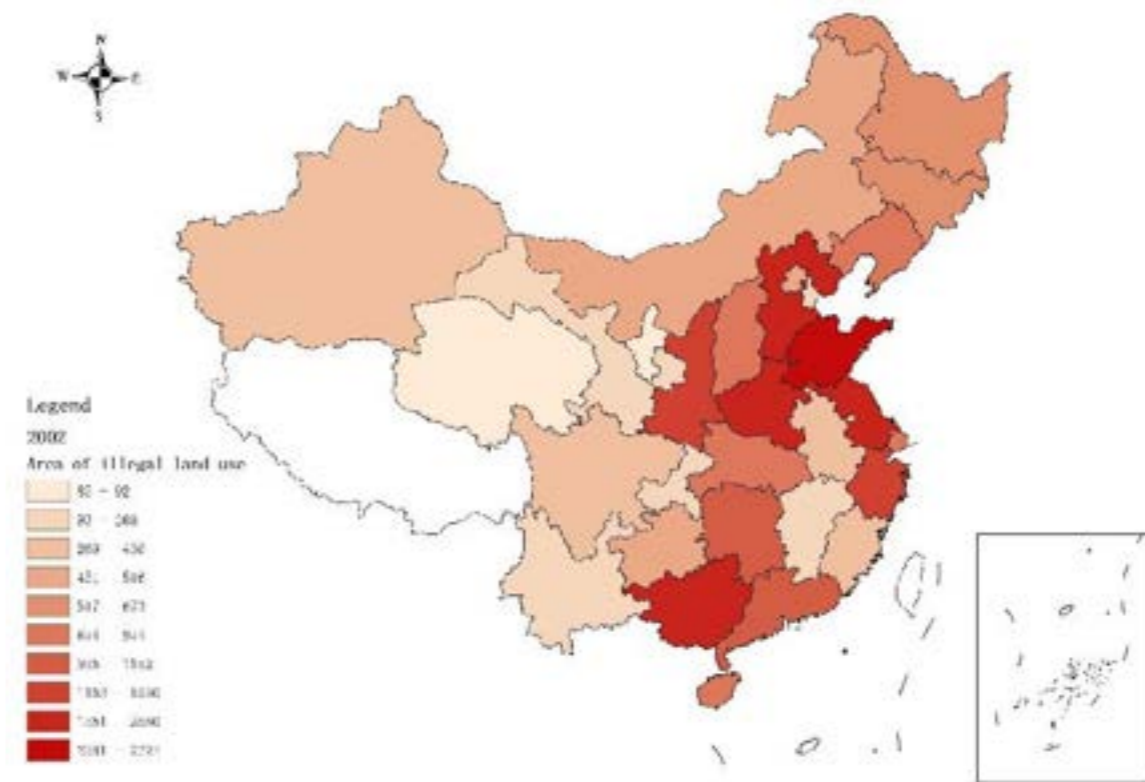


Figure 3: Area of Illegal Land Use in 2002

#### (2) Strategic interaction among local governments

Political centralization creates a tournament competition among local governments. Therefore, there are spillover effects of illegal land use, both in geographically and economically neighboring areas. The rationale behind is that the more arable land a region illegally converts into construction land, the faster that region's economy is likely to grow. If a local government complies with the construction land quotas it has been given and does not conduct illegal land use while its competing regions are doing so, this will put that local government at a disadvantage in the tournament competition game.

#### (3) Regulatory agencies under dual leadership

Since the central government cannot directly oversee implementation, it relies on regulatory agencies to provide information and monitor. However, considering the local regulatory agencies are part of local governments, this dual leadership does not incentivize the regulatory agencies to provide fully truthful regulatory information, and exaggerates the information asymmetry between the central government and local governments.

#### (4) Collusion of local actors

In addition to local governments, the conversion of more arable land into construction land actually benefits local actors, so they are prone to collusion. With farmers migrating to the cities for work, a large amount of arable land has been left unused. Many households privately build simple apartments on the arable land, and attract urban dwellers to stay on vacation. Local regulatory agencies acquiesce to such illegal land use because this conversion of use in fact increases the productivity of the arable land and improve the living standards of farmers. Moreover, in order to attract more and larger enterprises to invest, local governments would tolerate private enterprises to occupy land without approval, or even participate in illegal land use themselves, build various developmental zones to speed up the investment process.

#### 3. Outcomes

The direct outcome of these interactions is a significant increase in the area and cases of illegal land use, which deviates from the objectives of the arable land protection policy enacted by the central government (Figure 4). Besides, there is also indirect effect of these interactions, which is the massive expansion of developmental zones.

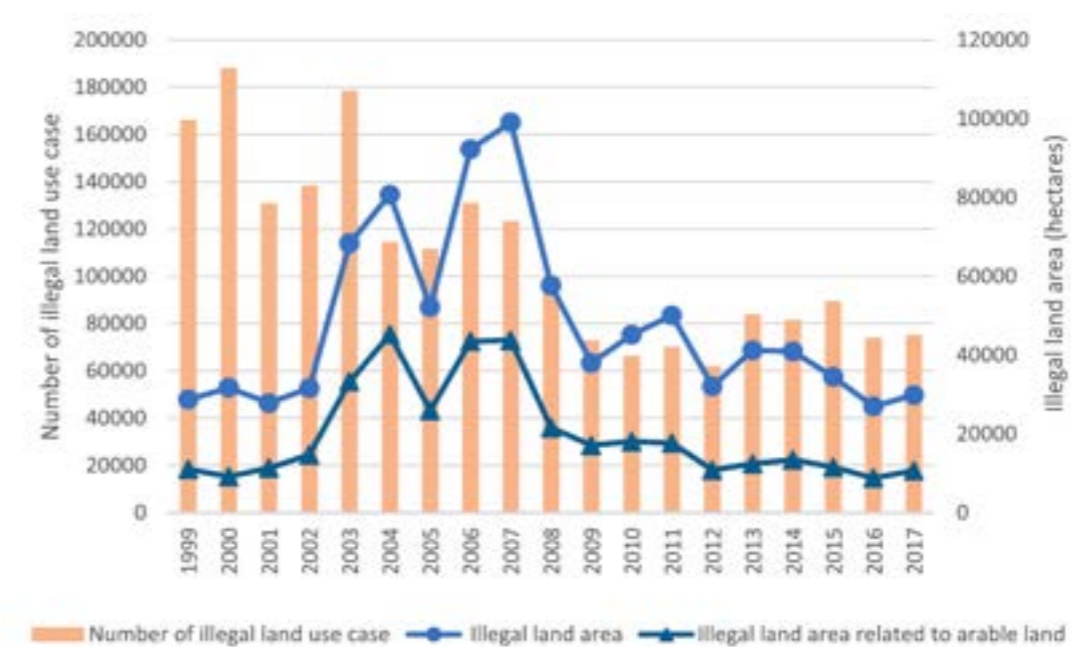


Figure 4: Illegal Land Use Direct Outcomes

As a response, the central government establish a national land inspection system in the second half of 2006, to strengthen central government's direct oversight of land use. Moreover, there are some other changes in rules-in-use, such as allowing local governments to trade construction land quotas within the province.



## Knowledge, Norms, and Perceptions of Sexual and Reproductive Health and Rights among Adolescents in India

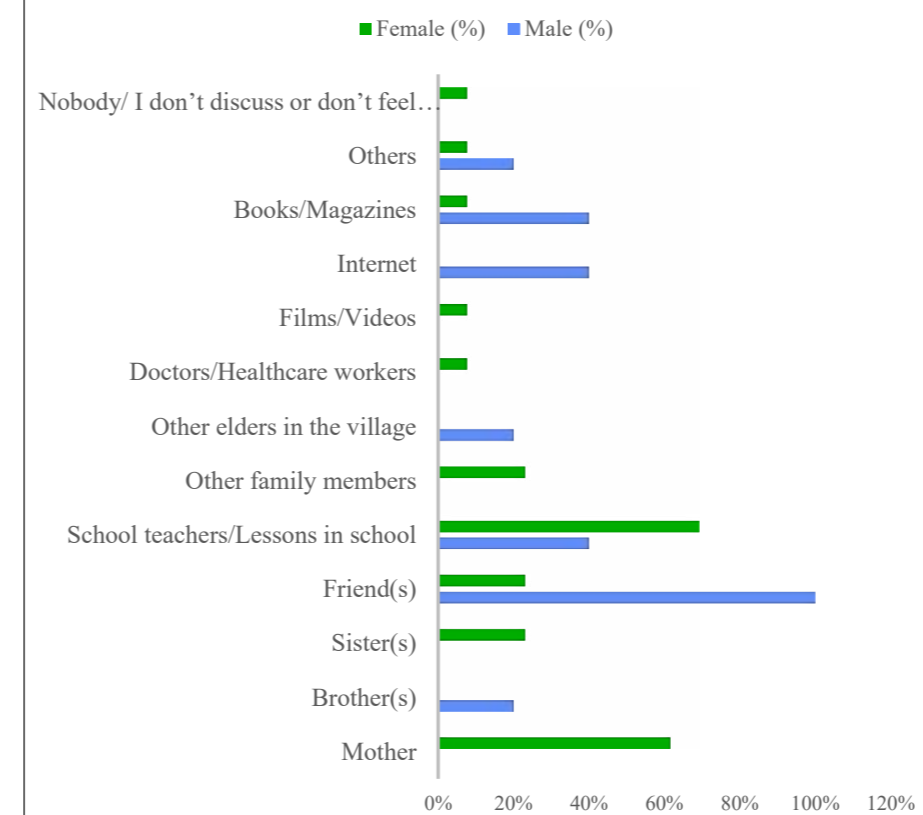
Kaushambi Bagchi, PhD Candidate

Thesis Advisors: Dr. Saravana Ravindran & Dr. Dan Han

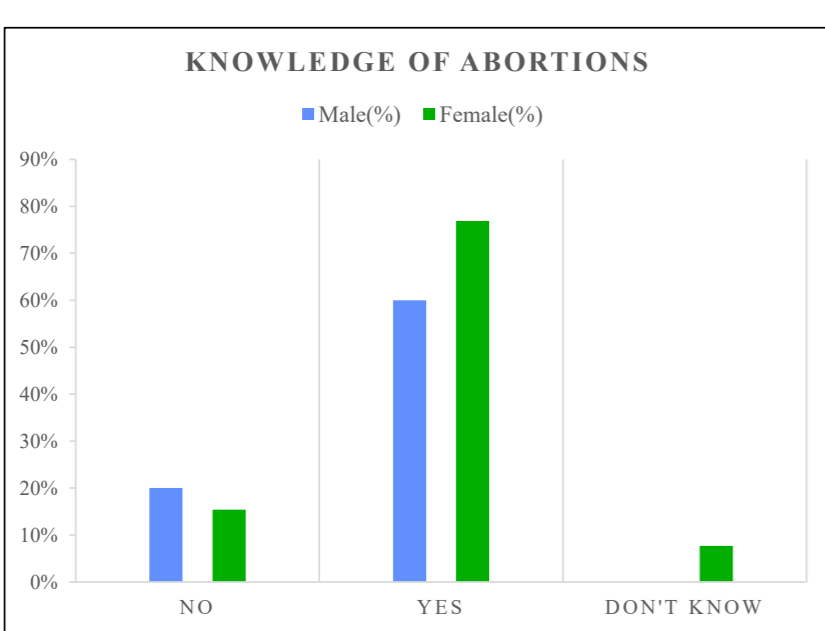
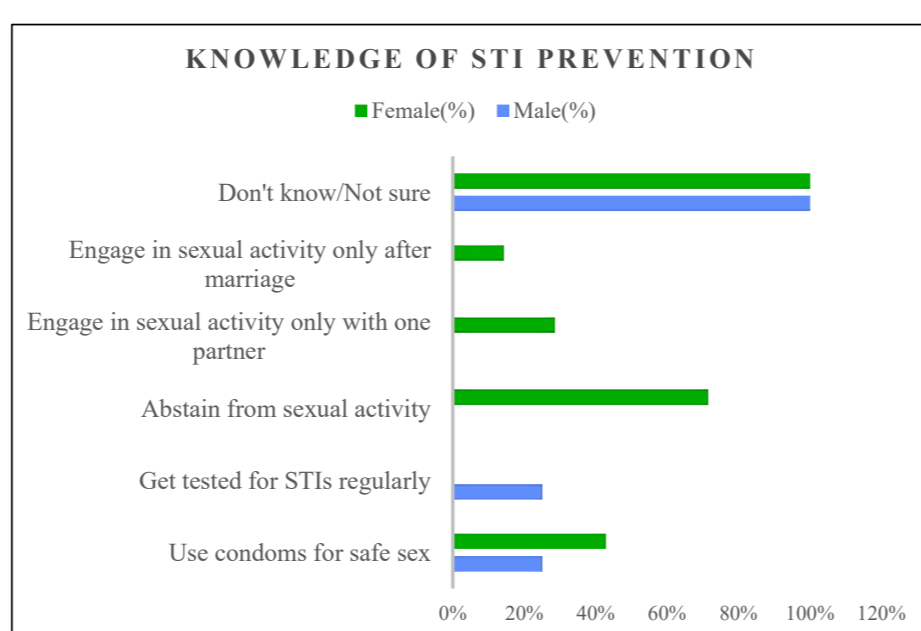
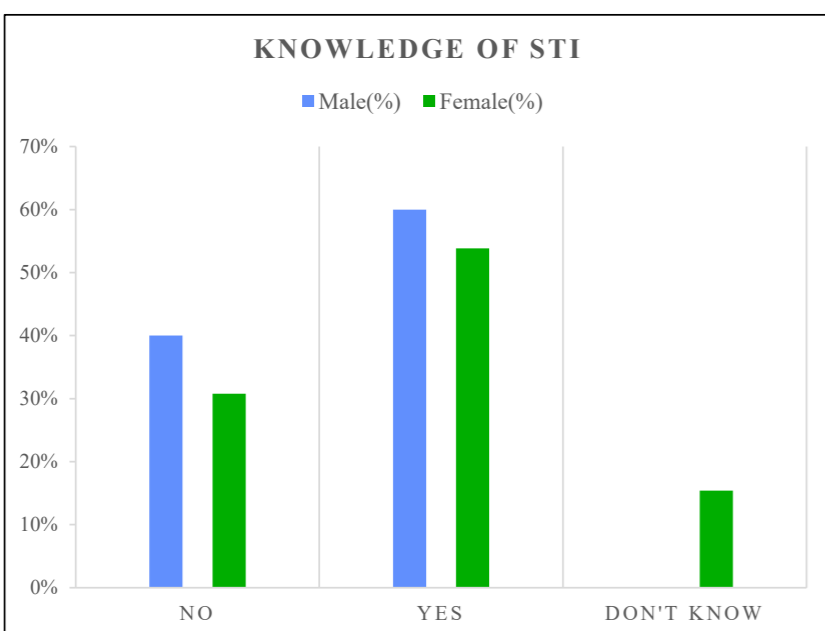
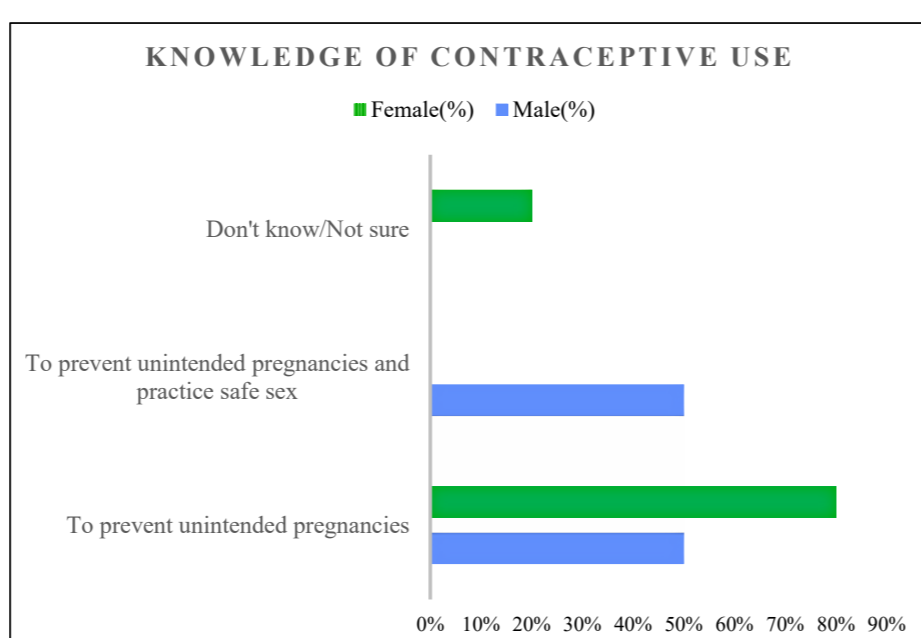
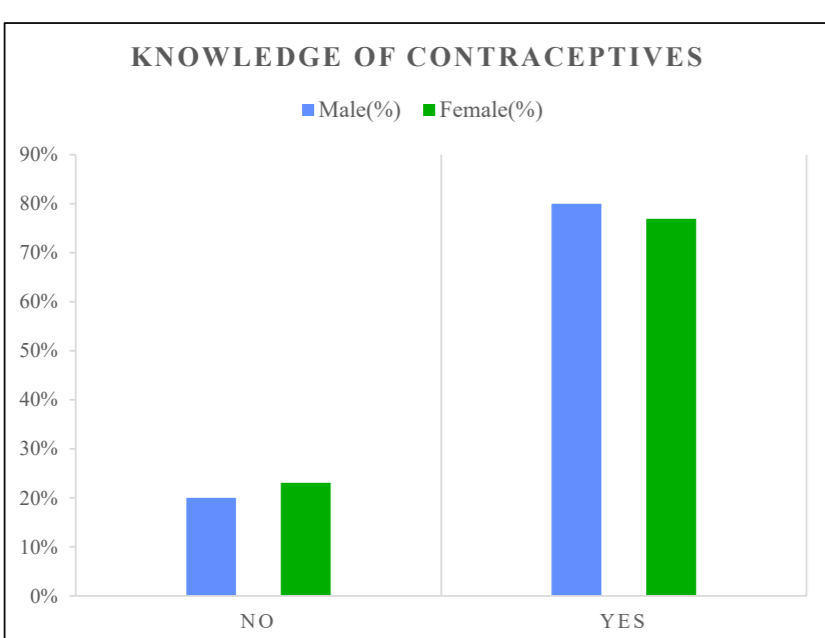
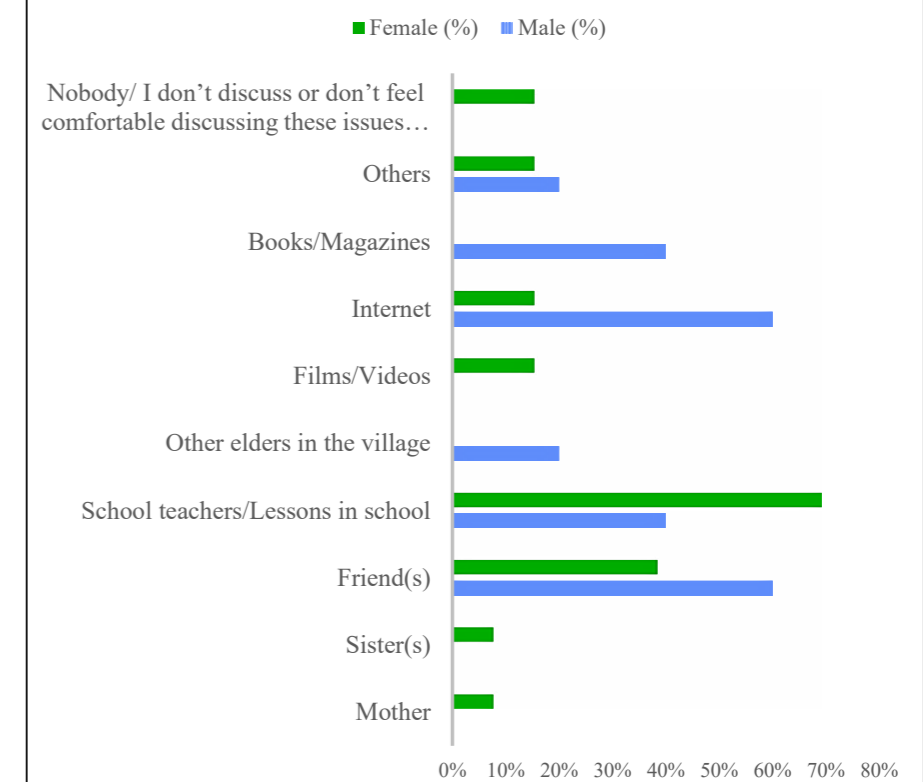
### Background

- There are an estimated 253 million adolescents in India in the age group of 10-19 years, which is the largest adolescent population in the world (UNICEF, n.d., NHM, n.d.).
- Early marriage and early childbearing continue to be prevalent despite existing national policies (Banerjee et al., 2015)
- Knowledge of sexual and reproductive health and rights (SRHR) continues to be scarce among women in India along with restrictions on their agency, mobility and financial resources (Banerjee et al., 2015)
- A common reason behind this paucity of knowledge are socio-cultural norms and cultural resistance continues to be a major hindrance to communication on sexuality in LMICs, including India (Gillespie et al., 2022)
- For rural India, studies underscore the need for interventions designed to build agency and life skills in young women, increase male involvement through their education and gender-sensitisation, improve the involvement of other community stakeholders and achieve an overall improvement in the communication of and access to SRHR knowledge and services (Banerjee et al., 2015).

### SOURCES OF LEARNING ABOUT PUBERTY



### SOURCES OF LEARNING ABOUT SEXUAL AND REPRODUCTIVE SYSTEMS



### Research Questions

- RQ1:** What is the state of SRHR knowledge among adolescents in India?
- RQ2:** What are primary sources of SRHR information for adolescents in India?
- RQ3:** What are the norms and perceptions around SRHR such as safe sex practices, STIs, understanding of gender and sexuality, pre-marital sex, unintended pregnancies and abortions?

### Data Collection

- Use of semi-structured interviews:
  - In-depth interviews with adolescents in the age group 13-19 years
  - Focus group discussions with parents of adolescents
  - Key informant interviews of community stakeholders such as school-teachers, community leaders and healthcare workers.
- Sample description:
  - 18 adolescents (13 girls and 5 boys)
  - 8 mothers (4 focus-groups)
  - 5 school-teachers
  - 1 community leader
  - 1 healthcare worker
- Geographic coverage – villages (rural areas), semi-urban areas and slums in Delhi-NCR, Haryana and Uttar Pradesh.

### Methodology

- All interviews and focus group discussions were translated from the local language, Hindi, to English.
- Traditional thematic analysis was done.
- Open coding of the transcripts followed by axial coding to establish connections between different codes.

### Findings

- Socialization into traditional gender-roles begins at an early age and despite education, these norms become internalized by adolescence. Adolescent girls display a strong sense of morality attached to sex and sexual activity, while this moral burden is nearly absent among adolescent boys.
- For girls, there was a predominant theme of “trust” of parents upon which their personal liberties were contingent, breaking which (through pre-marital romantic or sexual relationships) would bring shame to the family and girls would be punished by restrictions on their mobility and autonomy. This was indicative of girls’ sexualities being controlled through punishments and penalties rooted in morality. This theme was absent for boys. As a result, sexual permissiveness was much lower among girls as compared to boys.
- For girls, their major source of SRHR information was school where they were told about topics such as menstrual hygiene, and good touch and bad touch. This kind of systematic education seemed to be absent for boys.
- Knowledge of safe sex practices, contraceptive use, unintended pregnancies, abortions and STIs was scant and not systematically taught to boys or girls in schools or through other channels. For most girls, their mothers or female elders in the family were the most important sources to learn or talk to about SRHR. This was vastly different for boys, who relied primarily on discussions with friends and internet sources. Boys did not talk to their fathers about SRHR. In very few cases brothers or uncles were mentioned as sources of information. Fathers played no role in this aspect of up-bringing.
- Abstinence from pre-marital sexual activity to avoid unintended pregnancies was mentioned only by girls. Reasons for abstinence were tied to morality, breaking parents’ trust and bringing shame to the family. Girls received active social messaging to not do “anything wrong”. This kind of socialization was absent for boys. Boys approached pre-marital sex based on maturity and consent, and abstinence was absent from their responses. This indicates abstinence-focused sex education for girls but not for boys and sheds light on socialization into traditional ideas of masculinity and femininity from an early age.
- Adolescent boys appeared to have internalized the dominant social position of boys vis-à-vis girls even in adolescence. Through their responses on girls’ consent during sex after marriage, responses indicated at ideas of girls conceding to sexual demands of their husbands – “I think men do get some rights over sex. Men can do whatever they want.”
- There was scant knowledge of gender identities and sexualities. Transgender identity was the most widely understood. Among the respondents who presented non-normatively in their behaviour (girls who disliked feminine clothing, referred to themselves as boys and dressed as boys), did not seem to have the vocabulary to express themselves or conceive identities beyond the gender binary and heterosexuality. There was anecdotal evidence of girls behaving non-normatively but being ultimately socialized into heteronormative behaviour.
- Public health policies on SRHR continue to be focused on girls and women and reinforces the burden of proof and responsibility solely on women. This manifests as sexual hypervigilance and abstinence on moral grounds during adolescence, shifting the focus from the need for comprehensive knowledge of SRHR among adolescents. The moral burden is a significant barrier to accessing authentic and unbiased information on crucial SRHR issues.



Field sites. Photos by author

### References

- Banerjee, S. K., Andersen, K. L., Warvadekar, J., Aich, P., Rawat, A., & Upadhyay, B. (2015). How prepared are young, rural women in India to address their sexual and reproductive health needs? A cross-sectional assessment of youth in Jharkhand. *Reproductive health, 12*, 1-10.
- United Nations Population Fund. Global Goals Indicators 5.6.1. Research on factors that determine women’s ability to make decisions about sexual and reproductive health and rights. Technical Division, UNFPA; Right to Health and Development.2019 Oct; Vol 1.
- Gillespie, B., Balen, J., Allen, H., Soma-Pillay, P., & Anumba, D. (2022). Shifting Social Norms and Adolescent Girls’ Access to Sexual and Reproductive Health Services and Information in a South African Township. *Qualitative Health Research, 32*(6), 1014-1026.



## THE EVOLVING LANDSCAPE OF FISCAL DECENTRALIZATION RESEARCH: INSIGHTS USING TOPIC MODELLING

### Authors

**Lawrence G. Velasco**  
Ph.D. Candidate, Lee Kuan Yew School of Public Policy, National University of Singapore  
Email: lawrence.velasco@u.nus.edu

**Dr. Eduardo K. Araral, Jr.**  
Associate Professor, Lee Kuan Yew School of Public Policy, National University of Singapore  
Email: ed\_araral@nus.edu.sg

### KEY MESSAGES

- **Creative analytical approach.** The study applies Latent Dirichlet Allocation (LDA) on a large text corpus of abstracts, revealing previously latent topics within fiscal decentralization scholarship. The Latent Dirichlet Allocation (LDA) method reveals intricate connections between themes and identifies emerging patterns that go beyond the limitations of manual literature review.
- **Emerging Trends in Fiscal Decentralization Discourse.** Traditional themes, like public expenditure, public services, and interjurisdictional competition, continue to hold significance, underscoring their fundamental role. There has been a significant increase in academic discourse that focus on the relationship between fiscal decentralization and environmental and sustainability issues.
- **Advocacy for a Research Agenda.** The results of this study highlight the need for a more comprehensive examination of the intricate relationship between fiscal decentralization and sustainability, addressing a significant research trend.

### OBJECTIVES

- Survey literature on fiscal decentralization to identify scholarship trends.
- Use unsupervised machine learning, such as Topic Modeling/LDA, to analyze ~18,000 abstracts of articles, revealing hidden topics that can shape relevant research agendas.

### METHODOLOGY

- Analyzes ~18,000 abstracts of articles, adopting the Latent Dirichlet Allocation (LDA) technique for topic modeling.
- This technique enables the identification of latent topics by examining patterns of word distribution across documents, thereby revealing the underlying thematic structures within text corpora.

### CONCLUSION

- Charting a Research Agenda
- Some topics, like local expenditures, service delivery, and urban and social policies, endure over time and remain relevant.
  - Indicate new themes - like sustainability, green, and natural resources management that emerged in the 2020s.

### REFLECTIONS

- Contextualizing the Data-Driven Insights
- LDA is useful in uncovering the latent topics in text corpora, but interpreting the results requires a deep understanding of the literature.
  - However, LDA does not substitute for a detailed literature review.
  - Nonetheless, it provides an unbiased approach to evaluating the completeness of literature reviews.

## RESULTS AND ANALYSIS

### 1 Dominant Themes in Fiscal Decentralization from 1965-2024

- **Significant topics:** political reform, economic development, new public management, local governance spending, public service efficiency, taxation, and urban and social policies.

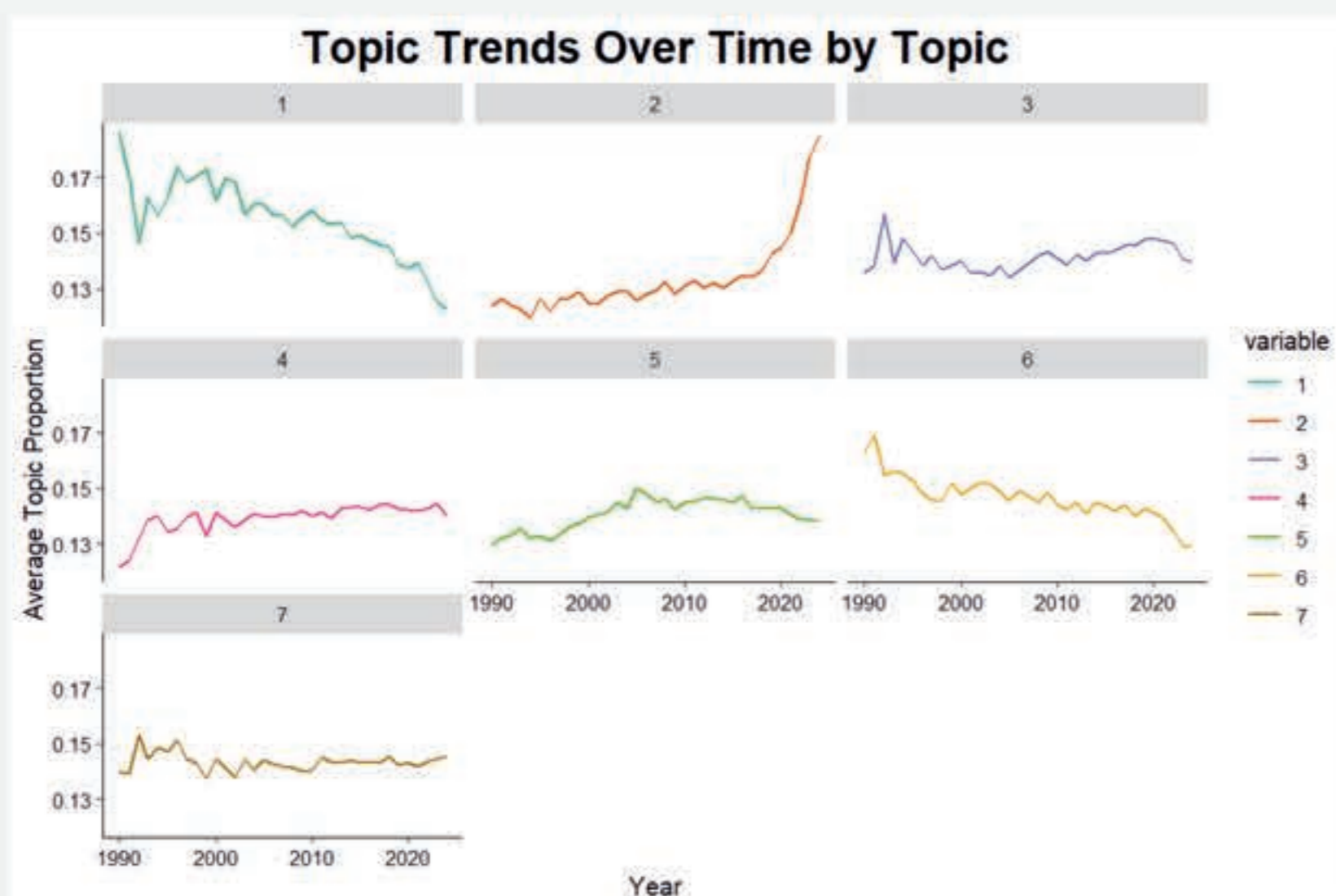
Topic	Top 10 Terms ranked by term-topic distribution (beta)	Theme	%*
1	local, government, governments, political, state, states, federal, central, system, reform	Politics and reform of subnational governments	14.45
2	economic, development, growth, environmental, financial, china, resources, economy, investment, spatial	Economic development in China (Environment and Resources)	14.40
3	public, model, supply, performance, market, services, quality, management, different, service	New public management, market supply	14.31
4	fiscal, decentralization, data, effects, effect, empirical, spending, expenditure, evidence, capital	Effects of local expenditures	14.19
5	regional, countries, analysis, regions, efficiency, factors, studies, level, institutional, education	Public service efficiency	14.21
6	tax, revenue, income, level, competition, municipalities, high, welfare, taxes, distribution	Taxes and interjurisdictional competition	14.10
7	policy, social, policies, urban, governance, cities, group, limited, process, areas	Urban and social policies and governance	14.33

\* average proportion of topics in documents (~18,000 from 1965-2024)

### 3 Temporal Analysis of Dominant Themes

The average topic proportion of the top 7 topics was calculated by year and plotted across time.

- **Increasing trend:** China's economic growth as it relates to the environment and resources (2)
- **Sustained trend:** Local expenditures (4), service delivery (5), and urban and social policies (7).
- **Decreasing trend:** New Public Management (3), taxes, and inter-jurisdictional competition (6).



\* average prevalence of topics in documents generated per year

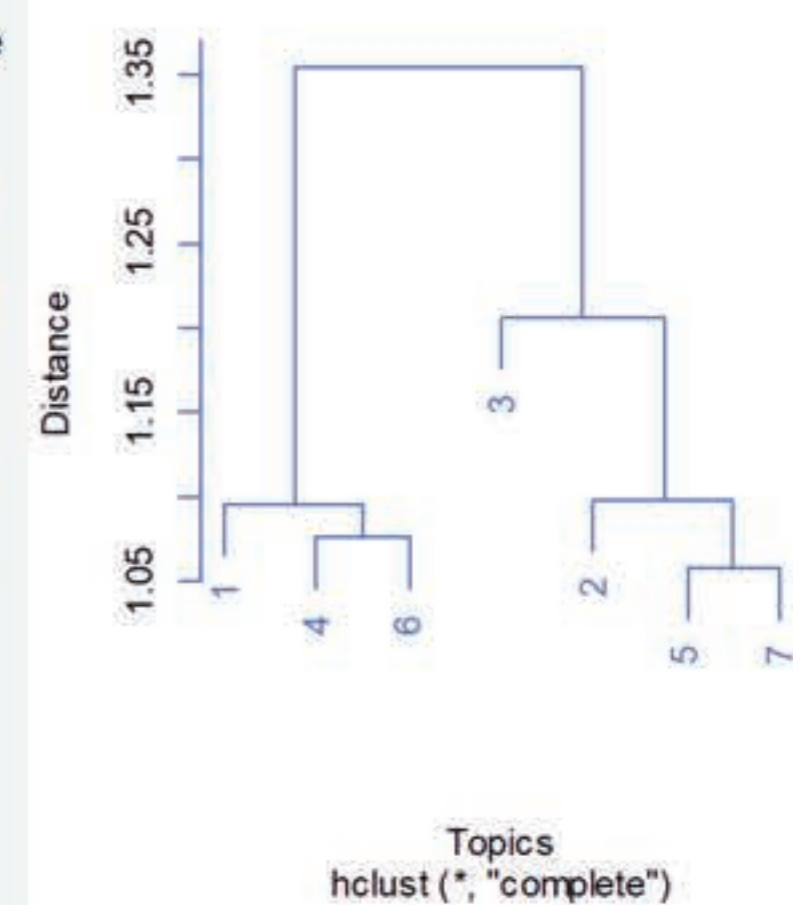
### 2 Clustering of Topics in Fiscal Decentralization from 1965-2024

Intertopic distance shows that topics may be clustered into three main branches:

- **Cluster 1:** Politics and Reform of SNGs (1), Taxation and inter-jurisdictional competition (6), and local spending and its effects (4).
- **Cluster 2:** Economic development in China (2), Public Service Efficiency (5), and urban and social policies (7).
- **Cluster 3:** New public management (3)

The structure's branches and leaves represent potential topic mergers and individual topics, respectively, and the height of merges reflects the degree of similarity between clusters.

### Hierarchical Clustering of Topics



### 4 Shifting Dominant Topics: Fiscal Decentralization Themes by Decade

This analysis used the LDA model based on a subset of text corpora over decades.

- In the 2020s, the *discourse has pivoted towards sustainability, natural resource management, and urban development*, reflecting shifting priorities in fiscal decentralization scholarship.
- Some topics, like *public expenditures, tax, and inter-jurisdictional competition*, endure over time.

Topic	1980s	1990s	2000s	2010s	2020s
1	Revenue sharing (analysis and impact)	Institutional reform (economic, political)	Tax and interjurisdictional competition	Tax and interjurisdictional competition	Tax analysis across states
2	Public policy and Federalism	Government system and public expenditures (decentralization)	Public expenditures and welfare (trends and distribution)	Political reforms and power in Europe	Social system analysis and management
3	Groups and their interest (economic, political)	Public expenditures and welfare (impact)	Economic and development reforms	Public income and expenditures (trends and distribution)	Natural resources, economic growth
4	State and federal transfers, grants and aid	Fiscal policy and Federalism (European Union)	Politics, Institutions and power in subnational governments	Institutional capacity and performance	Urban development policy in China
5	Public income and expenditures, services	Interjurisdictional competition	Governance and revenue across countries	Market supply, privatization	Governance, politics and policy between central and local govts
6	Tax analysis (income, growth)	Tax analysis across states (focus on local taxes)	Local governments, autonomy and control	Economic development, urban growth in China	Market supply, privatization
7	Government system and public expenditures	State and Federal transfers (program support)	State and Federal transfers (expenditure efficiency)	Public income and expenditures, services (Education)	Environmental, green energy investments and economic impact

Note: Cells with the same colors are topics in similar domains. White - Politics, Orange - Economics, Blue - Environment, Urban Development, and Natural Resources.

### Reference

Blei, D. M., Ng, A. Y., & Jordan, M. I. (2003). Latent dirichlet allocation. *Journal of machine Learning research*, 3 (Jan), 993-1022.

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Name: Liuqing Yu  
 Affiliation: PhD Candidate  
 Lee Kuan Yew School of Public Policy  
 National University of Singapore  
 Thesis advisor: Professor Ramkishan Sundara Rajan

## Climate change and Sovereign Risk: Can Policies Tip the Balance?

(Work in Progress)



### Introduction

Climate change has increasingly become a significant threat, altering the climatic conditions that underpin existing productivity models and leading to a rise in the incidence of natural disasters. These threats undermine the economic and financial stability of countries (Kahn et al., 2021). The Paris Agreement, one of the most significant global climate commitments, has set the goal of striving to maintain global temperature rises within 1.5 degrees Celsius, with a hard limit of 2 degrees Celsius. These goals have prompted the introduction of climate policies and the development of infrastructures that are compatible with, resilient to, or mitigate the effects of climate change.

Climate change affects economic performance through two primary risk channels: physical risks, where economic losses or benefits are incurred due to extreme weather events, rising sea levels, warming temperatures, water scarcity, and the loss of biodiversity; and transition risks, which arise from extensive policy, legal, technological, and market changes aimed at addressing climate change mitigation and adaptation requirements (Task Force on Climate-related Financial Disclosures, 2017).

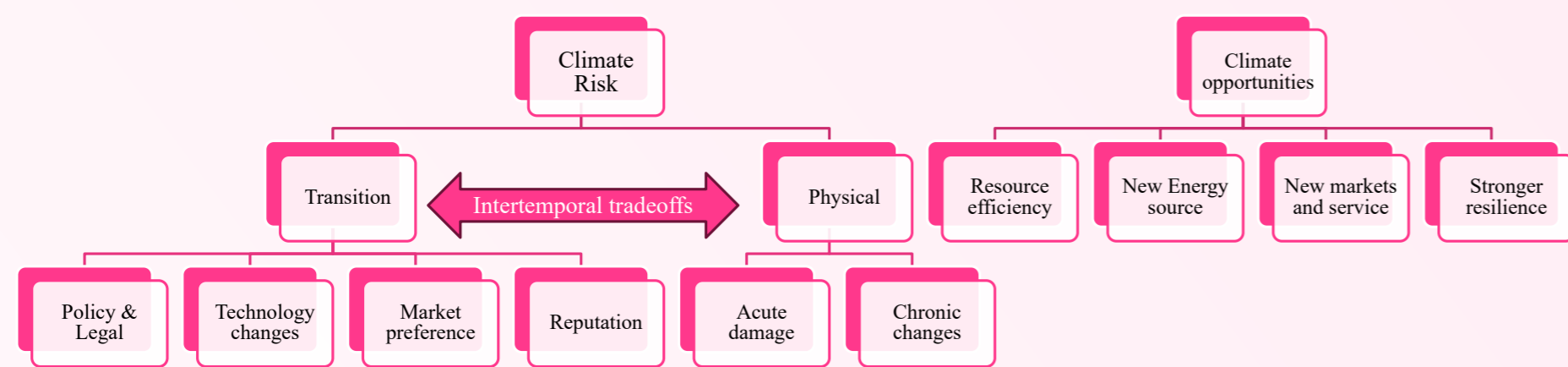


Figure 1: Classification of climate risks and opportunities for sovereign states  
 Adapted from Recommendations of the Task Force on Climate-related Financial Disclosures

These risks are likely to have a significant impact on a sovereign's ability to finance and repay its debts. Physical risks may lead to damage to physical assets, disrupt operations, increase expenditures for repairs, and reduce revenue due to interrupted activities (Battiston, Dafermos, & Monasterolo, 2021; Bank, 2020; Campiglio, Monnin, & Jagow, 2019). Transition risks, on the other hand, could strain fiscal resources due to the need to finance necessary changes, potentially triggering a "climate doom-loop" (Laybourn, Throp, & Sherman, 2023), where climate risks elevate sovereign yields further. The resulting higher financing costs squeeze the fiscal capacity of developing countries, further constraining their ability to adapt to and mitigate climate change.

Traditional methods for evaluating sovereign risks, such as sovereign rating frameworks, do not fully account for climate change (Angelova et al., 2021). The channels and exact impacts of climate change on ratings remain understudied. Most notably, policies in response to climate change could have mitigated these effects, and it is unclear whether sovereign creditworthiness is directly impacted by climate change or through specific channels. This paper will use a country-level panel dataset on climate risks and climate change policies to identify if, and how, climate change affects sovereign creditworthiness. More importantly, it will explore the relationships and channels through which climate change policy impacts sovereign creditworthiness.

Climate risks: transition and physical risks (intertemporal tradeoffs)



Figure 2: Sovereign climate-related risks and links to financial stability  
 Adapted from European Central Bank Financial Stability Review (May 2023)

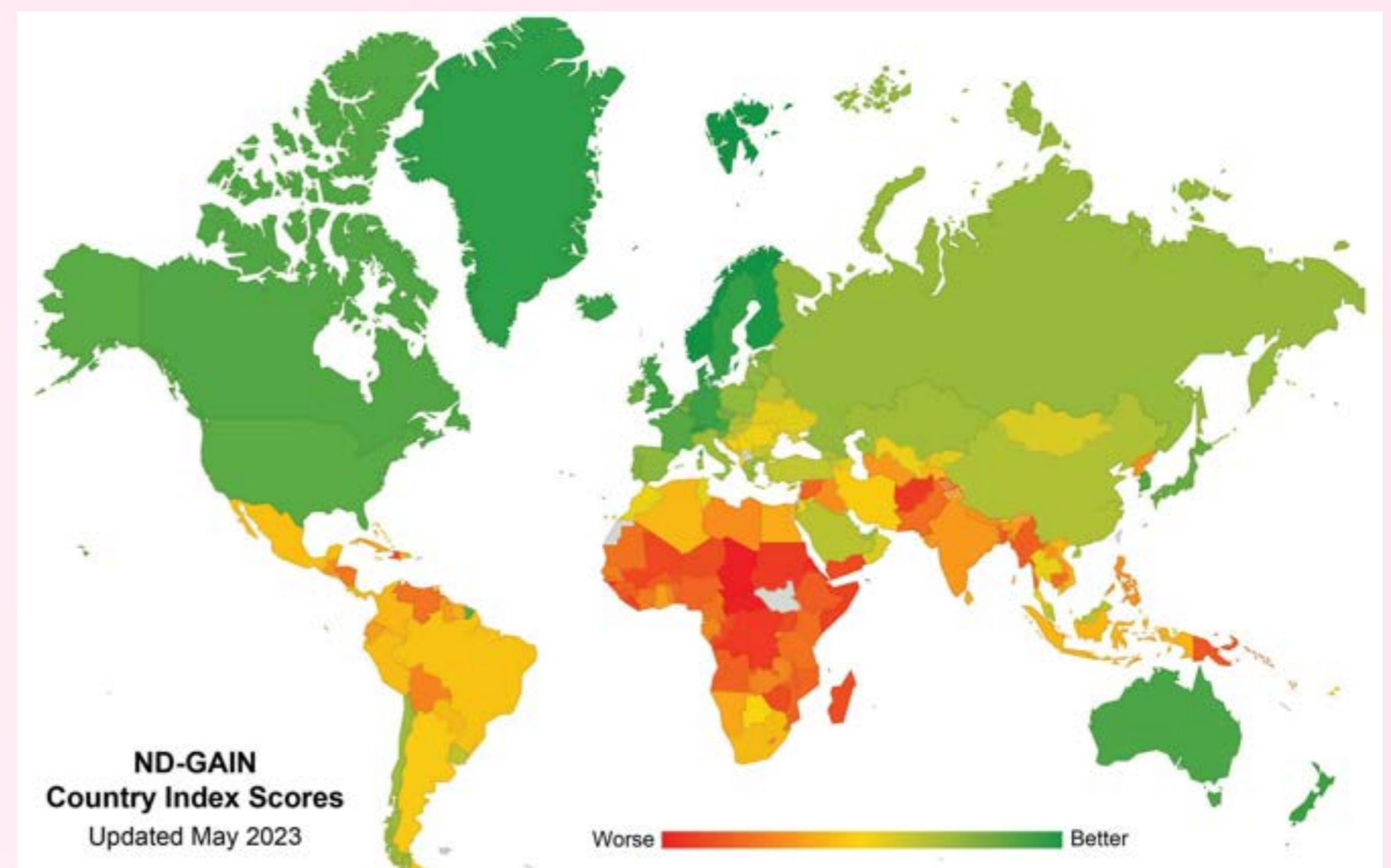


Figure 3: Countries see divergent vulnerability and preparation towards climate risks  
 Source: Notre Dame Global Adaptation Initiative

### Methodology and Estimation

To study the impact on sovereign risk by climate change and climate policies, we first attempt to determine that climate change has a true impact on sovereign creditworthiness. The empirical identification of the model aligns with the following equation:

$$SR_{it} = \alpha_i + \beta X_{it} + \delta Z_{it} + c_i + m_t + \varepsilon_{it}$$

where  $SR_{it}$  represents proxies for sovereign risks, which is an ordinal variable indicating the sovereign rating of the country. Subscript  $i$  denotes the country, and  $t$  represents the year.  $X_{it}$  refers to the independent variable of interest, namely measurements of climate risks, in terms of both physical and transition risks.  $Z_{it}$  includes control variables such as economic fundamentals, fiscal performance, external accounts, and government effectiveness indicators—variables identified in previous literature as critical to determining credit rating and sovereign creditworthiness. The terms  $c_i$  and  $m_t$  represent fixed effects for countries and years, respectively  $\varepsilon_{it}$  denotes the residual.

We utilize a two-way fixed effects model in this analysis, which controls for both time-invariant characteristics of each country  $c_i$  and global shocks or trends that affect all countries in a given year  $m_t$ . This approach accounts for unobserved heterogeneity across countries that could bias the results if omitted, and it controls for time-specific effects that might influence sovereign risk but are not directly related to the variables of interest. We will also apply classification to countries (i.e. tropical w/ non-tropical, developed vs. emerging). We will use different lags as a source of robustness.

As climate change mitigation and adaptation policies are implemented, we incorporate the measurement of climate policy into the equation to assess its impact, specifically the extent to which these policies have mitigated the effects of climate change. We will code and index the climate policy database, which is in text form, with text analysis measures. The revised regression model is specified as follows, where  $CP_{it}$  represents climate policy. The direction of coefficient  $\gamma$  will be critical as it signifies the effect of climate policy, being either a net improvement or fall for sovereign creditworthiness. Multiple specifications and interactions will be applied for robustness checks.

$$SR_{it} = \alpha_i + \beta X_{it} + \gamma CP_{it} + \delta Z_{it} + c_i + m_t + \varepsilon_{it}$$

### Expected Result

We expect to observe that climate change to leave marked downward pressure on sovereign credit rating, especially in countries in the tropical area and being rather underdeveloped. This will further amplify the inequality across developed and developing countries. Specifically, physical risks will have a more manifest impact, while transition risks see less immediate impact.

We expect climate policies to have a moderate impact to notch sovereign credit rating up, as they increase the resiliency against potential climate calamity and improve resilience of investments. The risk of such impact not manifesting, or statistically insignificant, is high, as policies require time to implement and reflect impacts. The size and scale of climate policy could also be too limited to have a significant impact on sovereign creditworthiness.

### Acknowledgements

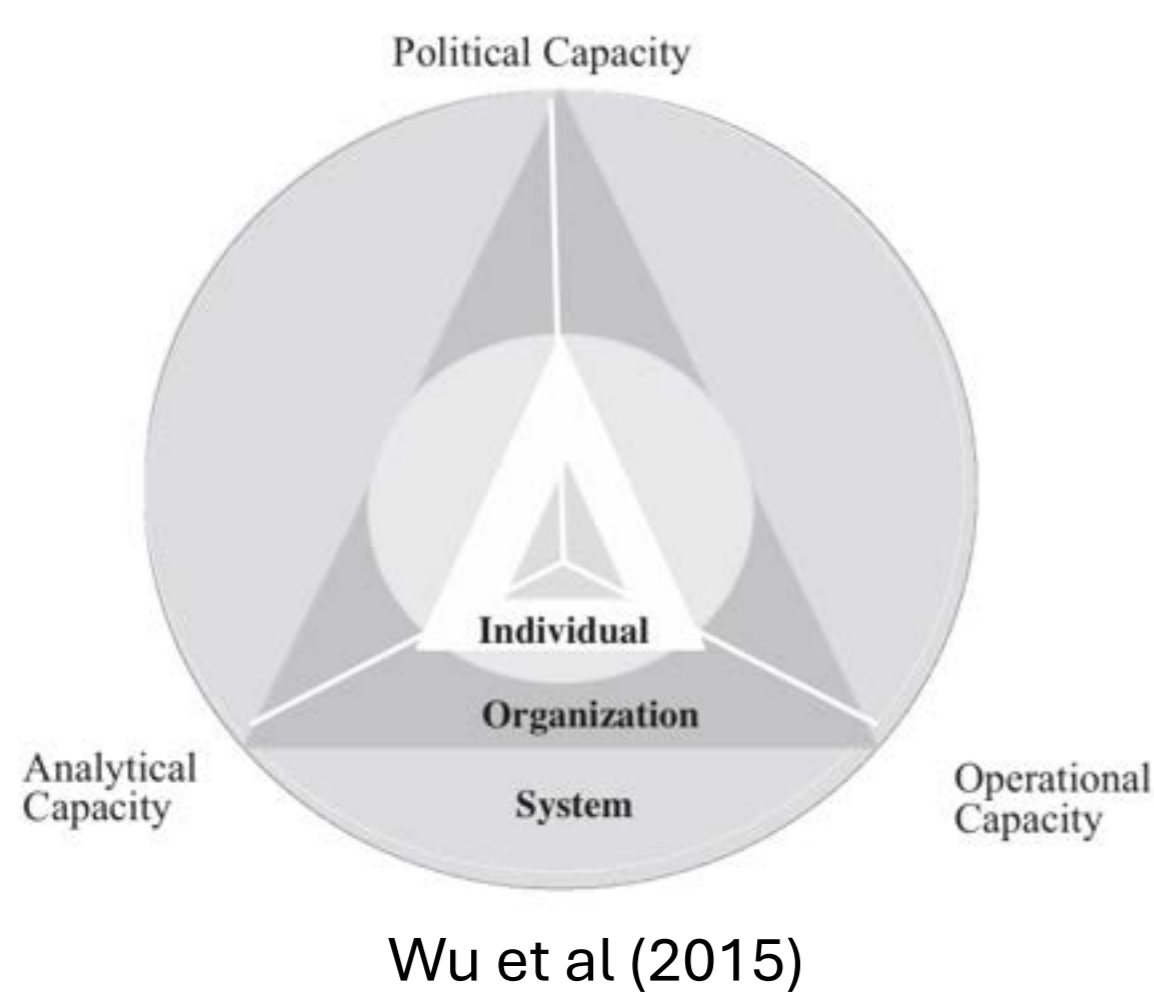
- Kahn, Matthew E., Kamiar Mohaddes, Ryan N. C. Ng, M. Hashem Pesaran, Mehdi Raissi, and Jui-Chung Yang. 2021. "Long-Term Macroeconomic Effects of Climate Change: A Cross-Country Analysis." *Energy Economics* 104 (December): 105624.
- Carney, M. M. (2017). *Letter from Michael R. Bloomberg*.
- Task Force on Climate-related Financial Disclosures. 2017. "Recommendations of the Task Force on Climate-Related Financial Disclosures."
- Battiston, Stefano, Yannis Dafermos, and Irene Monasterolo. 2021. "Climate Risks and Financial Stability." *Journal of Financial Stability* 54 (June): 100867.
- Bank, Asian Development. 2020. "Climate Change and Sovereign Risk," October.
- Campiglio, Emanuele, Pierre Monnin, and Adrian Jagow. 2019. *Climate Risks in Financial Assets*.
- Angelova, Denitsa, Francesco Bosello, Andrea Bigano, and Silvio Giove. 2021. "Sovereign Rating Methodologies, ESG and Climate Change Risk: An Overview."
- Emambakhsh, T., Fahr, S., Giuzio, M., Pourtalet, C. M. S., Spaggiari, M., & Simon, J. M. V. (2023). *Climate change and sovereign risk*.
- Chen, C., Noble, I., Hellmann, J., Coffee, J., Murillo, M., & Chawla, N. (2015). University of Notre Dame global adaptation index. *University of Notre Dame*.
- Laybourn, L., Throp, H., & Sherman, S. (2023). *THE RISKS TO TRANSFORMATIONAL CHANGE FROM REACHING AND BREACHING THE PARIS AGREEMENT GOAL*.



# Can We Transition To EVs Without Adequate Capacity? A Case Study of Delhi EV Policy

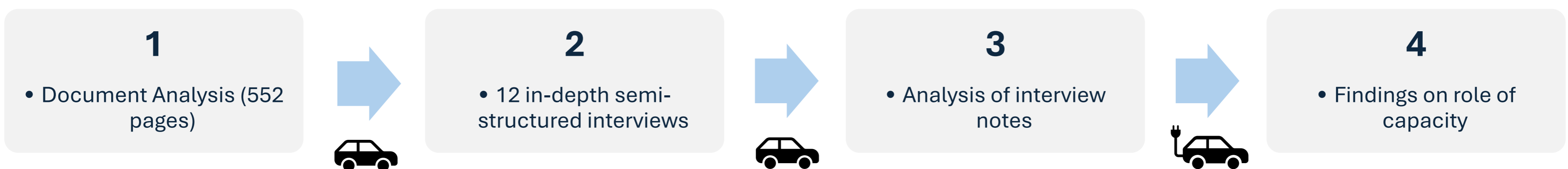
*Mohnish Kedia, Doctoral Candidate (Advisor: Dr M Ramesh)*

Transportation is the largest contributor to local air pollution including carbon monoxide, oxide of nitrogen and particulate matter (Barth and Sperling 2019). In the United States, transportation contributes to almost one-third (29%) of their global greenhouse (GHG) emissions (Barth and Sperling 2019). Globally, transportation contributes 25% to GHG emissions of which 72% comes from road transport, with significant contribution (60%) from passenger fossil fuel powered vehicles (rest 40% from freight) (Axsen et al 2020).



Recent studies estimate that vehicles contribute 15 to 23% of PM10 and PM2.5 pollution in Delhi respectively (ARAI and TERI, 2018). The Delhi Electric Vehicle (EV) policy is a serious step by the Delhi government to combat these challenges. However, a transition to EVs requires the support of the many different actors within Delhi's transport policy subsystem. While the design of policies is important, the capacities of involved policy actors are also essential in the collaborative efforts expended for the achievement of the policy goals.

This study explores how capacity shapes collaboration and subsequently the policy outcomes in the case of Delhi EV policy. It uses the framework developed by Wu et al (2015) – figure to the left, to understand the different types of capacities that matter to involved policy actors.



## Key Findings

### Lack of focus on actors and collaborations

- The studies on EV policy have yet to fully consider the role of actors and collaborations in transition to EVs, both globally and in India

### Policy is focused on financial tools

- Focus on financial tools to achieve cost parity between EVs and other vehicle types
- Mandates are slowly being introduced

### Policy performance is mixed

- In 2023, Delhi had 13.89 EVs/1000 people (country avg. 2.33 EVs/1000 people)
- Government is yet to reach its own vehicles sales target, charging stations target etc.

### High employee deficit in relevant government agencies

- Vacant posts - Transport department 57.85 %; Power department 50%
- Other departments: 29 to 35%

### Top bureaucrats might launch but find it harder to sustain policy momentum

- Presence of analytical and political capacity in top-level bureaucrats aided in augmenting capacity from non-state actors
- Expansion of capacity of the state agencies within the transport subsystem is needed to ensure policy momentum

## Analytical capacity gaps

- National level mobility surveys essential to get important data (such as vehicles in use, household type, family size, charging habits etc.) – hard to evaluate performance and equity issues without them
- Government ownership and formalization improves data availability (e.g., aviation, shipping etc. vis-à-vis road transport).

## Areas for Future Research

### More case studies at sub-national level

- Research on EVs in India is focused on national level
- Subnational, city level studies are essential to understand transition to EVs in their local context

### Collaborations can be useful but...

- Collaborations help in knowledge sharing and improved legitimacy
- However, capacities essential for collaboration: 1) Creative ways of collating data from nationwide road transport offices needed 2) well-staffed transport and power department needed

### Alternative modes of mobility

- Better data and further studies are needed on footpaths & walking behavior, cycling lanes, public transport etc. to fully contextualize the transition to EVs

## References

- Barth, Mathew, and Daniel Sperling. "Environmentally Sustainable Transportation." In *Bending the Curve: Climate Change Solutions*, edited by Veerabhadran Ramanathan, Adam Millard-Ball, and Michelle Niemann. Oakland, California: California Digital Library, University of California : EScholarship.org, University of California, 2019.
- Axsen, Jonn, Patrick Plötz, and Michael Wolinetz. "Crafting Strong, Integrated Policy Mixes for Deep CO2 Mitigation in Road Transport." *Nature Climate Change* 10, no. 9 (September 2020): 809–18. <https://doi.org/10.1038/s41558-020-0877-y>.
- ARAI, and TERI. "Source Apportionment of PM2.5 & PM10 of Delhi NCR for Identification of Major Sources - Prepared for Department of Heavy Industry - Ministry of Heavy Industries and Public Enterprises, New Delhi." New Delhi, 2018. [https://www.teriin.org/sites/default/files/2018-08/Report\\_SA\\_AQM-Delhi-NCR\\_0.pdf](https://www.teriin.org/sites/default/files/2018-08/Report_SA_AQM-Delhi-NCR_0.pdf).
- Wu, X, M Ramesh, and M Howlett. "Policy Capacity: A Conceptual Framework for Understanding Policy Competences and Capabilities." *Policy and Society* 34, no. 3–4 (September 1, 2015): 165–71. <https://doi.org/10.1016/j.polsoc.2015.09.001>.

To know more, email the author at [mohnish.kedia@gmail.com](mailto:mohnish.kedia@gmail.com) or scan the QR code





# The Impact of Schools Reserved for Indigenous Communities on their Education

## Outcomes: Evidence from India

Nikhitha Mary Mathew, PhD Candidate

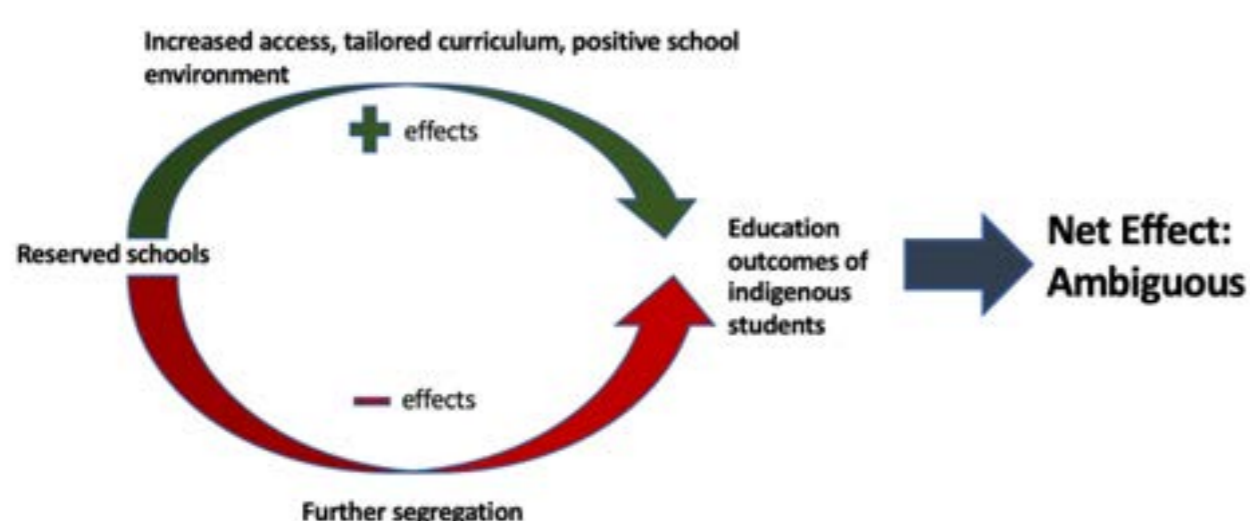
Thesis Committee: Dr. Andrew Francis-Tan (Supervisor), Dr. Saravana Ravindran, Dr. Siddharth George

### A. Research Question

How do schools reserved for indigenous students affect their school enrollments, dropout rates and education attainment?

### B. Motivation

- Distinct characteristics of indigenous students (geographical isolation, cultures, lifestyle milieu, languages, discrimination faced in mainstream settings etc.) make their integration into school system challenging
- Indigenous education outcomes lag behind other social groups

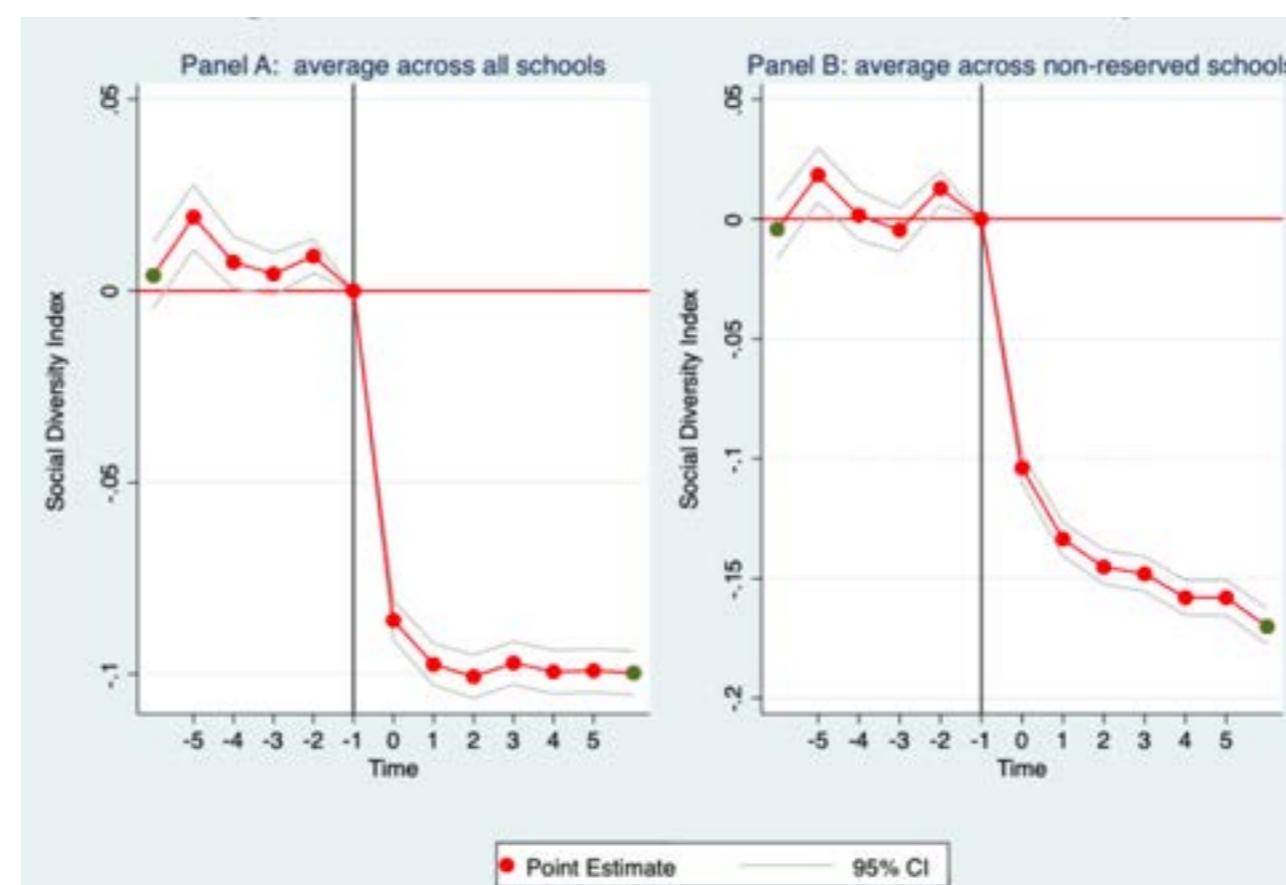


### C. Methodology

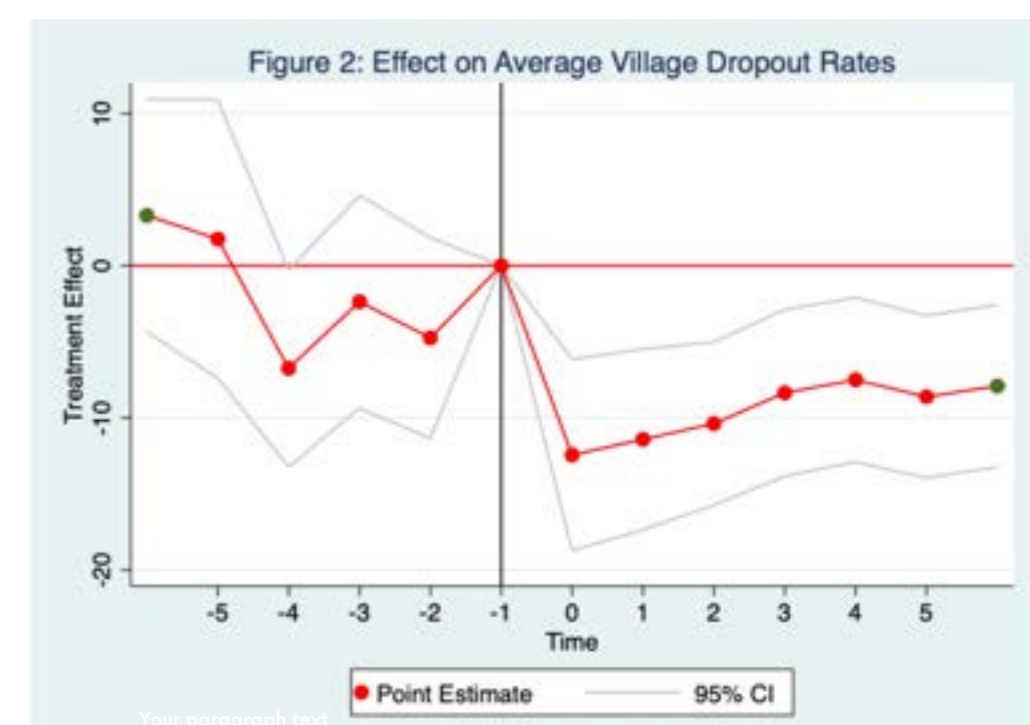
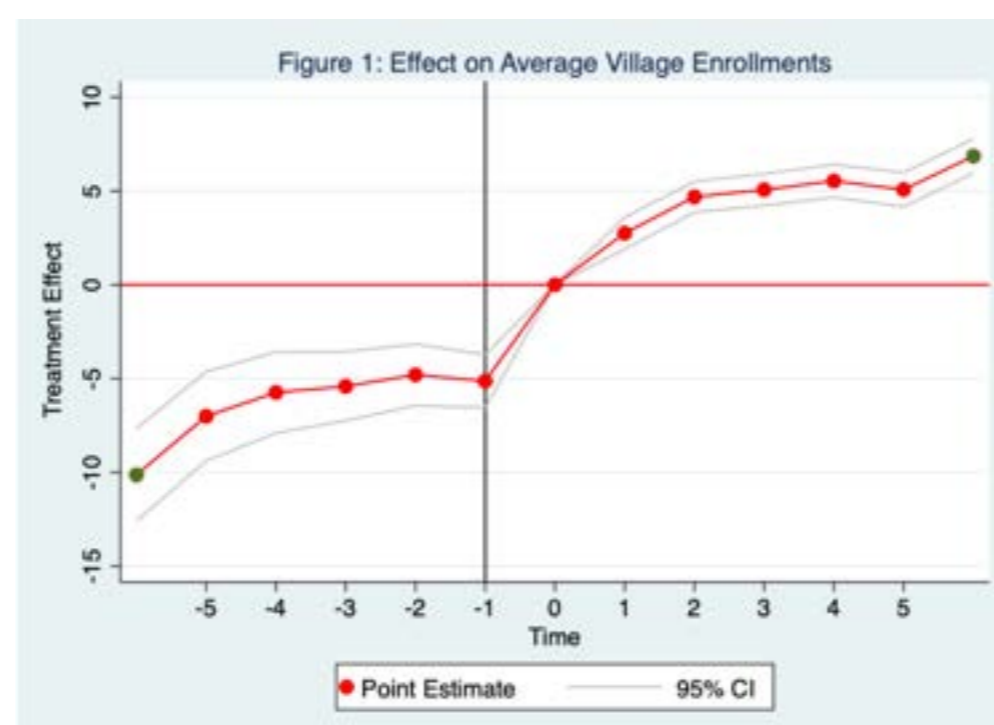
- **Case selection: India**
  - policy to establish schools exclusively for India's indigenous population of Scheduled Tribes
  - Reserved schools integrate tribal traditions and values in curriculum, pedagogy etc.
  - Schools with more than 85% students belonging to Scheduled Tribes included as reserved schools
- **Data:**
  - Enrollment by caste, grade for all schools in India: District Information System for Education
  - Education Attainment: individual level data + caste identifiers in Madhya Pradesh from Socio-Economic Caste Census 2011
- **Identification Strategy:**
  - Dynamic Triple Difference Methodology: exploiting variation across villages in the timing of entry of reserved schools and comparing outcomes of Scheduled Tribes relative to that of mainstream social groups (placebo).
  - Event Study Framework: including robust set of fixed effects such as village-year, village-social group and state-social group-year Fixed Effects.

### D. Results

- The entry of a reserved school decreases social diversity even in non-reserved schools indicating a sorting of Scheduled Tribe students into the reserved schools



- However, the impact on education outcomes of the Scheduled Tribe students seem to be positive. The average enrollment of these students increase while their dropout rates fall, upon entry of reserved schools.



- Scheduled Tribes exposed to reserved schools at the time of their school entry attain higher levels of education in the long-run

	(1) Secondary education	(2) Higher-secondary education	(3) College/Graduate education
Exposure to ST reserved school	0.061*** (12.13)	0.044*** (11.97)	0.028*** (11.91)
Village-birth cohort FE	Yes	Yes	Yes
Village-caste FE	Yes	Yes	Yes
Caste-birth cohort time trends	Yes	Yes	Yes
N	59,35,334	59,35,334	59,35,334

Note: Exposure to ST reserved school = 1 if there existed an ST reserved school in the village when the individual belonging to Scheduled Tribes was of school entry age (aged 6), and 0 otherwise. The analysis is restricted to ever-treated villages (those with at least one ST reserved school as of 2017). Standard errors in parentheses, \* p<0.10, \*\* p<0.05, \*\*\* p<0.01.

### E. Key Findings

#### Establishment of a reserved school in a village causes:

- lower average social diversity (Scheduled Tribe vs Mainstream social group) in non-reserved schools
- Increases the average enrollment of Scheduled Tribe students in a village by about 58% relative to that of mainstream groups; dropout rates fall by about 8%

#### Scheduled Tribe Students with access to reserved schools are:

- 6% more likely to complete secondary school
- 4.5% more likely to complete higher secondary schools
- 2.8% more likely to complete college or graduate education

### F. Policy Implications

- School reserved for indigenous students increase their access to education
- Intergrationist approach -inclusion by respecting and retaining minority groups' cultures and values- is an effective policy tool.



## The Conundrum of Fairness: the Political Economy of the Village Fund Allocation

**Talitha Fauzia Chairunissa, PhD Candidate**  
**Thesis advisor: Prof. Eduardo Araral**

### Village Funds



The Village Law, passed in 2014, transferred responsibility and authority to village-level governments

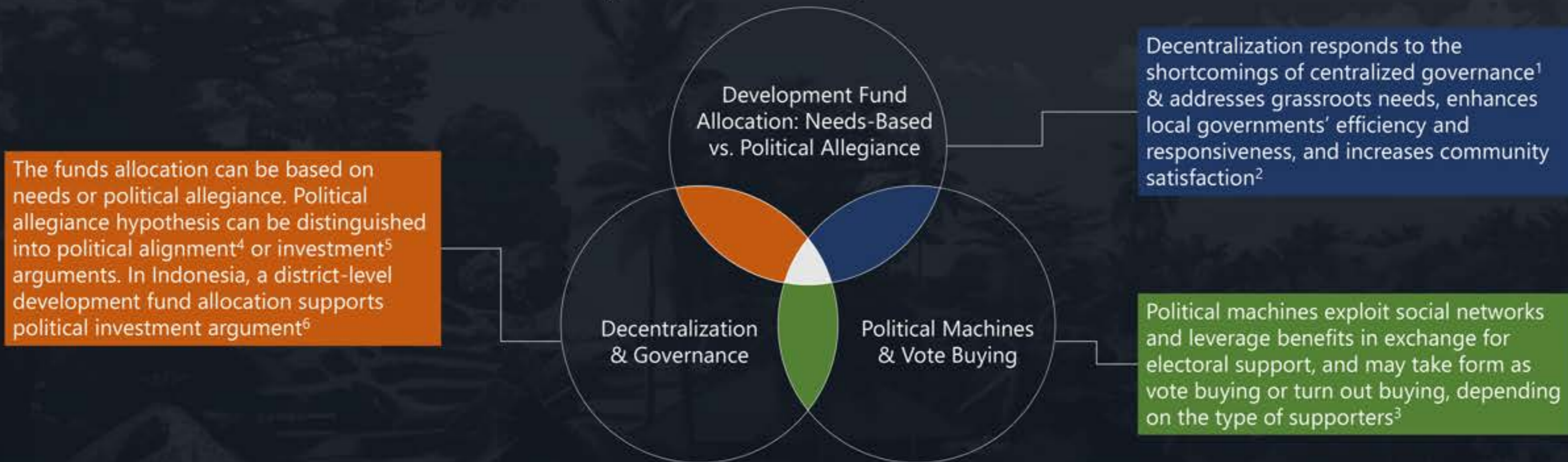


The law mandated annual direct fund transfers, averaging USD 70,000 per village



Villages hold annual meetings to set development priorities through participatory governance

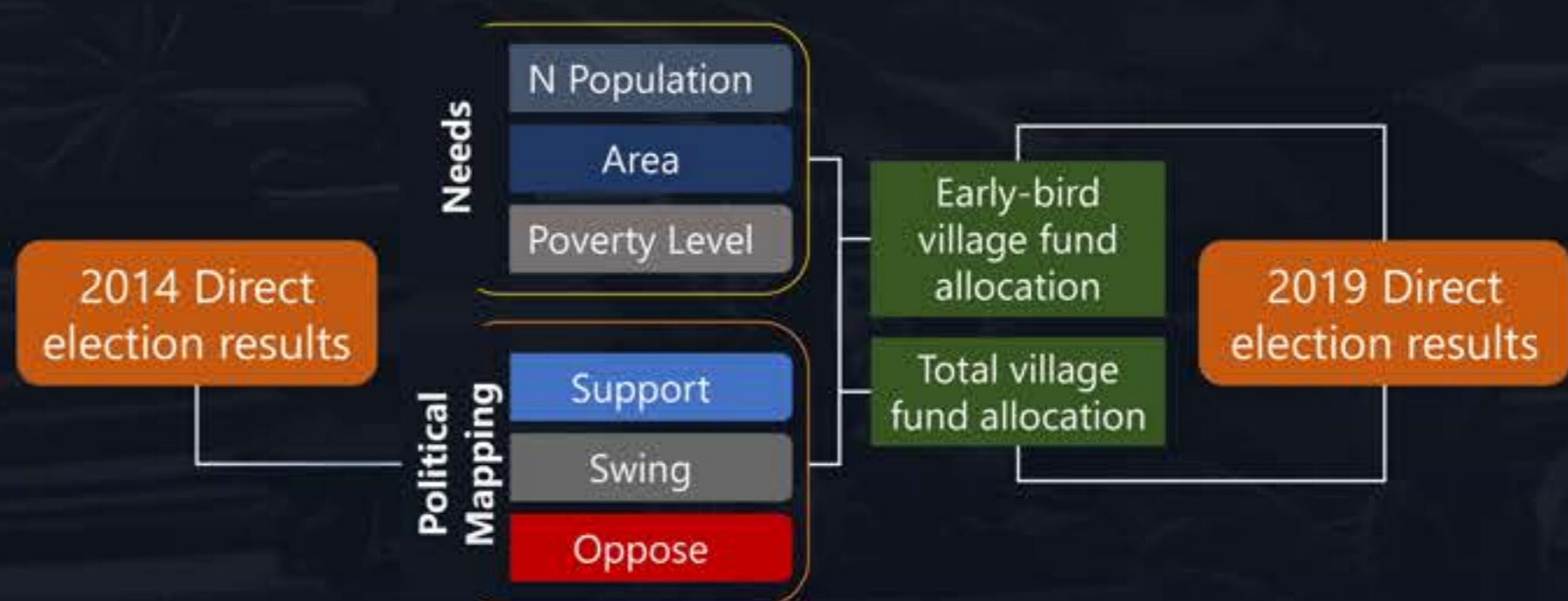
### Combining Three Primary Works of Literature



### The implementation of the Village Law in Indonesia is interesting as it differs from its initial plan, and coincides with two consecutive elections



### Empirical Framework



### Research Questions

- Village fund allocation:** Needs-based or political allegiance?
- If political allegiance:** Political alignment or investment?
- Impact to the next election?**

### Data & Methods

- Village characteristics** (Podes 2014/2019, Statistics Indonesia)
- Annual village fund transfer** per village (Ministry of Village/MoV 2015-2019)
- 2014 and 2019 election data** (Indonesia's Election Committee/KPU)
- Allocation:** Multivariate Ordinary Least Squares (OLS)
- Election impact:** Difference-in-differences estimation method
- Determinant of election results:** Panel data analysis with fixed effects

### MAIN FINDINGS

- Gratitude in early allocation:** early bird village fund allocation favored regime-supporting villages post-2014 election, aligning with the political alignment argument<sup>4</sup>
- Strategic investment:** despite the favoritism, more funds were allocated to opposing and swing villages, hinting at a strategy for future electoral gains<sup>5,6</sup>
- Mixed motives in allocation:** the village fund distribution served dual purposes—addressing village needs while also acting as a political tool—illustrating the complex interplay between development goals and political strategies<sup>3</sup>

The heterogeneity analysis shows consistent results across groupings, confirming the robustness of the results. While non-Java and Eastern regions may be targeted for early assignments—suggesting a political alignment move, more funds are transferred to opposing villages in poor, populous Java and Western regions, associated with higher vote count, suggesting political motives.



<sup>1</sup> The World Bank, (2003); White, (2011); de Mello & Barenstein, (2001); Fisman & Gatti, (2002); Jimenez-Rubio, (2011) <sup>2</sup> Kis-Katos & Sjahrir, (2017); Alatas et al., (2012); <sup>3</sup> Stokes (2005); Brusco et al. (2004); Nichter (2008); <sup>4</sup> Broilo & Naemicini, (2012); Berry et al., (2010); Bracco et al., (2015); Kauder et al., (2016); <sup>5</sup> Laricinese et al., (2013); Kriner & Reeves (2015); <sup>6</sup> Gonschorek et al. (2018)

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# Governance of smart cities

## Designing policies for inclusive urban development

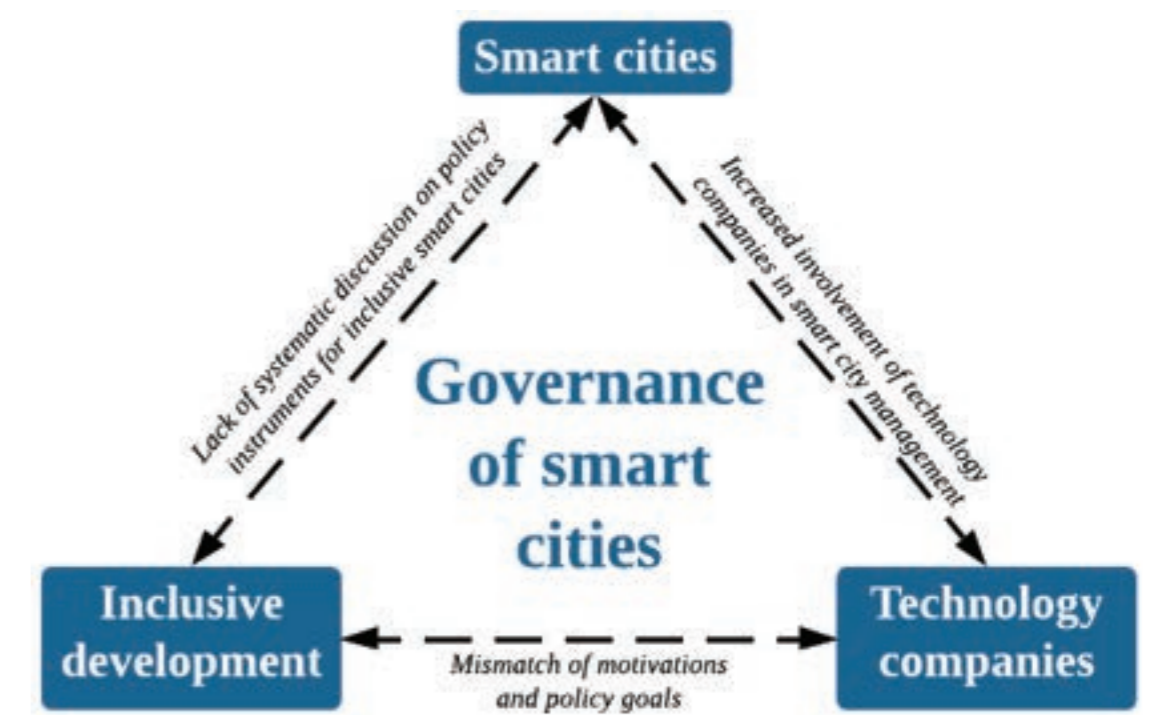
Kritika Sha, PhD Candidate  
Thesis Advisor: Dr. Araz Taeihagh

[kritika.sha@u.nus.edu](mailto:kritika.sha@u.nus.edu)  
[www.kritikashaprofile.wordpress.com](http://www.kritikashaprofile.wordpress.com) [@kritika\\_sha](https://twitter.com/kritika_sha)

Cities, facing complex challenges and limited resources, are adopting technology as a development strategy to achieve their sustainability goals - leading to urban development models such as smart cities. While smart cities demonstrate benefits, they also pose technical, societal, and governance challenges to inclusive development. Involving technology companies with greater expertise, capacity, and leverage than local governments often heighten these challenges. For equitable access and utilisation of essential services, governments must design policies and governance systems for 'inclusive' smart cities.

### How can governments advance inclusive development in smart cities through policy design?

- RQ1** *What are the various challenges faced by governments for inclusive development in smart cities?*
- RQ2** *How can innovation clusters and networks influence policy and regulatory design for inclusive development in smart cities?*
- RQ3** *How can we identify and advance synergies across policy instruments and packages for inclusive development in smart cities?*

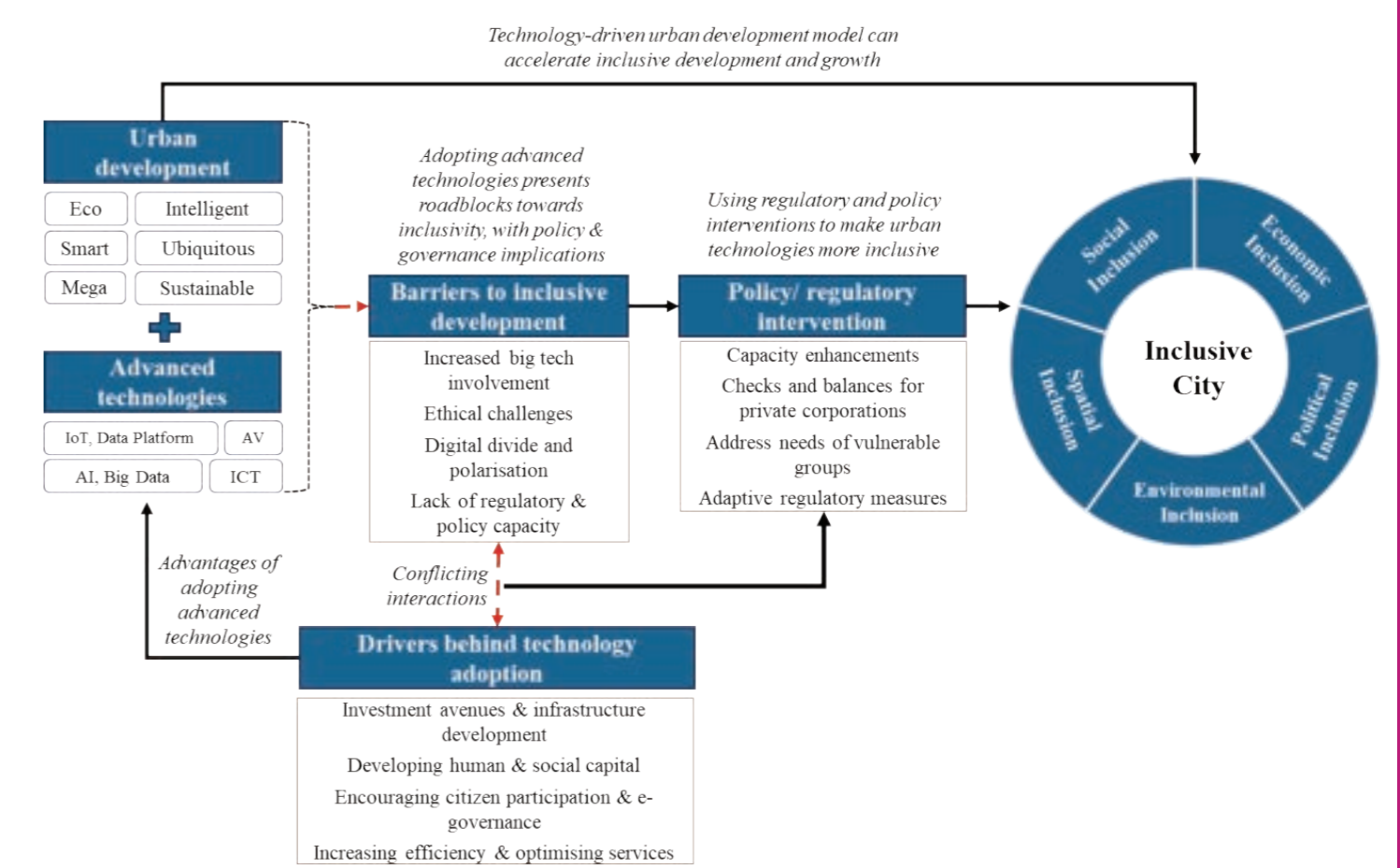


Dynamics between technology companies, inclusive development, and smart cities

### Governing disruptive technologies for inclusive urban development: A systematic literature review

The first article conducts a systematic literature review to identify the motivations behind cities adopting disruptive technologies, the challenges they present to inclusive development, and discuss its policy implications for inclusive development. It develops a conceptual model linking (1) the dominant city labels relating to technology driven urban development, (2) the characteristics and applications of disruptive technologies, and (3) the current understanding of inclusive urban development through a systematic literature review.

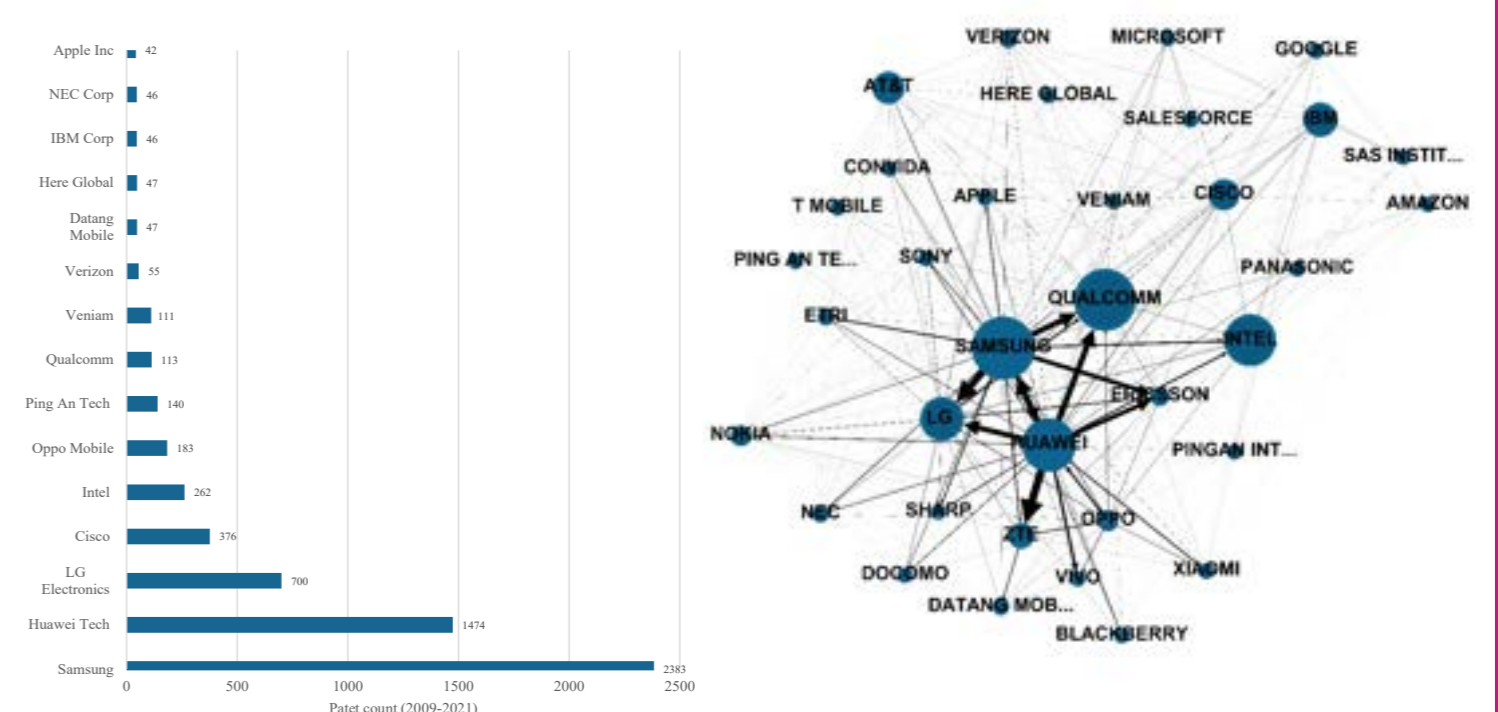
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Conceptual framework connecting cities, advanced technologies, and inclusivity

### Innovation trends and clusters in smart cities: Implications for regulatory design

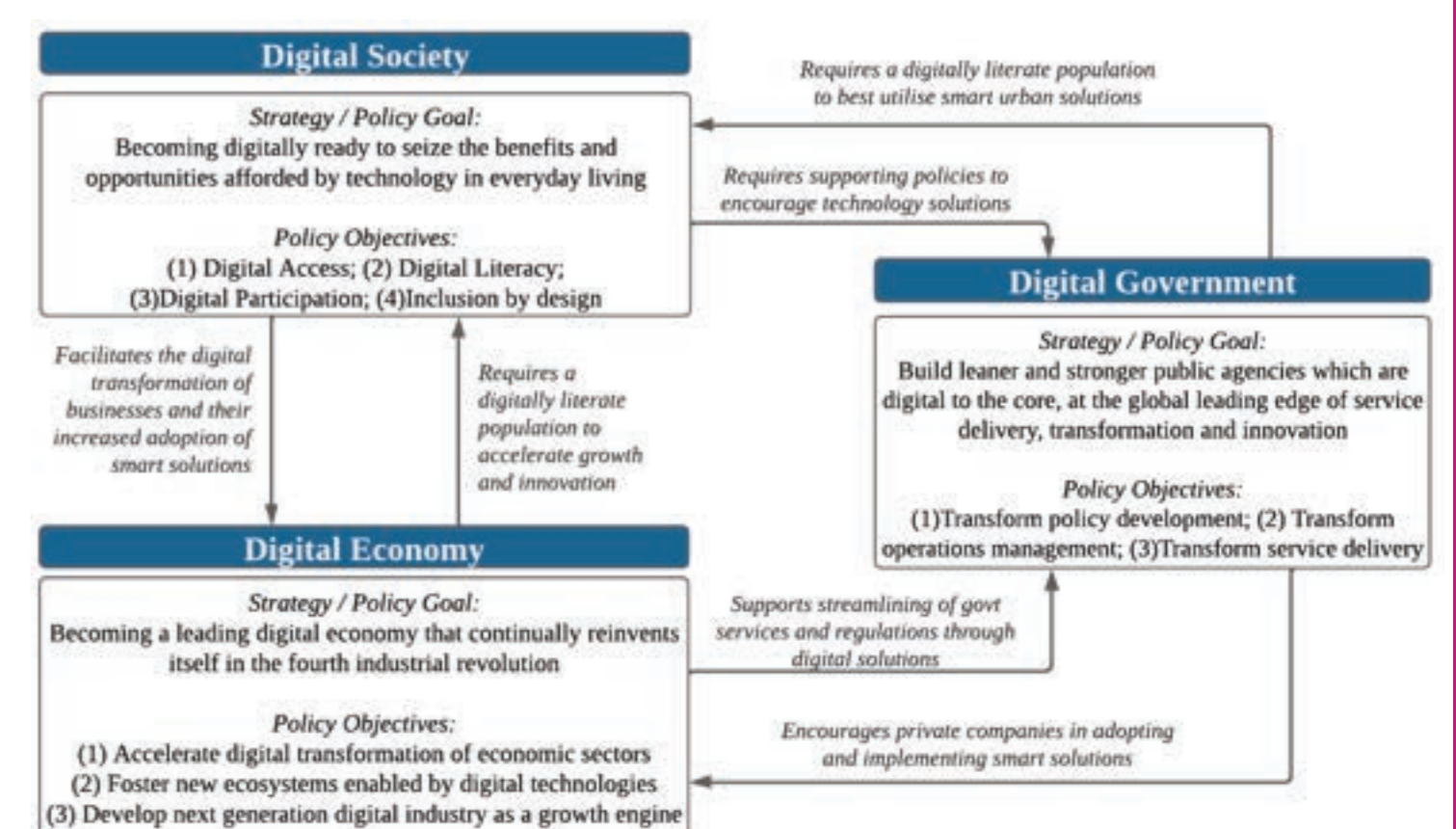
The second article examines the role of technology companies in smart cities by analysing patents from PatSnap (a global patent database). The analysis shows a heterogenous and dynamic landscape in the digital products and geographical location, connections, and composition of patent holders. It examines the approaches taken by selected technology companies towards inclusive development and discusses its implications for dynamic regulatory design, addressing information asymmetry, policy calibrations, and regulatory sandboxes and living labs for inclusive smart cities.



Patent assignees in the smart city innovation and their citation network (2009-2021)

### Designing Adaptive Policy Packages for Inclusive Smart Cities: Lessons from Singapore's Smart Nation Program

The third article identifies how policymakers can advance synergies in policy packages for inclusive development through an in depth analysis of Singapore's Smart Nation program. By analysing its components – goals, instruments, and their interaction in policy packages – the article indicates the need for developing adaptive spaces for policy design in smart cities that respond and adjust to the uncertainties associated with adopting advanced technologies while retaining the policy objectives for inclusive development. The results show how variation in policy instruments, combined with synergistic and facilitative interactions between them can contribute to adaptive spaces for policy design in smart cities.



Connections between the policy strategies in the Smart Nation program, Singapore

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