

# Decentralization and Development

Traviss Cassidy

U Alabama

Nurina Merdikawati

ANU

Tejaswi Velayudhan

UC Irvine

Dewan Ekonomi Nasional

8 July 2026

# Gratitude

We thank SunAh An, Harrison Balsdon, Firda Delayla, Vaughn Gingerich, and Aisha Mahirani for excellent research assistance.

We are grateful to the following agencies for generously sharing data:

- ▶ Ministry of Home Affairs, Directorate General of Population and Civil Registry, Director General of Village Government Development
- ▶ Ministry of Villages, Agency for the Development and Information of Villages and Disadvantaged Regions
- ▶ Ministry of Villages, Agency for Human Resource Development and Community Empowerment of Villages and Disadvantaged Regions

# Outline

- 1 Introduction
- 2 Context
- 3 Data
- 4 Identification Strategy
- 5 Average Effects of Decentralization
- 6 Treatment-Effect Heterogeneity
- 7 Fiscal Effects of the Village Law
- 8 Discussion

# Outline

- 1 Introduction
- 2 Context
- 3 Data
- 4 Identification Strategy
- 5 Average Effects of Decentralization
- 6 Treatment-Effect Heterogeneity
- 7 Fiscal Effects of the Village Law
- 8 Discussion

# Decentralization: An Important Policy Choice

- ▶ Decentralization is a major policy choice with implications for economic activity and welfare
- ▶ International agencies encourage decentralization as a tool for promoting development

# Decentralization: An Important Policy Choice

- ▶ Decentralization is a major policy choice with implications for economic activity and welfare
- ▶ International agencies encourage decentralization as a tool for promoting development

## Questions:

1. **How does decentralization affect economic activity and public service delivery?**
2. **Under what conditions does it succeed or fail?**

# Pros and Cons of Decentralization

## Pros of Decentralization:

- ▶ Local officials possess superior information
- ▶ Local government easier to monitor
- ▶ Intergovernmental competition

# Pros and Cons of Decentralization

## Pros of Decentralization:

- ▶ Local officials possess superior information
- ▶ Local government easier to monitor
- ▶ Intergovernmental competition

## Cons of Decentralization:

- ▶ Economies of scale in provision of public services
- ▶ Lower administrative capacity
- ▶ Elite capture

# Pros and Cons of Decentralization

## Pros of Decentralization:

- ▶ Local officials possess superior information
- ▶ Local government easier to monitor
- ▶ Intergovernmental competition

## Cons of Decentralization:

- ▶ Economies of scale in provision of public services
- ▶ Lower administrative capacity
- ▶ Elite capture

⇒ **Impact on development is theoretically ambiguous**

# This Paper: Decentralization and Village Development

Indonesia's Village Law expanded policymaking autonomy and fiscal resources of *desa* (villages; treatment) in 2015, with no change in autonomy for *kelurahan* (wards; control)

# This Paper: Decentralization and Village Development

Indonesia's Village Law expanded policymaking autonomy and fiscal resources of *desa* (villages; treatment) in 2015, with no change in autonomy for *kelurahan* (wards; control)

- ▶ Difference-in-differences (**DiD**) design: effects of decentralization
- ▶ Regression discontinuity (**RD**) design: pure fiscal effects

# This Paper: Decentralization and Village Development

Indonesia's Village Law expanded policymaking autonomy and fiscal resources of *desa* (villages; treatment) in 2015, with no change in autonomy for *kelurahan* (wards; control)

- ▶ Difference-in-differences (**DiD**) design: effects of decentralization
- ▶ Regression discontinuity (**RD**) design: pure fiscal effects

**Result 1: Decentralization increased economic activity and public services for rural villages**

- ▶ Benefits: ↑ in village head education, ↓ in ethnic fractionalization

# This Paper: Decentralization and Village Development

Indonesia's Village Law expanded policymaking autonomy and fiscal resources of *desa* (villages; treatment) in 2015, with no change in autonomy for *kelurahan* (wards; control)

- ▶ Difference-in-differences (**DiD**) design: effects of decentralization
- ▶ Regression discontinuity (**RD**) design: pure fiscal effects

**Result 1: Decentralization increased economic activity and public services for rural villages**

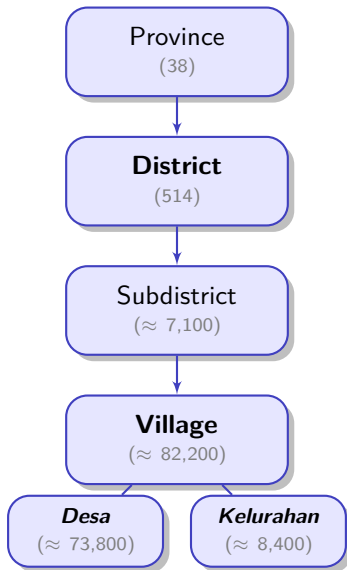
- ▶ Benefits: ↑ in village head education, ↓ in ethnic fractionalization

**Result 2: Marginal increase in fiscal resources has stat. insig. effects**

# Outline

- 1 Introduction
- 2 Context
- 3 Data
- 4 Identification Strategy
- 5 Average Effects of Decentralization
- 6 Treatment-Effect Heterogeneity
- 7 Fiscal Effects of the Village Law
- 8 Discussion

# Institutional Context: Subnational Government



# Institutional Context: Reforms

1966–98: Centralized and autocratic system under Suharto

1999: Democratic elections for national and local parliaments

2001: “Big Bang” decentralization → districts

**2015: Village Law decentralization → *desa* (villages)**

# Policymaking in *Desa* (Treatment)

## 1999–Present

- ▶ *Desa* contribute to basic infrastructure (roads, irrigation) and services
- ▶ *Desa* head (*kepala desa*) directly elected by villagers
- ▶ Village council (*BPD*) oversees *desa* head

# Policymaking in *Desa* (Treatment)

## 1999–Present

- ▶ *Desa* contribute to basic infrastructure (roads, irrigation) and services
- ▶ *Desa* head (*kepala desa*) directly elected by villagers
- ▶ Village council (*BPD*) oversees *desa* head

## Pre-Village Law: 1999–2014

- ▶ Districts had final say over *desa* regulations and budgets
- ▶ Small grants from higher tiers; minimal own-source revenue

# Policymaking in *Desa* (Treatment)

## 1999–Present

- ▶ *Desa* contribute to basic infrastructure (roads, irrigation) and services
- ▶ *Desa* head (*kepala desa*) directly elected by villagers
- ▶ Village council (*BPD*) oversees *desa* head

## Pre-Village Law: 1999–2014

- ▶ Districts had final say over *desa* regulations and budgets
- ▶ Small grants from higher tiers; minimal own-source revenue

## Post-Village Law: 2015–Present

- ▶ *Desa* set local spending priorities and regulations
- ▶ ↑ Fiscal transfers from central (*DD*) and district governments (*ADD*)
- ▶ Strategic decisions deliberated in village assembly (*musyawarah desa*)

# Policymaking in *Kelurahan* (Control)

## 1999–Present

- ▶ *Kelurahan* contribute to basic infrastructure and services
- ▶ *Kelurahan* head (*lurah*) is a civil servant appointed by district
- ▶ No council; no fiscal or regulatory autonomy

# Policymaking in *Kelurahan* (Control)

## 1999–Present

- ▶ *Kelurahan* contribute to basic infrastructure and services
- ▶ *Kelurahan* head (*lurah*) is a civil servant appointed by district
- ▶ No council; no fiscal or regulatory autonomy

## Ward Fund: 2019–2020, 2023–Present

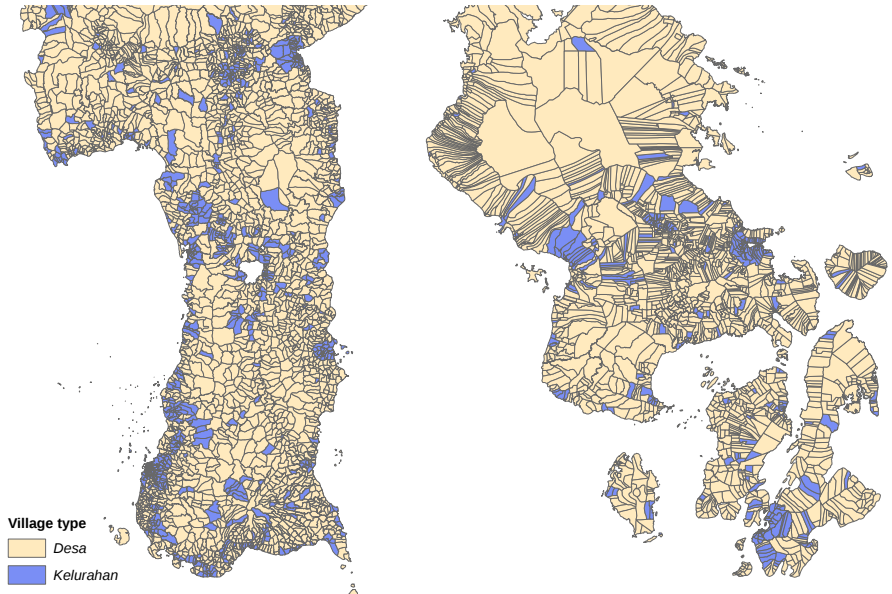
- ▶ ↑ Earmarked transfers for local infrastructure and services (*Dana Kelurahan*)
- ▶ Per-*kelurahan* Ward Fund  $\approx$  40% of per-*desa* Village Fund (*Dana Desa*)

# *Desa* (Treatment) and *Kelurahan* (Control) Characteristics

*Kelurahan* mostly urban, *desa* mostly rural, but there is overlap

- ▶ *Kelurahan* were established in:
  1. Urban districts & capitals of rural districts (**urban**)
  2. Subdistrict capitals & surrounding areas (**often rural**)
- ▶ *Desa* were converted to *kelurahan* as they became more urban, but many urbanized without converting

# Desa (Treatment) *Kelurahan* (Control) in Sulawesi



# Outline

- 1 Introduction
- 2 Context
- 3 Data**
- 4 Identification Strategy
- 5 Average Effects of Decentralization
- 6 Treatment-Effect Heterogeneity
- 7 Fiscal Effects of the Village Law
- 8 Discussion

## Visible Infrared Imaging Radiometer Suite (VIIRS)

- ▶ Nighttime light intensity within village borders, **2012–2025**

## Village Census (*PODES*)

- ▶ Local public services, village characteristics, **2005–2025**

## Ministry of Finance (*Kemenkeu*), Ministry of Villages (*Kemendesa*)

- ▶ Village Fund (*Dana Desa*), **2016–2025**

## Ministry of Home Affairs (*Kemendagri*)

- ▶ Village budgets (*APBDes*), **2023–2025**; population, **2020–2025**

## Full-Count Population Census (*SP*)

- ▶ Baseline demographic and economic characteristics, **2010**

# Baseline Village Characteristics (Small Subset)

|                             | <i>Desa</i> (treatment) |               | <i>Kelurahan</i> (control) |               | Standardized difference |
|-----------------------------|-------------------------|---------------|----------------------------|---------------|-------------------------|
|                             | Mean<br>(1)             | (S.D.)<br>(2) | Mean<br>(3)                | (S.D.)<br>(4) |                         |
| Urban                       | 0.14                    | (0.35)        | 0.78                       | (0.42)        | −1.67                   |
| Population                  | 2,392.24                | (2,876.50)    | 8,663.68                   | (10,728.68)   | −0.80                   |
| Land area (sq. km)          | 24.03                   | (88.02)       | 8.16                       | (30.28)       | 0.24                    |
| Dist. to district cap. (km) | 45.61                   | (51.49)       | 13.31                      | (23.67)       | 0.81                    |
| Ethnic fractionalization    | 0.16                    | (0.22)        | 0.39                       | (0.30)        | −0.90                   |
| Ethnic polarization         | 0.23                    | (0.29)        | 0.44                       | (0.26)        | −0.75                   |
| % Aged 15–64                | 63.49                   | (5.01)        | 66.89                      | (4.34)        | −0.73                   |
| % Completed prim. school    | 78.42                   | (17.29)       | 90.54                      | (8.21)        | −0.90                   |
| % Completed sec. school     | 19.67                   | (14.11)       | 47.83                      | (17.47)       | −1.77                   |
| % Completed college         | 2.16                    | (2.82)        | 9.19                       | (6.35)        | −1.43                   |
| % Literate                  | 88.26                   | (14.57)       | 95.50                      | (5.79)        | −0.65                   |
| % Employed: agriculture     | 63.65                   | (26.21)       | 19.38                      | (23.16)       | 1.79                    |
| Village head college-educ.  | 0.15                    | (0.35)        | 0.77                       | (0.42)        | −1.61                   |
| Observations                | 61,467                  |               | 6,898                      |               |                         |

# Baseline Village Characteristics (Small Subset)

|                             | <i>Desa</i> (treatment) |               | <i>Kelurahan</i> (control) |               | Standardized difference |
|-----------------------------|-------------------------|---------------|----------------------------|---------------|-------------------------|
|                             | Mean<br>(1)             | (S.D.)<br>(2) | Mean<br>(3)                | (S.D.)<br>(4) |                         |
| <b>Urban</b>                | <b>0.14</b>             | (0.35)        | <b>0.78</b>                | (0.42)        | −1.67                   |
| Population                  | 2,392.24                | (2,876.50)    | 8,663.68                   | (10,728.68)   | −0.80                   |
| Land area (sq. km)          | 24.03                   | (88.02)       | 8.16                       | (30.28)       | 0.24                    |
| Dist. to district cap. (km) | 45.61                   | (51.49)       | 13.31                      | (23.67)       | 0.81                    |
| Ethnic fractionalization    | 0.16                    | (0.22)        | 0.39                       | (0.30)        | −0.90                   |
| Ethnic polarization         | 0.23                    | (0.29)        | 0.44                       | (0.26)        | −0.75                   |
| % Aged 15–64                | 63.49                   | (5.01)        | 66.89                      | (4.34)        | −0.73                   |
| % Completed prim. school    | 78.42                   | (17.29)       | 90.54                      | (8.21)        | −0.90                   |
| % Completed sec. school     | 19.67                   | (14.11)       | 47.83                      | (17.47)       | −1.77                   |
| % Completed college         | 2.16                    | (2.82)        | 9.19                       | (6.35)        | −1.43                   |
| % Literate                  | 88.26                   | (14.57)       | 95.50                      | (5.79)        | −0.65                   |
| % Employed: agriculture     | 63.65                   | (26.21)       | 19.38                      | (23.16)       | 1.79                    |
| Village head college-educ.  | 0.15                    | (0.35)        | 0.77                       | (0.42)        | −1.61                   |
| Observations                | 61,467                  |               | 6,898                      |               |                         |

# Baseline Village Characteristics (Small Subset)

|                             | <i>Desa</i> (treatment) |               | <i>Kelurahan</i> (control) |               | Standardized difference |
|-----------------------------|-------------------------|---------------|----------------------------|---------------|-------------------------|
|                             | Mean<br>(1)             | (S.D.)<br>(2) | Mean<br>(3)                | (S.D.)<br>(4) |                         |
| Urban                       | 0.14                    | (0.35)        | 0.78                       | (0.42)        | −1.67                   |
| Population                  | 2,392.24                | (2,876.50)    | 8,663.68                   | (10,728.68)   | −0.80                   |
| Land area (sq. km)          | 24.03                   | (88.02)       | 8.16                       | (30.28)       | 0.24                    |
| Dist. to district cap. (km) | 45.61                   | (51.49)       | 13.31                      | (23.67)       | 0.81                    |
| Ethnic fractionalization    | 0.16                    | (0.22)        | 0.39                       | (0.30)        | −0.90                   |
| Ethnic polarization         | 0.23                    | (0.29)        | 0.44                       | (0.26)        | −0.75                   |
| % Aged 15–64                | 63.49                   | (5.01)        | 66.89                      | (4.34)        | −0.73                   |
| % Completed prim. school    | 78.42                   | (17.29)       | 90.54                      | (8.21)        | −0.90                   |
| % Completed sec. school     | 19.67                   | (14.11)       | 47.83                      | (17.47)       | −1.77                   |
| % Completed college         | 2.16                    | (2.82)        | 9.19                       | (6.35)        | −1.43                   |
| % Literate                  | 88.26                   | (14.57)       | 95.50                      | (5.79)        | −0.65                   |
| % Employed: agriculture     | 63.65                   | (26.21)       | 19.38                      | (23.16)       | 1.79                    |
| Village head college-educ.  | 0.15                    | (0.35)        | 0.77                       | (0.42)        | −1.61                   |
| Observations                | 61,467                  |               | 6,898                      |               |                         |

# Baseline Village Characteristics (Small Subset)

|                             | <i>Desa</i> (treatment) |               | <i>Kelurahan</i> (control) |               | Standardized difference |
|-----------------------------|-------------------------|---------------|----------------------------|---------------|-------------------------|
|                             | Mean<br>(1)             | (S.D.)<br>(2) | Mean<br>(3)                | (S.D.)<br>(4) |                         |
| Urban                       | 0.14                    | (0.35)        | 0.78                       | (0.42)        | −1.67                   |
| Population                  | 2,392.24                | (2,876.50)    | 8,663.68                   | (10,728.68)   | −0.80                   |
| Land area (sq. km)          | 24.03                   | (88.02)       | 8.16                       | (30.28)       | 0.24                    |
| Dist. to district cap. (km) | 45.61                   | (51.49)       | 13.31                      | (23.67)       | 0.81                    |
| Ethnic fractionalization    | 0.16                    | (0.22)        | 0.39                       | (0.30)        | −0.90                   |
| Ethnic polarization         | 0.23                    | (0.29)        | 0.44                       | (0.26)        | −0.75                   |
| % Aged 15–64                | 63.49                   | (5.01)        | 66.89                      | (4.34)        | −0.73                   |
| % Completed prim. school    | 78.42                   | (17.29)       | 90.54                      | (8.21)        | −0.90                   |
| % Completed sec. school     | 19.67                   | (14.11)       | 47.83                      | (17.47)       | −1.77                   |
| % Completed college         | 2.16                    | (2.82)        | 9.19                       | (6.35)        | −1.43                   |
| % Literate                  | 88.26                   | (14.57)       | 95.50                      | (5.79)        | −0.65                   |
| % Employed: agriculture     | 63.65                   | (26.21)       | 19.38                      | (23.16)       | 1.79                    |
| Village head college-educ.  | 0.15                    | (0.35)        | 0.77                       | (0.42)        | −1.61                   |
| Observations                | 61,467                  |               | 6,898                      |               |                         |

# Baseline Village Characteristics (Small Subset)

|                             | <i>Desa</i> (treatment) |               | <i>Kelurahan</i> (control) |               | Standardized difference |
|-----------------------------|-------------------------|---------------|----------------------------|---------------|-------------------------|
|                             | Mean<br>(1)             | (S.D.)<br>(2) | Mean<br>(3)                | (S.D.)<br>(4) |                         |
| Urban                       | 0.14                    | (0.35)        | 0.78                       | (0.42)        | −1.67                   |
| Population                  | 2,392.24                | (2,876.50)    | 8,663.68                   | (10,728.68)   | −0.80                   |
| Land area (sq. km)          | 24.03                   | (88.02)       | 8.16                       | (30.28)       | 0.24                    |
| Dist. to district cap. (km) | 45.61                   | (51.49)       | 13.31                      | (23.67)       | 0.81                    |
| Ethnic fractionalization    | 0.16                    | (0.22)        | 0.39                       | (0.30)        | −0.90                   |
| Ethnic polarization         | 0.23                    | (0.29)        | 0.44                       | (0.26)        | −0.75                   |
| % Aged 15–64                | 63.49                   | (5.01)        | 66.89                      | (4.34)        | −0.73                   |
| % Completed prim. school    | 78.42                   | (17.29)       | 90.54                      | (8.21)        | −0.90                   |
| % Completed sec. school     | 19.67                   | (14.11)       | 47.83                      | (17.47)       | −1.77                   |
| % Completed college         | 2.16                    | (2.82)        | 9.19                       | (6.35)        | −1.43                   |
| % Literate                  | 88.26                   | (14.57)       | 95.50                      | (5.79)        | −0.65                   |
| % Employed: agriculture     | 63.65                   | (26.21)       | 19.38                      | (23.16)       | 1.79                    |
| Village head college-educ.  | 0.15                    | (0.35)        | 0.77                       | (0.42)        | −1.61                   |
| Observations                | 61,467                  |               | 6,898                      |               |                         |

# Baseline Village Characteristics (Small Subset)

|                             | <i>Desa</i> (treatment) |               | <i>Kelurahan</i> (control) |               | Standardized difference |
|-----------------------------|-------------------------|---------------|----------------------------|---------------|-------------------------|
|                             | Mean<br>(1)             | (S.D.)<br>(2) | Mean<br>(3)                | (S.D.)<br>(4) |                         |
| Urban                       | 0.14                    | (0.35)        | 0.78                       | (0.42)        | −1.67                   |
| Population                  | 2,392.24                | (2,876.50)    | 8,663.68                   | (10,728.68)   | −0.80                   |
| Land area (sq. km)          | 24.03                   | (88.02)       | 8.16                       | (30.28)       | 0.24                    |
| Dist. to district cap. (km) | 45.61                   | (51.49)       | 13.31                      | (23.67)       | 0.81                    |
| Ethnic fractionalization    | 0.16                    | (0.22)        | 0.39                       | (0.30)        | −0.90                   |
| Ethnic polarization         | 0.23                    | (0.29)        | 0.44                       | (0.26)        | −0.75                   |
| % Aged 15–64                | 63.49                   | (5.01)        | 66.89                      | (4.34)        | −0.73                   |
| % Completed prim. school    | 78.42                   | (17.29)       | 90.54                      | (8.21)        | −0.90                   |
| % Completed sec. school     | 19.67                   | (14.11)       | 47.83                      | (17.47)       | −1.77                   |
| % Completed college         | 2.16                    | (2.82)        | 9.19                       | (6.35)        | −1.43                   |
| % Literate                  | 88.26                   | (14.57)       | 95.50                      | (5.79)        | −0.65                   |
| % Employed: agriculture     | 63.65                   | (26.21)       | 19.38                      | (23.16)       | 1.79                    |
| Village head college-educ.  | 0.15                    | (0.35)        | 0.77                       | (0.42)        | −1.61                   |
| Observations                | 61,467                  |               | 6,898                      |               |                         |

# Baseline Village Characteristics (Small Subset)

|                             | <i>Desa</i> (treatment) |               | <i>Kelurahan</i> (control) |               | Standardized difference |
|-----------------------------|-------------------------|---------------|----------------------------|---------------|-------------------------|
|                             | Mean<br>(1)             | (S.D.)<br>(2) | Mean<br>(3)                | (S.D.)<br>(4) |                         |
| Urban                       | 0.14                    | (0.35)        | 0.78                       | (0.42)        | −1.67                   |
| Population                  | 2,392.24                | (2,876.50)    | 8,663.68                   | (10,728.68)   | −0.80                   |
| Land area (sq. km)          | 24.03                   | (88.02)       | 8.16                       | (30.28)       | 0.24                    |
| Dist. to district cap. (km) | 45.61                   | (51.49)       | 13.31                      | (23.67)       | 0.81                    |
| Ethnic fractionalization    | 0.16                    | (0.22)        | 0.39                       | (0.30)        | −0.90                   |
| Ethnic polarization         | 0.23                    | (0.29)        | 0.44                       | (0.26)        | −0.75                   |
| % Aged 15–64                | 63.49                   | (5.01)        | 66.89                      | (4.34)        | −0.73                   |
| % Completed prim. school    | 78.42                   | (17.29)       | 90.54                      | (8.21)        | −0.90                   |
| % Completed sec. school     | 19.67                   | (14.11)       | 47.83                      | (17.47)       | −1.77                   |
| % Completed college         | 2.16                    | (2.82)        | 9.19                       | (6.35)        | −1.43                   |
| % Literate                  | 88.26                   | (14.57)       | 95.50                      | (5.79)        | −0.65                   |
| % Employed: agriculture     | 63.65                   | (26.21)       | 19.38                      | (23.16)       | 1.79                    |
| Village head college-educ.  | 0.15                    | (0.35)        | 0.77                       | (0.42)        | −1.61                   |
| Observations                | 61,467                  |               | 6,898                      |               |                         |

# Baseline Village Characteristics (Small Subset)

|                             | <i>Desa</i> (treatment) |               | <i>Kelurahan</i> (control) |               | Standardized difference |
|-----------------------------|-------------------------|---------------|----------------------------|---------------|-------------------------|
|                             | Mean<br>(1)             | (S.D.)<br>(2) | Mean<br>(3)                | (S.D.)<br>(4) |                         |
| Urban                       | 0.14                    | (0.35)        | 0.78                       | (0.42)        | −1.67                   |
| Population                  | 2,392.24                | (2,876.50)    | 8,663.68                   | (10,728.68)   | −0.80                   |
| Land area (sq. km)          | 24.03                   | (88.02)       | 8.16                       | (30.28)       | 0.24                    |
| Dist. to district cap. (km) | 45.61                   | (51.49)       | 13.31                      | (23.67)       | 0.81                    |
| Ethnic fractionalization    | 0.16                    | (0.22)        | 0.39                       | (0.30)        | −0.90                   |
| Ethnic polarization         | 0.23                    | (0.29)        | 0.44                       | (0.26)        | −0.75                   |
| % Aged 15–64                | 63.49                   | (5.01)        | 66.89                      | (4.34)        | −0.73                   |
| % Completed prim. school    | 78.42                   | (17.29)       | 90.54                      | (8.21)        | −0.90                   |
| % Completed sec. school     | 19.67                   | (14.11)       | 47.83                      | (17.47)       | −1.77                   |
| % Completed college         | 2.16                    | (2.82)        | 9.19                       | (6.35)        | −1.43                   |
| % Literate                  | 88.26                   | (14.57)       | 95.50                      | (5.79)        | −0.65                   |
| % Employed: agriculture     | 63.65                   | (26.21)       | 19.38                      | (23.16)       | 1.79                    |
| Village head college-educ.  | 0.15                    | (0.35)        | 0.77                       | (0.42)        | −1.61                   |
| Observations                | 61,467                  |               | 6,898                      |               |                         |

# Outline

- 1 Introduction
- 2 Context
- 3 Data
- 4 Identification Strategy**
- 5 Average Effects of Decentralization
- 6 Treatment-Effect Heterogeneity
- 7 Fiscal Effects of the Village Law
- 8 Discussion

# Identification Strategy: Difference in Differences (DiD)

Key assumption: *desa* and *kelurahan* with the same covariate values would have followed parallel paths in the absence of the Village Law

# Identification Strategy: Difference in Differences (DiD)

Key assumption: *desa* and *kelurahan* with the same covariate values would have followed parallel paths in the absence of the Village Law

1. Estimate probability of being *desa* as function of 38 geographic, demographic, and economic covariates (**propensity score**)
2. Keep subsample of villages with propensity score below a threshold (mostly drops *desa* that are very different from *kelurahan*) [► Details](#)
3. DiD flexibly controlling for covariates [► Details](#)

## Desa Majapahit, Southeast Sulawesi (p-score = 0.80)



Notes: SDN 1 Majapahit (primary school), Google Street View, October 2023.

## Kelurahan Mala Mala, Southeast Sulawesi (p-score = 0.77)



Notes: SDN 1 Mala Mala (primary school), Google Street View, October 2023.

# Subset of Village Characteristics (Trimmed Sample)

|                             | <i>Desa</i><br>mean | <i>Kelurahan</i> mean |                  | Standardized<br>difference |                  |
|-----------------------------|---------------------|-----------------------|------------------|----------------------------|------------------|
|                             | Raw<br>(1)          | Raw<br>(2)            | Rewighted<br>(3) | Raw<br>(4)                 | Rewighted<br>(5) |
| Urban                       | 0.59                | 0.85                  | 0.57             | −0.61                      | 0.03             |
| Population                  | 5,243.65            | 9,453.75              | 4,731.11         | −0.47                      | 0.09             |
| Land area (sq. km)          | 11.57               | 6.64                  | 13.90            | 0.16                       | −0.05            |
| Dist. to district cap. (km) | 20.08               | 10.31                 | 19.42            | 0.43                       | 0.03             |
| Ethnic fractionalization    | 0.25                | 0.42                  | 0.26             | −0.59                      | −0.01            |
| Ethnic polarization         | 0.33                | 0.46                  | 0.33             | −0.47                      | −0.01            |
| % Aged 15–64                | 65.06               | 67.35                 | 64.99            | −0.55                      | 0.02             |
| % Completed prim. school    | 87.67               | 91.68                 | 87.28            | −0.47                      | 0.04             |
| % Completed sec. school     | 38.08               | 50.77                 | 37.99            | −0.77                      | 0.01             |
| % Completed college         | 6.17                | 10.00                 | 6.15             | −0.66                      | 0.00             |
| % Literate                  | 93.93               | 96.08                 | 93.77            | −0.36                      | 0.02             |
| % Employed: agriculture     | 31.35               | 15.01                 | 32.84            | 0.74                       | −0.06            |
| Village head college-educ.  | 0.67                | 0.83                  | 0.67             | −0.38                      | −0.01            |
| Observations                | 5,050               | 6,075                 |                  |                            |                  |

# Subset of Village Characteristics (Trimmed Sample)

|                             | <i>Desa</i><br>mean | <i>Kelurahan</i> mean |                   | Standardized<br>difference |                   |
|-----------------------------|---------------------|-----------------------|-------------------|----------------------------|-------------------|
|                             | Raw<br>(1)          | Raw<br>(2)            | Reweighted<br>(3) | Raw<br>(4)                 | Reweighted<br>(5) |
| Urban                       | 0.59                | 0.85                  | 0.57              | -0.61                      | 0.03              |
| Population                  | 5,243.65            | 9,453.75              | 4,731.11          | -0.47                      | 0.09              |
| Land area (sq. km)          | 11.57               | 6.64                  | 13.90             | 0.16                       | -0.05             |
| Dist. to district cap. (km) | 20.08               | 10.31                 | 19.42             | 0.43                       | 0.03              |
| Ethnic fractionalization    | 0.25                | 0.42                  | 0.26              | -0.59                      | -0.01             |
| Ethnic polarization         | 0.33                | 0.46                  | 0.33              | -0.47                      | -0.01             |
| % Aged 15–64                | 65.06               | 67.35                 | 64.99             | -0.55                      | 0.02              |
| % Completed prim. school    | 87.67               | 91.68                 | 87.28             | -0.47                      | 0.04              |
| % Completed sec. school     | 38.08               | 50.77                 | 37.99             | -0.77                      | 0.01              |
| % Completed college         | 6.17                | 10.00                 | 6.15              | -0.66                      | 0.00              |
| % Literate                  | 93.93               | 96.08                 | 93.77             | -0.36                      | 0.02              |
| % Employed: agriculture     | 31.35               | 15.01                 | 32.84             | 0.74                       | -0.06             |
| Village head college-educ.  | 0.67                | 0.83                  | 0.67              | -0.38                      | -0.01             |
| Observations                | 5,050               | 6,075                 |                   |                            |                   |

# Subset of Village Characteristics (Trimmed Sample)

|                             | <i>Desa</i><br>mean | <i>Kelurahan</i> mean |                   | Standardized<br>difference |                   |
|-----------------------------|---------------------|-----------------------|-------------------|----------------------------|-------------------|
|                             | Raw<br>(1)          | Raw<br>(2)            | Reweighted<br>(3) | Raw<br>(4)                 | Reweighted<br>(5) |
| Urban                       | 0.59                | 0.85                  | 0.57              | -0.61                      | 0.03              |
| Population                  | 5,243.65            | 9,453.75              | 4,731.11          | -0.47                      | 0.09              |
| Land area (sq. km)          | 11.57               | 6.64                  | 13.90             | 0.16                       | -0.05             |
| Dist. to district cap. (km) | 20.08               | 10.31                 | 19.42             | 0.43                       | 0.03              |
| Ethnic fractionalization    | 0.25                | 0.42                  | 0.26              | -0.59                      | -0.01             |
| Ethnic polarization         | 0.33                | 0.46                  | 0.33              | -0.47                      | -0.01             |
| % Aged 15-64                | 65.06               | 67.35                 | 64.99             | -0.55                      | 0.02              |
| % Completed prim. school    | 87.67               | 91.68                 | 87.28             | -0.47                      | 0.04              |
| % Completed sec. school     | 38.08               | 50.77                 | 37.99             | -0.77                      | 0.01              |
| % Completed college         | 6.17                | 10.00                 | 6.15              | -0.66                      | 0.00              |
| % Literate                  | 93.93               | 96.08                 | 93.77             | -0.36                      | 0.02              |
| % Employed: agriculture     | 31.35               | 15.01                 | 32.84             | 0.74                       | -0.06             |
| Village head college-educ.  | 0.67                | 0.83                  | 0.67              | -0.38                      | -0.01             |
| Observations                | 5,050               | 6,075                 |                   |                            |                   |

# Subset of Village Characteristics (Trimmed Sample)

|                             | <i>Desa</i><br>mean | <i>Kelurahan</i> mean |                   | Standardized<br>difference |                   |
|-----------------------------|---------------------|-----------------------|-------------------|----------------------------|-------------------|
|                             | Raw<br>(1)          | Raw<br>(2)            | Reweighted<br>(3) | Raw<br>(4)                 | Reweighted<br>(5) |
| Urban                       | 0.59                | 0.85                  | 0.57              | -0.61                      | 0.03              |
| Population                  | 5,243.65            | 9,453.75              | 4,731.11          | -0.47                      | 0.09              |
| Land area (sq. km)          | 11.57               | 6.64                  | 13.90             | 0.16                       | -0.05             |
| Dist. to district cap. (km) | 20.08               | 10.31                 | 19.42             | 0.43                       | 0.03              |
| Ethnic fractionalization    | 0.25                | 0.42                  | 0.26              | -0.59                      | -0.01             |
| Ethnic polarization         | 0.33                | 0.46                  | 0.33              | -0.47                      | -0.01             |
| % Aged 15–64                | 65.06               | 67.35                 | 64.99             | -0.55                      | 0.02              |
| % Completed prim. school    | 87.67               | 91.68                 | 87.28             | -0.47                      | 0.04              |
| % Completed sec. school     | 38.08               | 50.77                 | 37.99             | -0.77                      | 0.01              |
| % Completed college         | 6.17                | 10.00                 | 6.15              | -0.66                      | 0.00              |
| % Literate                  | 93.93               | 96.08                 | 93.77             | -0.36                      | 0.02              |
| % Employed: agriculture     | 31.35               | 15.01                 | 32.84             | 0.74                       | -0.06             |
| Village head college-educ.  | 0.67                | 0.83                  | 0.67              | -0.38                      | -0.01             |
| Observations                | 5,050               | 6,075                 |                   |                            |                   |

# Subset of Village Characteristics (Trimmed Sample)

|                             | <i>Desa</i><br>mean | <i>Kelurahan</i> mean |                   | Standardized<br>difference |                   |
|-----------------------------|---------------------|-----------------------|-------------------|----------------------------|-------------------|
|                             | Raw<br>(1)          | Raw<br>(2)            | Reweighted<br>(3) | Raw<br>(4)                 | Reweighted<br>(5) |
| Urban                       | 0.59                | 0.85                  | 0.57              | -0.61                      | 0.03              |
| Population                  | 5,243.65            | 9,453.75              | 4,731.11          | -0.47                      | 0.09              |
| Land area (sq. km)          | 11.57               | 6.64                  | 13.90             | 0.16                       | -0.05             |
| Dist. to district cap. (km) | 20.08               | 10.31                 | 19.42             | 0.43                       | 0.03              |
| Ethnic fractionalization    | 0.25                | 0.42                  | 0.26              | -0.59                      | -0.01             |
| Ethnic polarization         | 0.33                | 0.46                  | 0.33              | -0.47                      | -0.01             |
| % Aged 15-64                | 65.06               | 67.35                 | 64.99             | -0.55                      | 0.02              |
| % Completed prim. school    | 87.67               | 91.68                 | 87.28             | -0.47                      | 0.04              |
| % Completed sec. school     | 38.08               | 50.77                 | 37.99             | -0.77                      | 0.01              |
| % Completed college         | 6.17                | 10.00                 | 6.15              | -0.66                      | 0.00              |
| % Literate                  | 93.93               | 96.08                 | 93.77             | -0.36                      | 0.02              |
| % Employed: agriculture     | 31.35               | 15.01                 | 32.84             | 0.74                       | -0.06             |
| Village head college-educ.  | 0.67                | 0.83                  | 0.67              | -0.38                      | -0.01             |
| Observations                | 5,050               | 6,075                 |                   |                            |                   |

# Subset of Village Characteristics (Trimmed Sample)

|                             | <i>Desa</i><br>mean | <i>Kelurahan</i> mean |                  | Standardized<br>difference |                  |
|-----------------------------|---------------------|-----------------------|------------------|----------------------------|------------------|
|                             | Raw<br>(1)          | Raw<br>(2)            | Rewighted<br>(3) | Raw<br>(4)                 | Rewighted<br>(5) |
| Urban                       | 0.59                | 0.85                  | 0.57             | -0.61                      | 0.03             |
| Population                  | 5,243.65            | 9,453.75              | 4,731.11         | -0.47                      | 0.09             |
| Land area (sq. km)          | 11.57               | 6.64                  | 13.90            | 0.16                       | -0.05            |
| Dist. to district cap. (km) | 20.08               | 10.31                 | 19.42            | 0.43                       | 0.03             |
| Ethnic fractionalization    | 0.25                | 0.42                  | 0.26             | -0.59                      | -0.01            |
| Ethnic polarization         | 0.33                | 0.46                  | 0.33             | -0.47                      | -0.01            |
| % Aged 15–64                | 65.06               | 67.35                 | 64.99            | -0.55                      | 0.02             |
| % Completed prim. school    | 87.67               | 91.68                 | 87.28            | -0.47                      | 0.04             |
| % Completed sec. school     | 38.08               | 50.77                 | 37.99            | -0.77                      | 0.01             |
| % Completed college         | 6.17                | 10.00                 | 6.15             | -0.66                      | 0.00             |
| % Literate                  | 93.93               | 96.08                 | 93.77            | -0.36                      | 0.02             |
| % Employed: agriculture     | 31.35               | 15.01                 | 32.84            | 0.74                       | -0.06            |
| Village head college-educ.  | 0.67                | 0.83                  | 0.67             | -0.38                      | -0.01            |
| Observations                | 5,050               | 6,075                 |                  |                            |                  |

# Subset of Village Characteristics (Trimmed Sample)

|                             | <i>Desa</i><br>mean | <i>Kelurahan</i> mean |                   | Standardized<br>difference |                   |
|-----------------------------|---------------------|-----------------------|-------------------|----------------------------|-------------------|
|                             | Raw<br>(1)          | Raw<br>(2)            | Reweighted<br>(3) | Raw<br>(4)                 | Reweighted<br>(5) |
| Urban                       | 0.59                | 0.85                  | 0.57              | -0.61                      | 0.03              |
| Population                  | 5,243.65            | 9,453.75              | 4,731.11          | -0.47                      | 0.09              |
| Land area (sq. km)          | 11.57               | 6.64                  | 13.90             | 0.16                       | -0.05             |
| Dist. to district cap. (km) | 20.08               | 10.31                 | 19.42             | 0.43                       | 0.03              |
| Ethnic fractionalization    | 0.25                | 0.42                  | 0.26              | -0.59                      | -0.01             |
| Ethnic polarization         | 0.33                | 0.46                  | 0.33              | -0.47                      | -0.01             |
| % Aged 15-64                | 65.06               | 67.35                 | 64.99             | -0.55                      | 0.02              |
| % Completed prim. school    | 87.67               | 91.68                 | 87.28             | -0.47                      | 0.04              |
| % Completed sec. school     | 38.08               | 50.77                 | 37.99             | -0.77                      | 0.01              |
| % Completed college         | 6.17                | 10.00                 | 6.15              | -0.66                      | 0.00              |
| % Literate                  | 93.93               | 96.08                 | 93.77             | -0.36                      | 0.02              |
| % Employed: agriculture     | 31.35               | 15.01                 | 32.84             | 0.74                       | -0.06             |
| Village head college-educ.  | 0.67                | 0.83                  | 0.67              | -0.38                      | -0.01             |
| Observations                | 5,050               | 6,075                 |                   |                            |                   |

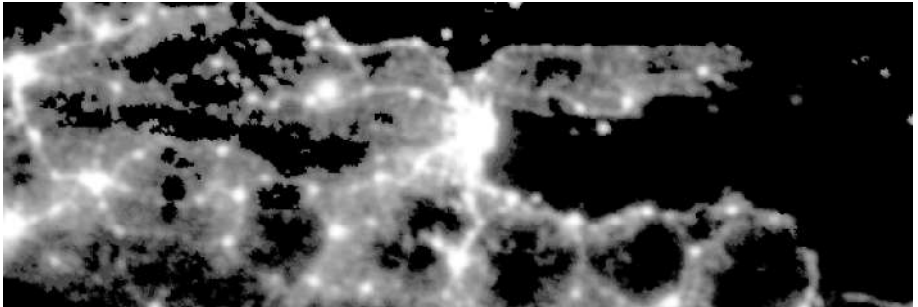
# Subset of Village Characteristics (Trimmed Sample)

|                             | <i>Desa</i><br>mean | <i>Kelurahan</i> mean |                   | Standardized<br>difference |                   |
|-----------------------------|---------------------|-----------------------|-------------------|----------------------------|-------------------|
|                             | Raw<br>(1)          | Raw<br>(2)            | Reweighted<br>(3) | Raw<br>(4)                 | Reweighted<br>(5) |
| Urban                       | 0.59                | 0.85                  | 0.57              | -0.61                      | 0.03              |
| Population                  | 5,243.65            | 9,453.75              | 4,731.11          | -0.47                      | 0.09              |
| Land area (sq. km)          | 11.57               | 6.64                  | 13.90             | 0.16                       | -0.05             |
| Dist. to district cap. (km) | 20.08               | 10.31                 | 19.42             | 0.43                       | 0.03              |
| Ethnic fractionalization    | 0.25                | 0.42                  | 0.26              | -0.59                      | -0.01             |
| Ethnic polarization         | 0.33                | 0.46                  | 0.33              | -0.47                      | -0.01             |
| % Aged 15-64                | 65.06               | 67.35                 | 64.99             | -0.55                      | 0.02              |
| % Completed prim. school    | 87.67               | 91.68                 | 87.28             | -0.47                      | 0.04              |
| % Completed sec. school     | 38.08               | 50.77                 | 37.99             | -0.77                      | 0.01              |
| % Completed college         | 6.17                | 10.00                 | 6.15              | -0.66                      | 0.00              |
| % Literate                  | 93.93               | 96.08                 | 93.77             | -0.36                      | 0.02              |
| % Employed: agriculture     | 31.35               | 15.01                 | 32.84             | 0.74                       | -0.06             |
| Village head college-educ.  | 0.67                | 0.83                  | 0.67              | -0.38                      | -0.01             |
| Observations                | 5,050               | 6,075                 |                   |                            |                   |

# Outline

- 1 Introduction
- 2 Context
- 3 Data
- 4 Identification Strategy
- 5 Average Effects of Decentralization**
- 6 Treatment-Effect Heterogeneity
- 7 Fiscal Effects of the Village Law
- 8 Discussion

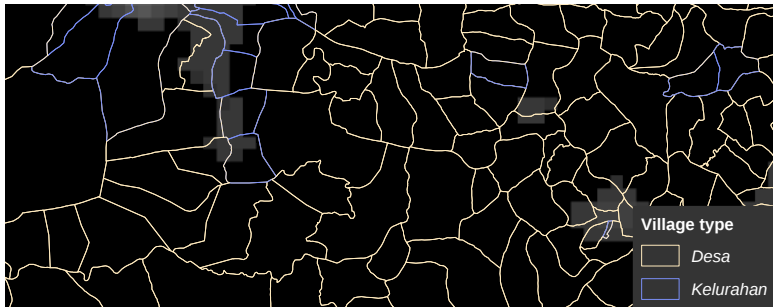
DMSP lights in 2012



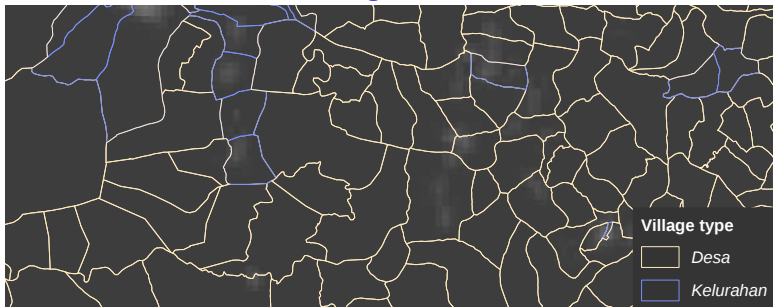
VIIRS lights in 2012



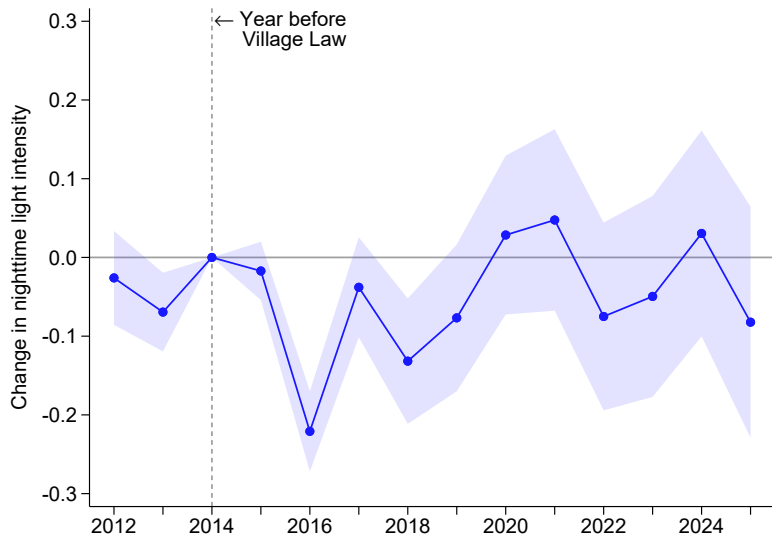
DMSP lights in 2012



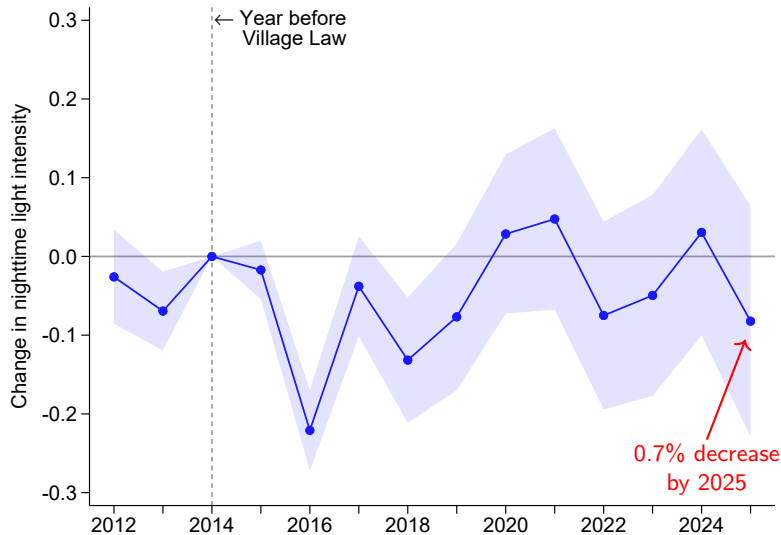
VIIRS lights in 2012



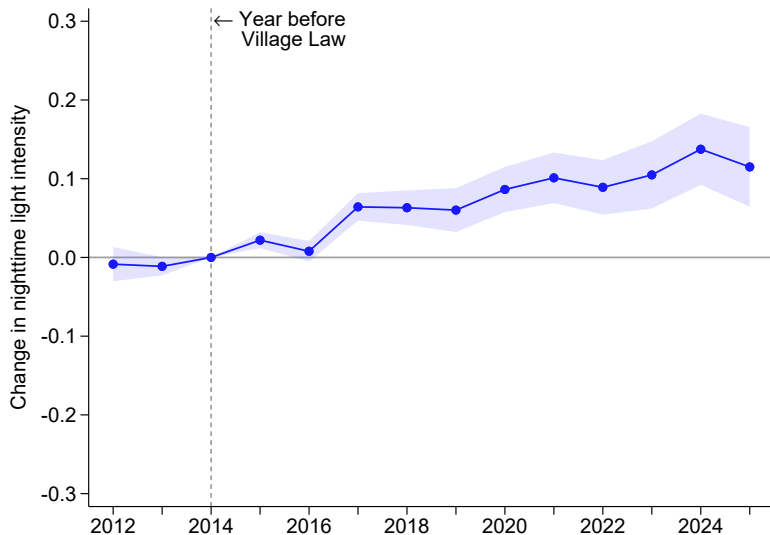
# Decentralization and Nighttime Lights: **Urban Villages**



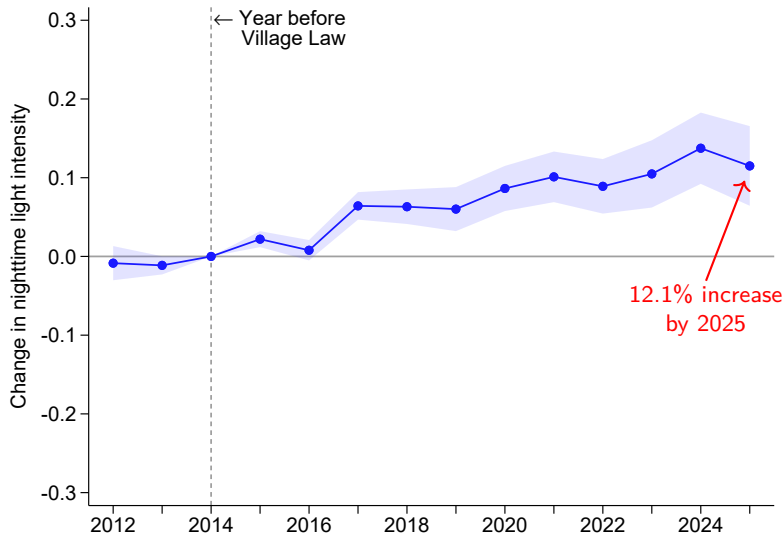
# Decentralization and Nighttime Lights: **Urban Villages**



# Decentralization and Nighttime Lights: Rural Villages



# Decentralization and Nighttime Lights: Rural Villages



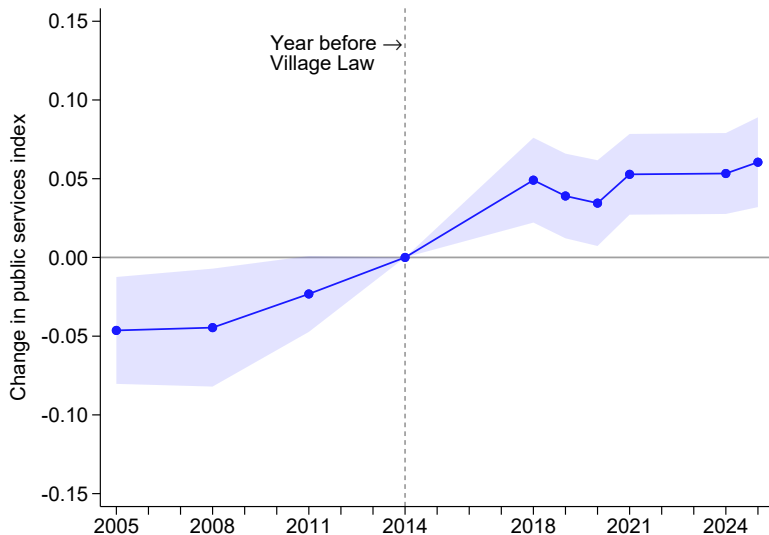
# Village Public Service Delivery (*PODES*)

## Public services over which villages have authority or influence:

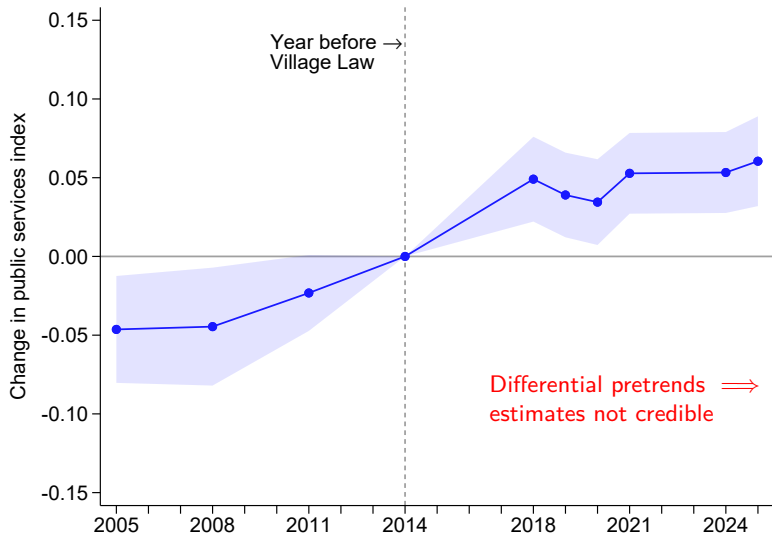
1. Paved main road
2. Paved farm road
3. Street lighting
4. Irrigation canal
5. Preschool (*pos pendidikan anak usia dini*)
6. Library (*taman bacaan masyarakat*)
7. Integrated health posts (*posyandu*)
8. Village haterernity/health posts (*polindes/poskesdes*)

⇒ **Combine into a standardized index**

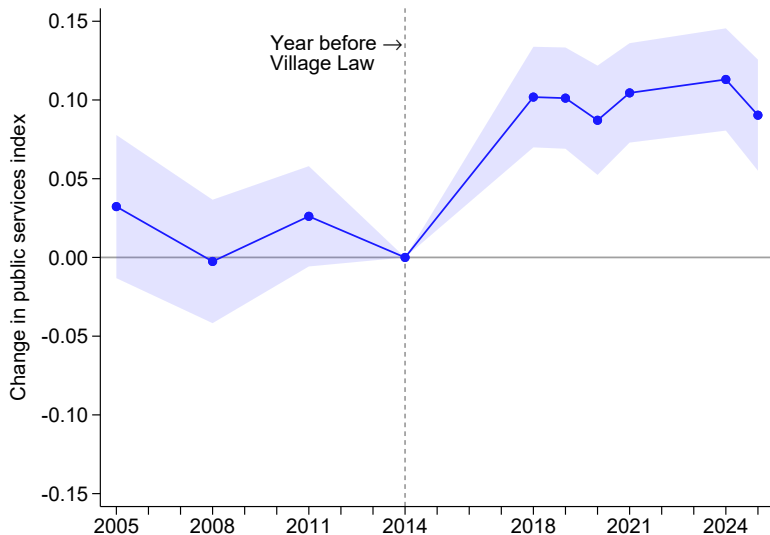
# Decentralization and Public Services: **Urban Villages**



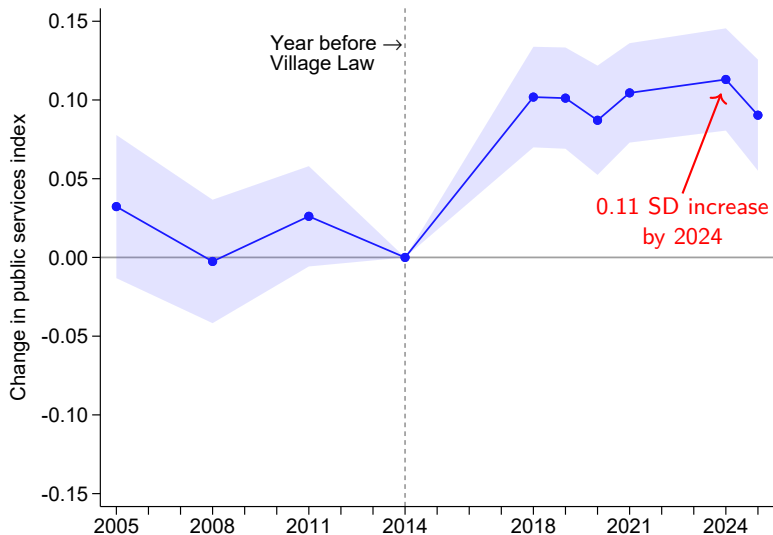
# Decentralization and Public Services: **Urban Villages**



# Decentralization and Public Services: **Rural Villages**



# Decentralization and Public Services: Rural Villages



# Outline

- 1 Introduction
- 2 Context
- 3 Data
- 4 Identification Strategy
- 5 Average Effects of Decentralization
- 6 Treatment-Effect Heterogeneity**
- 7 Fiscal Effects of the Village Law
- 8 Discussion

# Treatment-Effect Heterogeneity: Summary

Use machine learning to examine how treatment effects depend on covariates

Effect of decentralization on lights in rural villages is ...

- ▶ ↑ in **village head education**
- ▶ ↓ in **land area, ethnic fractionalization** (probability 2 randomly chosen individuals have different ethnicity)

Effect of decentralization on public services in rural villages is ...

- ▶ ↑ in **distance to district capital, village head education** (small)
- ▶ ↓ in **ethnic fractionalization**

No evidence that treatment effects increase with villager education

# Outline

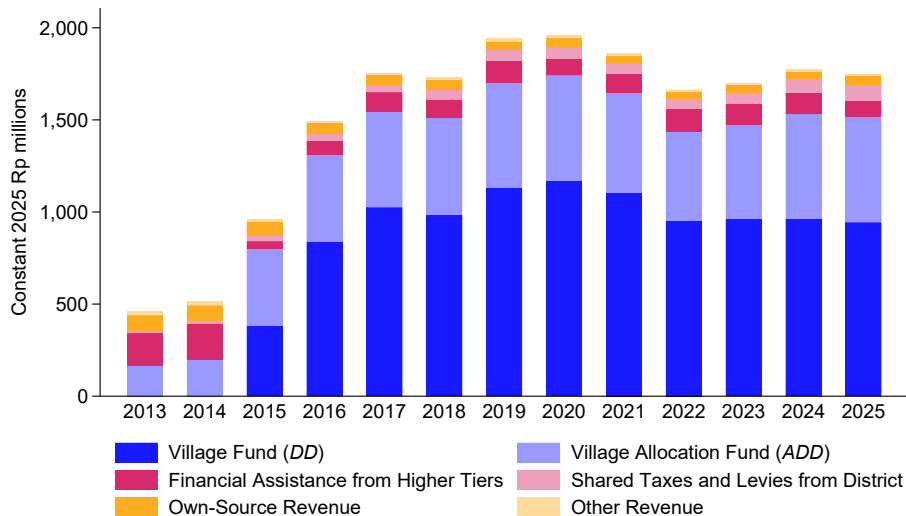
- 1 Introduction
- 2 Context
- 3 Data
- 4 Identification Strategy
- 5 Average Effects of Decentralization
- 6 Treatment-Effect Heterogeneity
- 7 Fiscal Effects of the Village Law**
- 8 Discussion

- ▶ Village Law could affect *desa* through **expanded autonomy** or **increased fiscal resources**

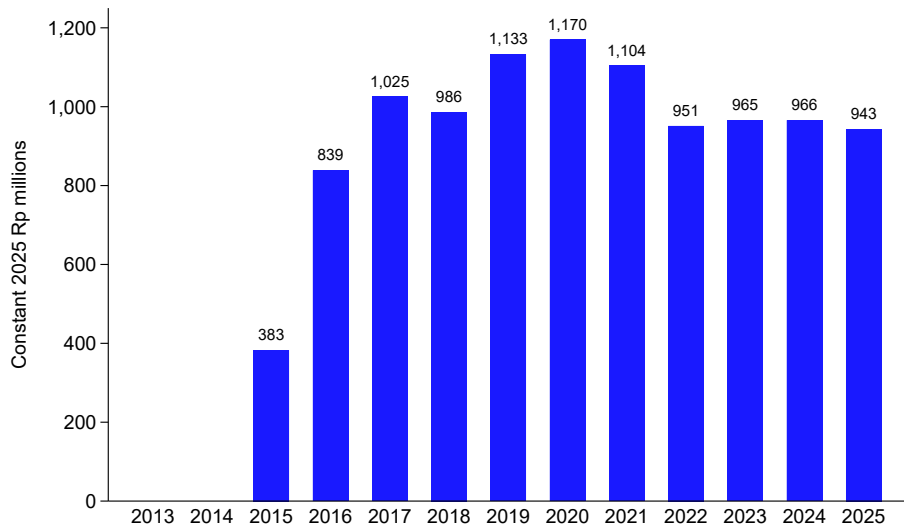
# Fiscal Effects of the Village Law

- ▶ Village Law could affect *desa* through **expanded autonomy** or **increased fiscal resources**
- ▶ Separating these effects is important from a policy perspective

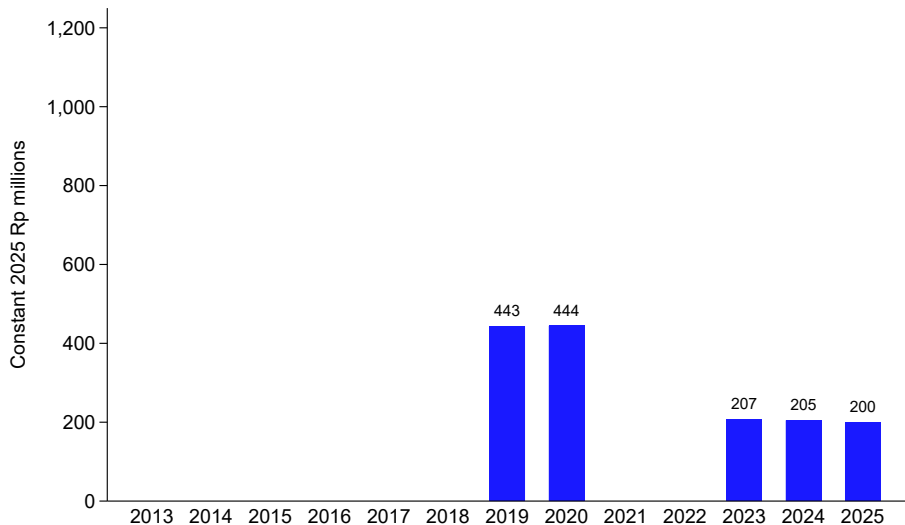
# Revenues per *Desa*, 2013–2025



# Village Funds per *Desa*, 2013–2025



# Ward Funds per *Kelurahan*, 2013–2025



## Village Fund $\approx$ Basic Allocation + Formula Allocation

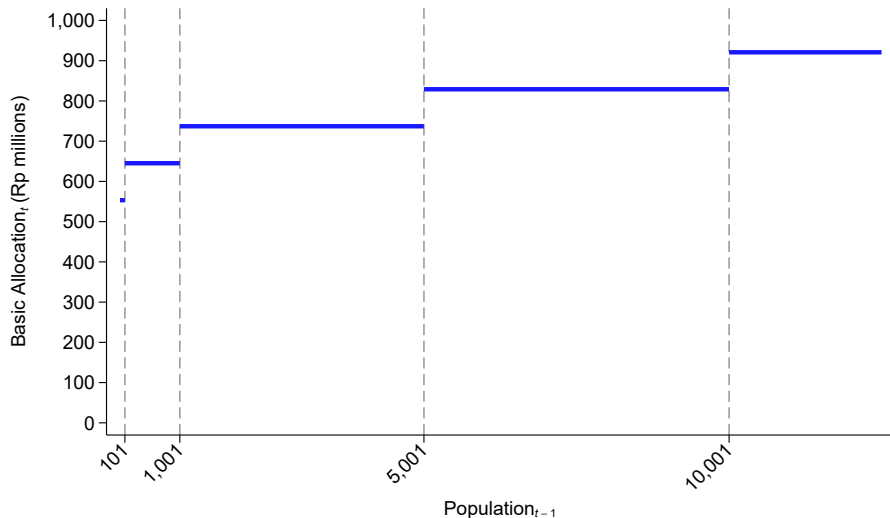
- ▶ **2015–2020:** BA is a fixed amount (90%  $\rightarrow$  69% of VF)
- ▶ **2021–present:** BA is a **discontinuous** function of population (65%)

**Village Fund  $\approx$  Basic Allocation + Formula Allocation**

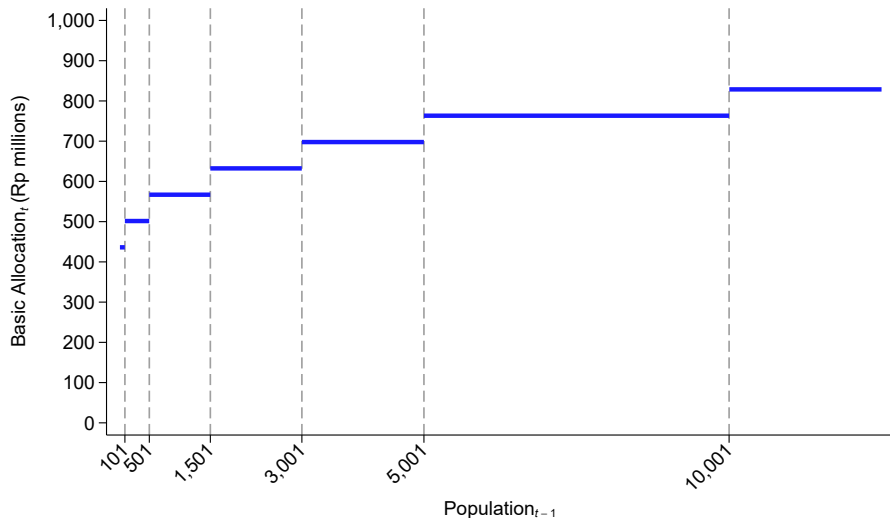
- ▶ **2015–2020:** BA is a fixed amount (90%  $\rightarrow$  69% of VF)
- ▶ **2021–present:** BA is a **discontinuous** function of population (65%)

**$\Rightarrow$  Estimate fiscal effects using regression discontinuity (RD) design**

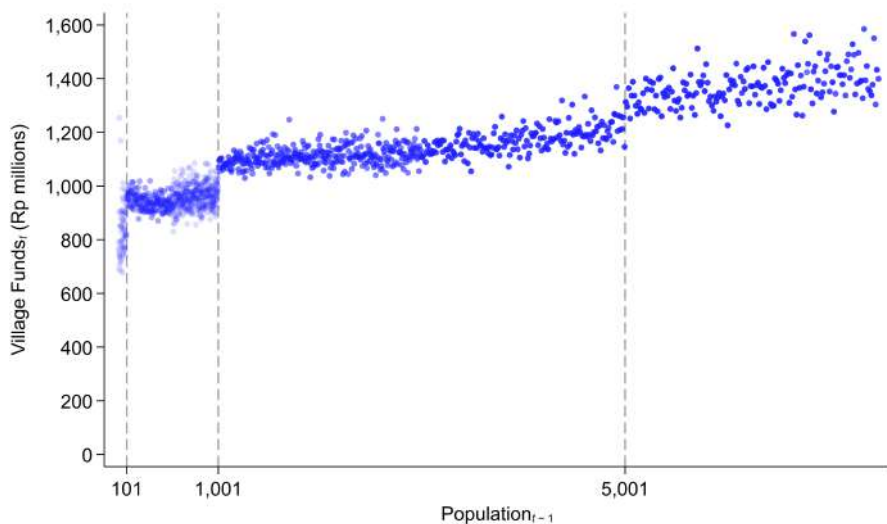
# Village Fund Basic Allocation, 2021



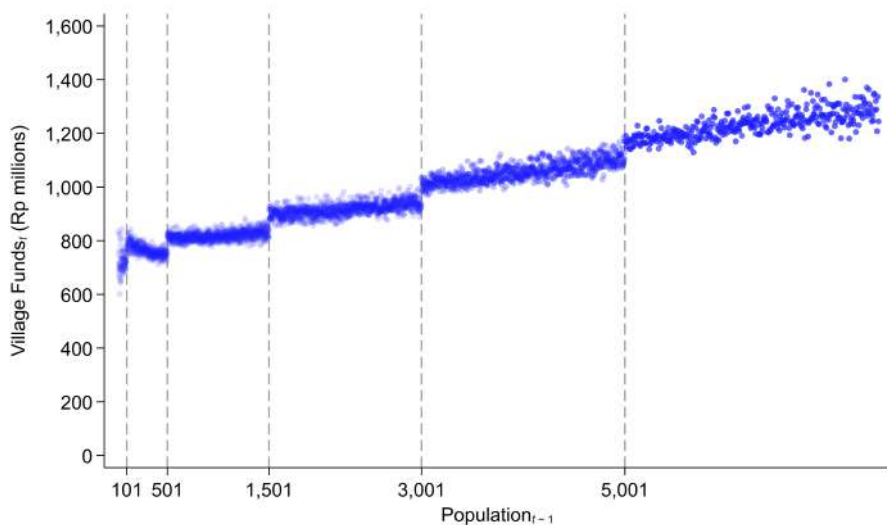
# Village Fund Basic Allocation, 2022



# Total Village Funds, 2021 (Excluding Last Threshold)



# Total Village Funds, 2022–2025 (Excluding Last Threshold)



# RD Estimates: Fiscal Outcomes

|                | Min. of Fin.,<br>2021–25 | SISKEUDES, 2023–25 |                                |                             |                                   |                   |
|----------------|--------------------------|--------------------|--------------------------------|-----------------------------|-----------------------------------|-------------------|
|                | Village<br>Funds         | Village<br>Funds   | Village<br>Allocation<br>Funds | Shared<br>taxes &<br>levies | Develop. &<br>empower.<br>expend. | Admin.<br>expend. |
| RD estimate    | 71.3                     | 49.2               | 19.5                           | −1.6                        | 49.3                              | 4.7               |
| Robust 95% CI  | [64.6, 80.0]             | [39.2, 59.9]       | [4.1, 40.9]                    | [−4.2, 2.3]                 | [31.0, 74.7]                      | [−8.8, 21.1]      |
| Bandwidth      | 196.1                    | 252.0              | 293.6                          | 358.1                       | 268.9                             | 293.1             |
| Effective obs. | 129,811                  | 71,268             | 79,886                         | 79,195                      | 66,398                            | 70,666            |

# RD Estimates: Fiscal Outcomes

|                | Min. of Fin.,<br>2021–25 | SISKEUDES, 2023–25 |                                |                             |                                   |                   |
|----------------|--------------------------|--------------------|--------------------------------|-----------------------------|-----------------------------------|-------------------|
|                | Village<br>Funds         | Village<br>Funds   | Village<br>Allocation<br>Funds | Shared<br>taxes &<br>levies | Develop. &<br>empower.<br>expend. | Admin.<br>expend. |
| RD estimate    | 71.3                     | 49.2               | 19.5                           | −1.6                        | 49.3                              | 4.7               |
| Robust 95% CI  | [64.6, 80.0]             | [39.2, 59.9]       | [4.1, 40.9]                    | [−4.2, 2.3]                 | [31.0, 74.7]                      | [−8.8, 21.1]      |
| Bandwidth      | 196.1                    | 252.0              | 293.6                          | 358.1                       | 268.9                             | 293.1             |
| Effective obs. | 129,811                  | 71,268             | 79,886                         | 79,195                      | 66,398                            | 70,666            |

Village Funds (2021–25) ↑ by Rp 71m (7.3%) on avg. at pop. threshold

# RD Estimates: Fiscal Outcomes

|                | Min. of Fin.,<br>2021–25 | SISKEUDES, 2023–25 |                                |                             |                                   |                   |
|----------------|--------------------------|--------------------|--------------------------------|-----------------------------|-----------------------------------|-------------------|
|                | Village<br>Funds         | Village<br>Funds   | Village<br>Allocation<br>Funds | Shared<br>taxes &<br>levies | Develop. &<br>empower.<br>expend. | Admin.<br>expend. |
| RD estimate    | 71.3                     | 49.2               | 19.5                           | −1.6                        | 49.3                              | 4.7               |
| Robust 95% CI  | [64.6, 80.0]             | [39.2, 59.9]       | [4.1, 40.9]                    | [−4.2, 2.3]                 | [31.0, 74.7]                      | [−8.8, 21.1]      |
| Bandwidth      | 196.1                    | 252.0              | 293.6                          | 358.1                       | 268.9                             | 293.1             |
| Effective obs. | 129,811                  | 71,268             | 79,886                         | 79,195                      | 66,398                            | 70,666            |

Village Funds (2021–25) ↑ by Rp 71m (7.3%) on avg. at pop. threshold

Reported VF and development & empowerment expenditure (2023–25)  
both ↑ by Rp 49m (5.7%)

# RD Estimates: Luminosity and Public Services

|                | Nighttime luminosity |                        |                        | Public services index  |
|----------------|----------------------|------------------------|------------------------|------------------------|
|                | $\Delta_{(t-1),t}$   | $\Delta_{(t-1),(t+1)}$ | $\Delta_{(t-1),(t+3)}$ | $\Delta_{(t-1),(t+3)}$ |
| RD estimate    | -0.001               | -0.004                 | 0.006                  | 0.009                  |
| Robust 95% CI  | $[-0.010, 0.007]$    | $[-0.020, 0.010]$      | $[-0.020, 0.039]$      | $[-0.005, 0.021]$      |
| Bandwidth      | 216.4                | 217.5                  | 192.8                  | 308.1                  |
| Effective obs. | 139,198              | 109,591                | 43,678                 | 64,378                 |

# RD Estimates: Luminosity and Public Services

|                | Nighttime luminosity |                        |                        | Public services index  |
|----------------|----------------------|------------------------|------------------------|------------------------|
|                | $\Delta_{(t-1),t}$   | $\Delta_{(t-1),(t+1)}$ | $\Delta_{(t-1),(t+3)}$ | $\Delta_{(t-1),(t+3)}$ |
| RD estimate    | -0.001               | -0.004                 | 0.006                  | 0.009                  |
| Robust 95% CI  | $[-0.010, 0.007]$    | $[-0.020, 0.010]$      | $[-0.020, 0.039]$      | $[-0.005, 0.021]$      |
| Bandwidth      | 216.4                | 217.5                  | 192.8                  | 308.1                  |
| Effective obs. | 139,198              | 109,591                | 43,678                 | 64,378                 |

Little change in luminosity 3 years later; reject effects  $\geq 0.039$   
(3-year impact of decentralization is 0.067 for rural villages)

# RD Estimates: Luminosity and Public Services

|                | Nighttime luminosity |                        |                        | Public services index  |
|----------------|----------------------|------------------------|------------------------|------------------------|
|                | $\Delta_{(t-1),t}$   | $\Delta_{(t-1),(t+1)}$ | $\Delta_{(t-1),(t+3)}$ | $\Delta_{(t-1),(t+3)}$ |
| RD estimate    | -0.001               | -0.004                 | 0.006                  | 0.009                  |
| Robust 95% CI  | $[-0.010, 0.007]$    | $[-0.020, 0.010]$      | $[-0.020, 0.039]$      | $[-0.005, 0.021]$      |
| Bandwidth      | 216.4                | 217.5                  | 192.8                  | 308.1                  |
| Effective obs. | 139,198              | 109,591                | 43,678                 | 64,378                 |

Little change in luminosity 3 years later; reject effects  $\geq 0.039$   
(3-year impact of decentralization is 0.067 for rural villages)

Little change in public services 3 years later; reject effects  $\geq 0.021$  SD  
(3-year impact of decentralization is 0.102 SD for rural villages)

# Outline

- 1 Introduction
- 2 Context
- 3 Data
- 4 Identification Strategy
- 5 Average Effects of Decentralization
- 6 Treatment-Effect Heterogeneity
- 7 Fiscal Effects of the Village Law
- 8 Discussion**

**Decentralization  $\Rightarrow$   $\uparrow$  luminosity, public services in rural villages**

- ▶ 12% increase in lights, 0.1 SD increase in services
- ▶ Benefits  $\uparrow$  in village head education,  $\downarrow$  in ethnic fractionalization
- ▶ Effects do not vary much with villager education

## Decentralization $\Rightarrow$ $\uparrow$ luminosity, public services in rural villages

- ▶ 12% increase in lights, 0.1 SD increase in services
- ▶ Benefits  $\uparrow$  in village head education,  $\downarrow$  in ethnic fractionalization
- ▶ Effects do not vary much with villager education

## Decentralization has unclear impacts in urban villages

- ▶ Insignificant effect on lights, differential pretrends in public services

# Results Summary

## Decentralization $\Rightarrow$ $\uparrow$ luminosity, public services in rural villages

- ▶ 12% increase in lights, 0.1 SD increase in services
- ▶ Benefits  $\uparrow$  in village head education,  $\downarrow$  in ethnic fractionalization
- ▶ Effects do not vary much with villager education

## Decentralization has unclear impacts in urban villages

- ▶ Insignificant effect on lights, differential pretrends in public services

**Marginal increase in Village Fund has statistically insignificant effects on lights and services, but statistical uncertainty is large enough that moderate effects are possible**

What is the net change in total public spending (central + district + village) in *desa* vs. *kelurahan*?

► **Institutional details?**

- Village Fund financed by cut in fuel subsidy and increased taxes
- Village Allocation Fund mechanically crowds out district spending
- *Kelurahan* received *Dana Kelurahan* during 2019–20 and 2023–present
- What else?

► **Data on central & district expenditure at village level? Proxies?**

What other outcomes should we examine?

- Plan to use MODIS data to measure changes in agricultural output

# Appendix

# Optimal Sample Trimming

Let  $p(\cdot)$  denote the propensity score. Under some assumptions, the variance-minimizing subsample is

$$\mathbb{A} = \{x \in \mathbb{X} : p(x) \leq \gamma\}$$

for a particular choice of  $\gamma$  (Crump et al., 2006).

- ▶ **Full sample:**  $\gamma = 0.88 \implies 5,050 \text{ desa}, 6,075 \text{ kelurahan}$
- ▶ **Urban sample:**  $\gamma = 0.83 \implies 2,285 \text{ desa}, 5,062 \text{ kelurahan}$
- ▶ **Rural sample:**  $\gamma = 0.95 \implies 5,242 \text{ desa}, 1,217 \text{ kelurahan}$

▶ Go back

# Doubly Robust Estimator

Let  $D_i = 1$  if village  $i$  is a *desa*, and define  $\Delta_t Y_i \equiv Y_{i,t} - Y_{i,2014}$ .

$$\widehat{\text{ATT}}_{\mathbb{A},t} = \frac{1}{N_{\mathbb{A}}} \sum_{i: X_i \in \mathbb{A}} \hat{\omega}_i \cdot (\Delta_t Y_i - \hat{\mu}_{0,t}(X_i)).$$

where

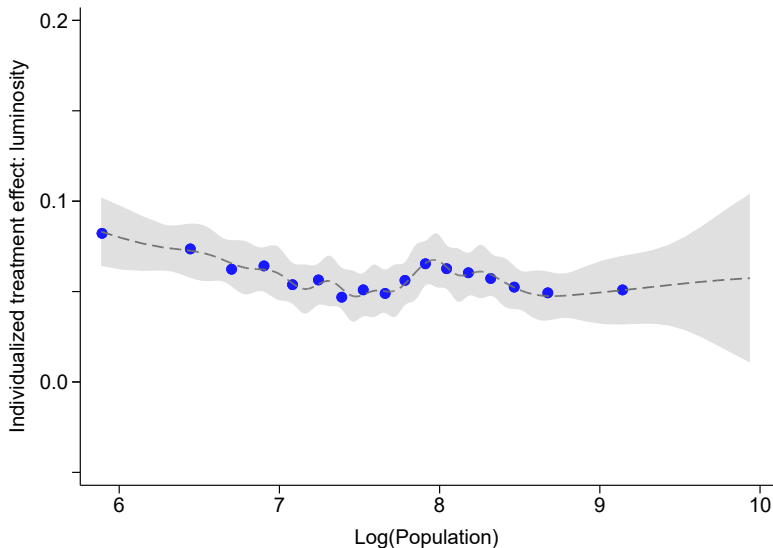
$$\hat{\omega}_i = \frac{1}{D_{\mathbb{A}}} \cdot \left( D_i - (1 - D_i) \cdot \frac{\hat{p}(X_i)}{1 - \hat{p}(X_i)} \right),$$

$$\hat{\mu}_{0,t}(X_i) = \hat{E}(\Delta_t Y_i \mid D_i = 0, X_i).$$

We use Lasso to select  $\hat{p}(\cdot)$  and  $\hat{\mu}_{0,t}(\cdot)$ , and we use normalized propensity score weights.

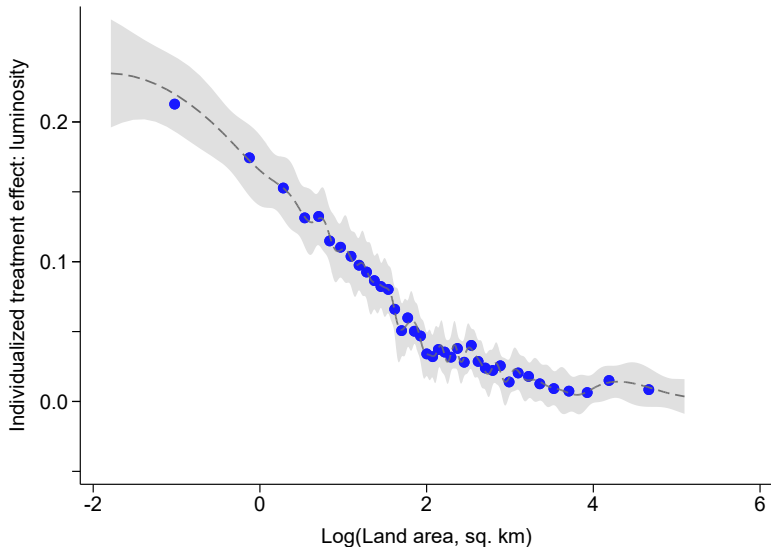
► Go back

# Lights TE Heterogeneity: **Population**



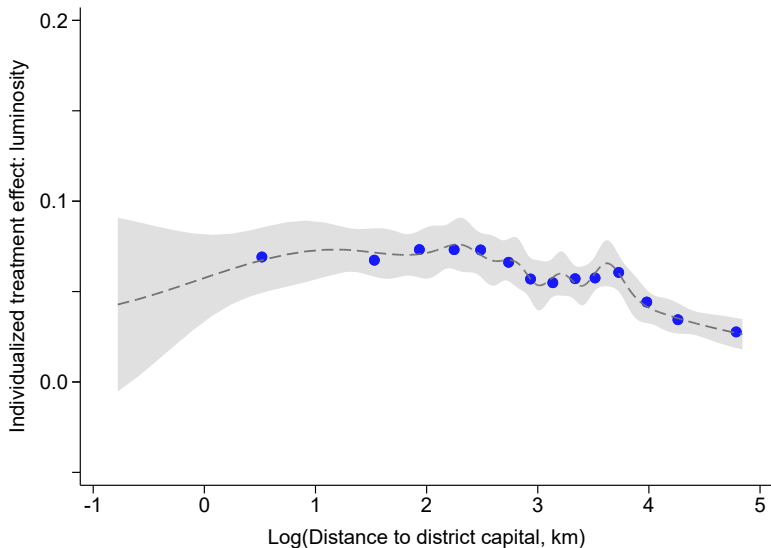
► Go back

# Lights TE Heterogeneity: **Land Area**



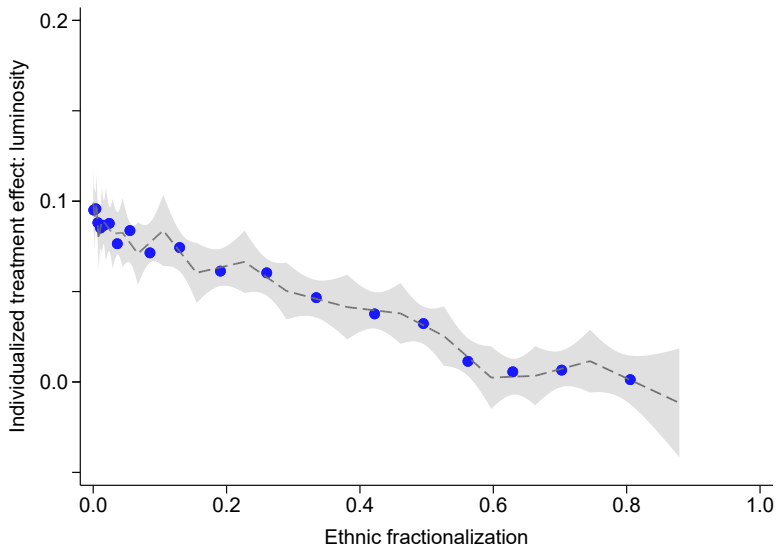
► [Go back](#)

# Lights TE Heterogeneity: Distance to District Capital



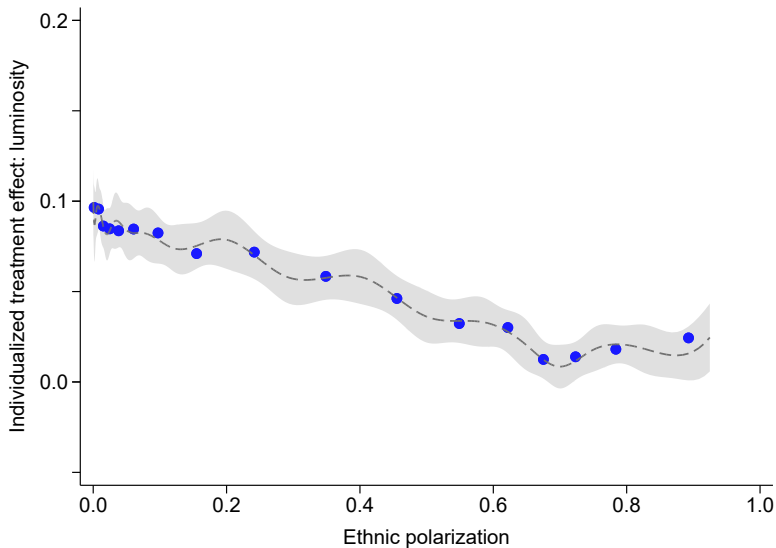
► Go back

# Lights TE Heterogeneity: **Ethnic Fractionalization**



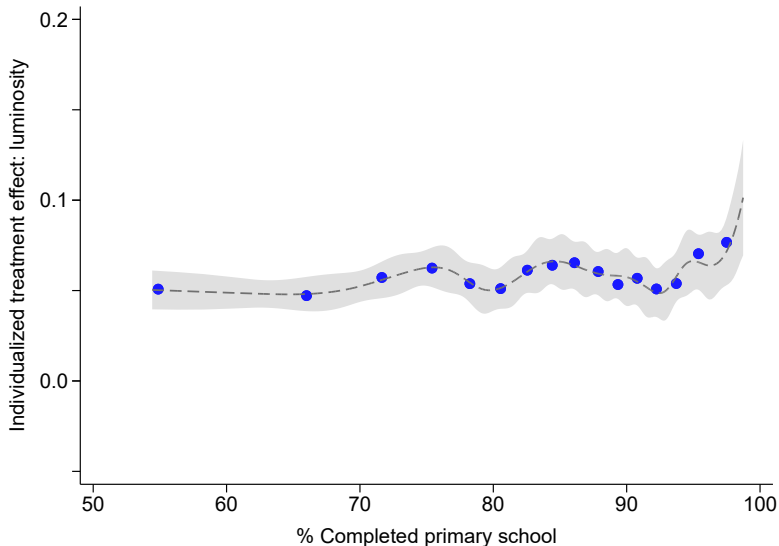
[► Go back](#)

# Lights TE Heterogeneity: **Ethnic Polarization**



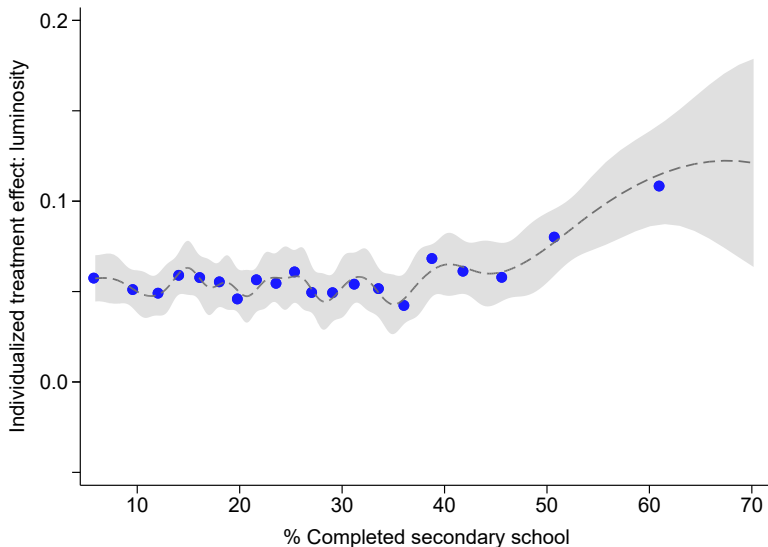
► Go back

# Lights TE Heterogeneity: **Primary Education**



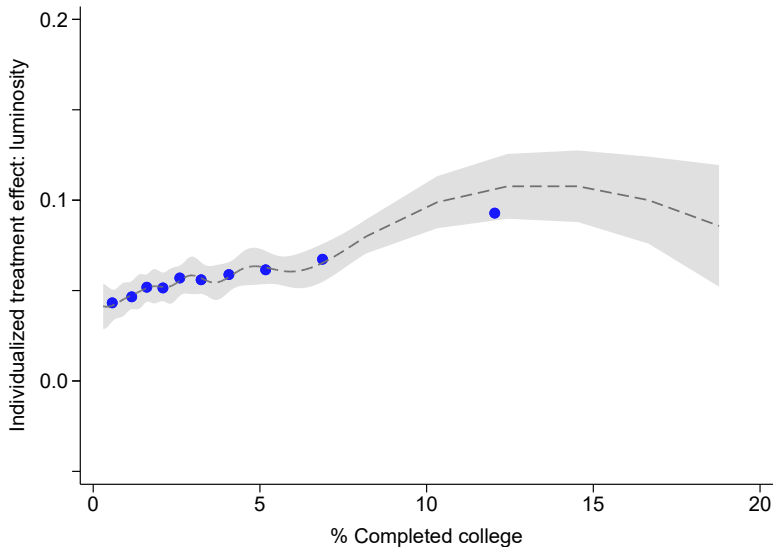
[▶ Go back](#)

# Lights TE Heterogeneity: **Secondary Education**



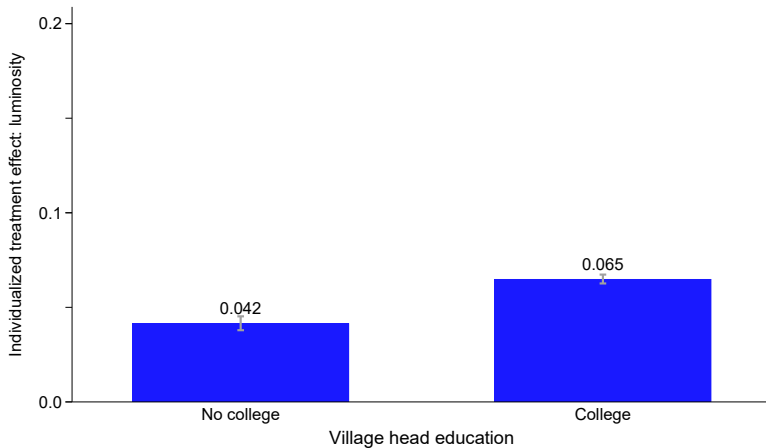
[► Go back](#)

# Lights TE Heterogeneity: College Education



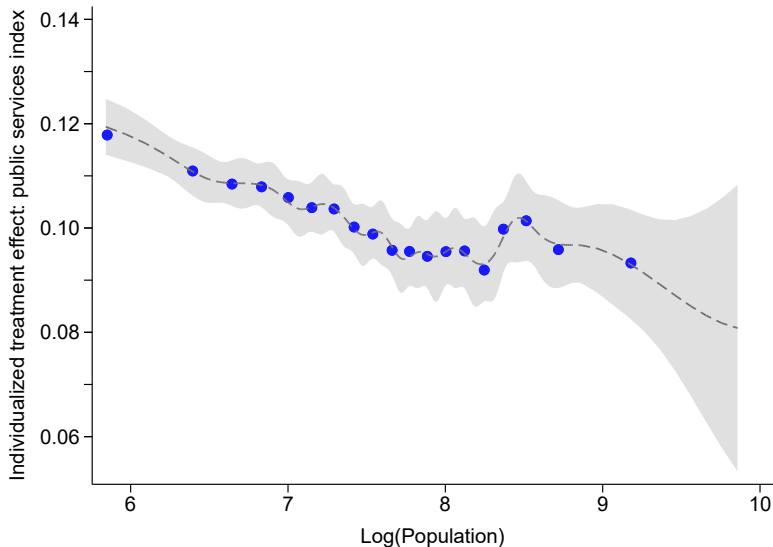
► Go back

# Lights TE Heterogeneity: **Village Head Education**



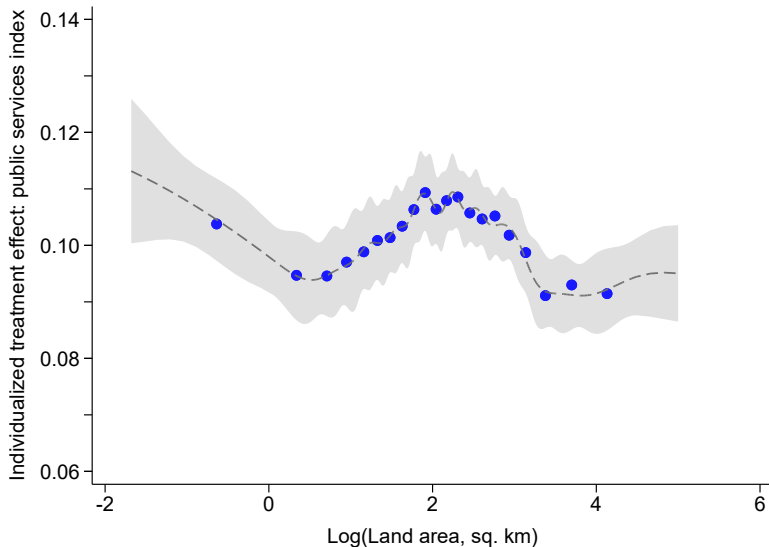
► Go back

# Public Services TE Heterogeneity: **Population**



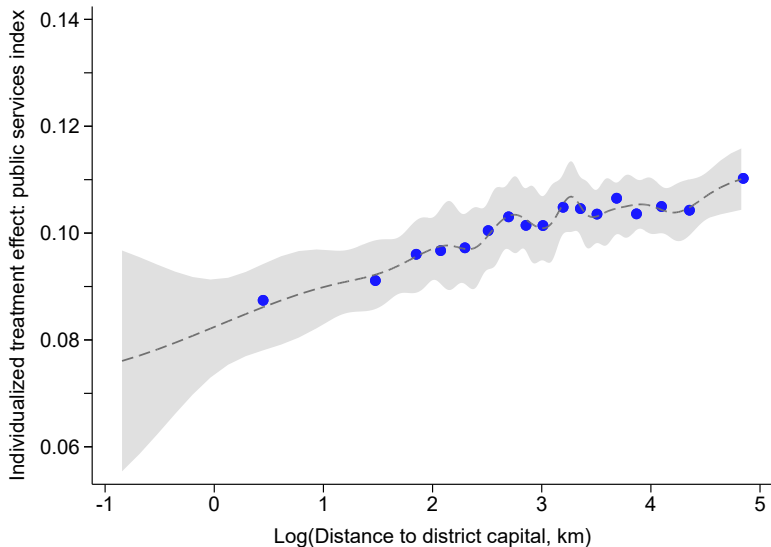
► Go back

# Public Services TE Heterogeneity: **Land Area**



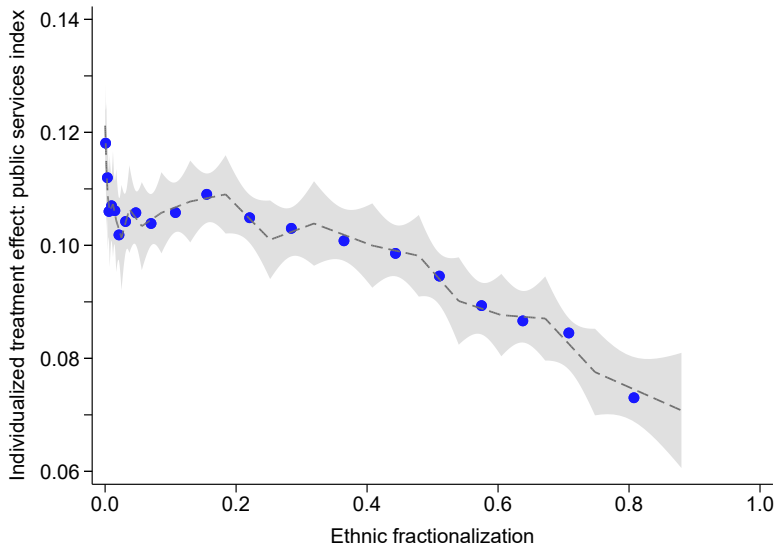
► Go back

# Pub. Services TE Heterogeneity: **Dist. to District Capital**



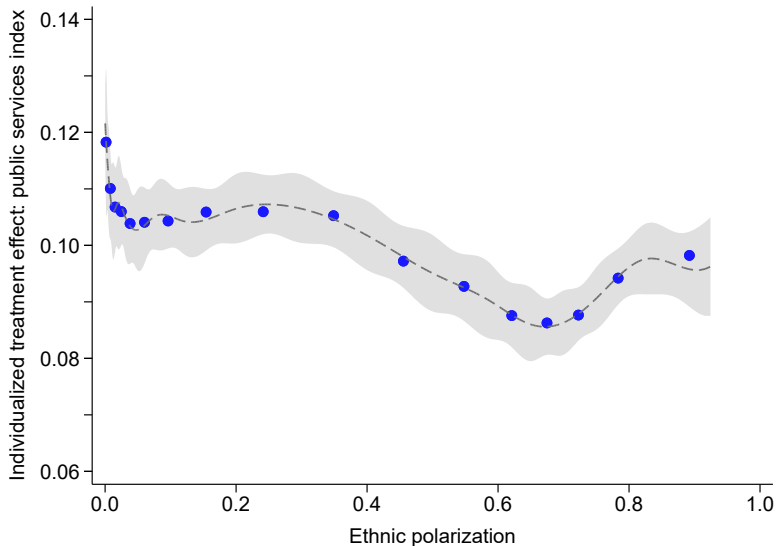
► Go back

# Pub. Services TE Heterogeneity: **Ethnic Fractionalization**



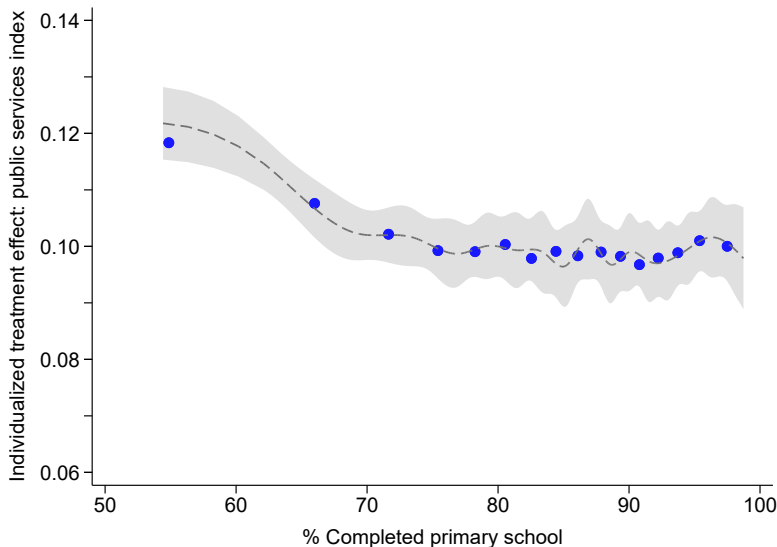
[► Go back](#)

# Public Services TE Heterogeneity: **Ethnic Polarization**



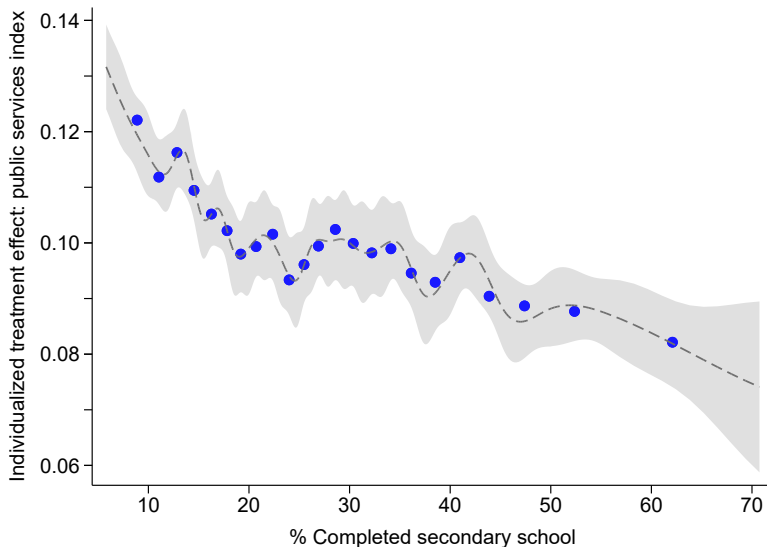
► [Go back](#)

# Public Services TE Heterogeneity: **Primary Education**



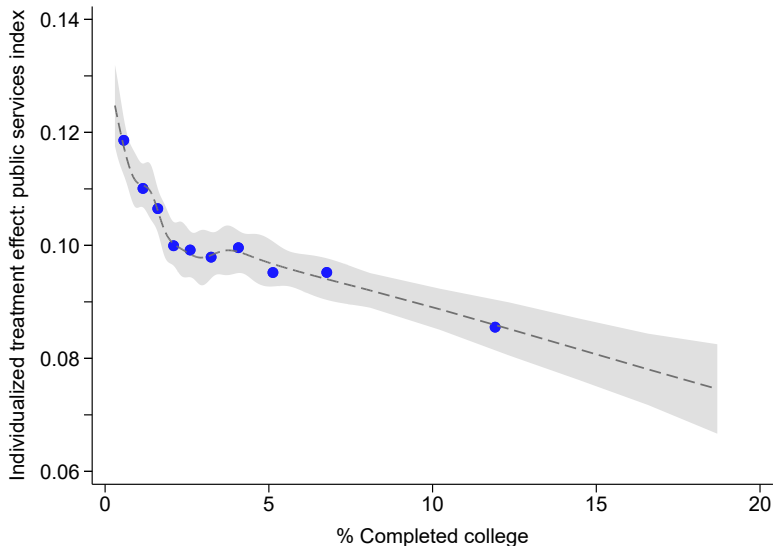
► [Go back](#)

# Public Services TE Heterogeneity: **Secondary Education**



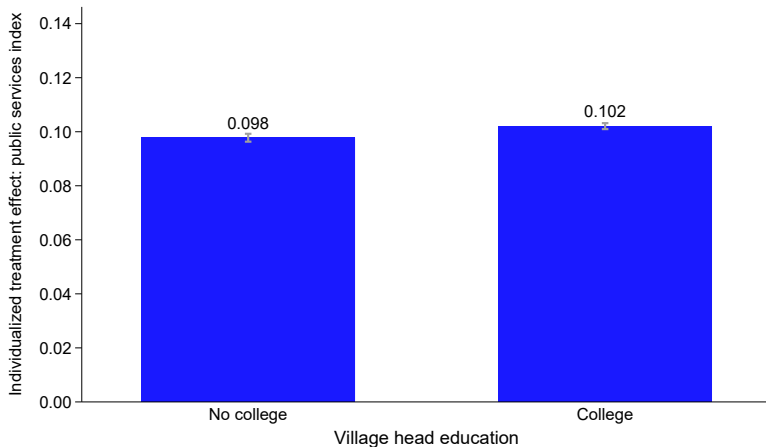
[► Go back](#)

# Public Services TE Heterogeneity: **College Education**



► Go back

# Pub. Services TE Heterogeneity: **Village Head Education**



[▶ Go back](#)