

# The Impact of Commuting on Wages: Quasi-Experimental Evidence from Indonesia's Largest Metropolitan Area

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# Presentation Outline

- 1 Introduction
- 2 Conceptual Framework
- 3 Data & Methods
- 4 Results
- 5 Discussion & Conclusion

# Background & Motivation

## Urban Growth & Commuting in Indonesia:

- **59% of Indonesia's population** currently resides in urban areas (World Bank, 2025)
- Projected to reach **66.6% by 2035** (Statistics Indonesia, 2020)
- Jakarta Metropolitan Area (Jabodetabek): **31 million inhabitants**
- Land scarcity in urban core → workers settle in metropolitan periphery

## Research Gap:

- Compensating wage differential (CWD) literature largely focused on **developed economies**
- Limited evidence from megacities in developing countries with housing market rigidities

# Jakarta Metropolitan Area Map

Figure 1. Map of the Jakarta Metropolitan Area



Source: Cities Climate Finance Leadership Alliance

Jabodetabek (Jakarta, Bogor, Depok, Tangerang, Bekasi)

# Research Objective

## Research Question

Do workers receive wage premiums for commuting in the Jakarta Metropolitan Area?

## Key Contributions:

- Provide **quasi-experimental evidence** on compensating wage differentials for commuting in a developing country context
- Address endogeneity using **instrumental variable** approach
- Examine **heterogeneity** by workplace location and work-from-home status
- Document the **disutility of commuting** (stress, health concerns, negative commuting experiences)

# Theory of Compensating Wage Differential

- Firms in central areas offer higher wages to offset commuting burdens.
  - **Alonso-Muth-Mills (AMM) monocentric city model:** Trade-offs between housing costs and commuting expenses
  - **Theory of Equalizing Differences** (Rosen, 1986): Jobs with disutility require higher wages
- **Jakarta Metropolitan Area:** Possibility of **no compensating wage differential**. People choose to commute to earn higher wages by working in the central parts (economic hub) of Jabodetabek.

# Theory of Compensating Wage Differential

Simple Model (Lavetti, 2023):

$$W_i = X_i\beta + A_i\gamma + \epsilon_i$$

Where:

- $W_i$  = wage of worker  $i$
- $X_i$  = observed worker, job, employer characteristics
- $A_i$  = job amenities (including commuting as disamenity)
- $\gamma$  = compensating wage differential

# Empirical Evidence from Literature

Study	Finding	Context
Morris & Zhou (2018)	Positive correlation between commute duration and wages	United States
Verdugo & Kandoussi (2025)	10-20% hourly wage increase per additional hour of commuting	Paris Metro Area
Mulalic et al. (2014)	Wage increases by 0.15% 3 years after firm relocation per 1km distance	Denmark
Giménez-Nadal et al. (2024)	10% wage increase ↔ 3.2% (M) / 2.5% (F) commuting time increase	United States

**Gap:** Limited evidence from **developing country megacities**

# Data: 2023 Jabodetabek Commuter Survey

## Data Source:

- Cross-sectional data of the 2023 Jabodetabek Commuter Survey from **Statistics Indonesia**
- Information on commuting activities, individual & household characteristics in Jakarta Metropolitan Area

## Sample Selection:

- Working-age population (15-64 years) (OECD, n.d.)
- Workers reporting wages for primary jobs
- Excludes workers with high-mobility jobs (e.g., bicycle-taxi workers)
- Final sample: **16,070 workers**

# Key Variables

**Outcome Variable:** Natural logarithm of monthly wages

**Main Explanatory Variable:** Binary variable (1 = commutes across city/regency boundaries for work and returns same day) (commuting definition by Statistics Indonesia)

**Instruments:** Distance traveled from home to work (main instrument)

**Control Variables:** Individual (education, gender, marital status, age, experience, urban/rural), household (size, dependents, expenditure, residence area), neighbourhood (material of road and road width in place of residence), job (job category, field of occupation, days of work, workplace type), commuting (public transport)

# Empirical Strategy

**Challenge:** Endogeneity due to reverse causality

**Method:** Two-Stage Least Squares (2SLS)

**First Stage:**

$$\text{Commute}_{ilw} = \delta_0 + \delta_1 \text{Distance}_{ilw} + X'_{ilw} \tau + v_{ilw}$$

**Second Stage:**

$$\ln(\text{wages})_{ilw} = \beta_0 + \beta_1 \widehat{\text{Commute}}_{ilw} + X'_{ilw} \gamma + \alpha_l + \alpha_w + \varepsilon_{ilw}$$

Where:

- $X'_{ilw}$  = control variables
- $\alpha_l$  = city/regency fixed effects (residence)
- $\alpha_w$  = city/regency fixed effects (workplace)

# Main Results: Impact of Commuting on Wages

Outcome: ln(wages)	(1) Base	(2) Controls	(3) Controls+FE
1 if commutes to work	0.901*** (0.019)	0.407*** (0.020)	<b>0.435*** (0.025)</b>
Observations	16,068	15,976	15,976
First-stage F-statistic	6,460	3,870	2,813
p-val. (endogeneity test)	0.000	0.000	0.000
Controls	No	Yes	Yes
Fixed Effects	No	No	Yes

**Main Finding:** Cross-city commuters earn **43.5% higher wages** compared to non-cross-city commuters ( $p < 0.01$ )

# Heterogeneity Analysis

Outcome: ln(wages)	(1) Jakarta	(2) Non-Jakarta	(3) WFH	(4) Non-WFH
1 if commutes	0.590*** (0.061)	0.558*** (0.043)	0.356** (0.173)	0.437*** (0.025)
N	7,603	8,373	423	15,216
First-stage F-stat	623	1,017	59	2,731

## Key Insights:

- **Similar wage premiums** for workers that work in Jakarta province (59%) vs. outside of Jakarta province (55.8%).
- Suggests compensation for commuting, not just higher wages in Jakarta
- WFH workers have **lower premium** (35.6%) vs. non-WFH (43.7%)

# Robustness Check: Alternative Instrument

Instrument: Time	(1) Base	(2) Controls	(3) Controls+FE
1 if commutes to work	0.832*** (0.019)	0.368*** (0.021)	<b>0.371***</b> (0.025)
Observations	16,068	15,976	15,976
First-stage F-statistic	6,327	3,854	2,675

## Robustness:

- Using **commuting time** as alternative instrument: 37.1% wage premium
- Difference from main result: 6.4 pp ( $\approx 0.06$  SD)

# Disutility of Commuting: Health & Experience

Outcome	(1) Stress	(2) Health Concerns	(3) Bad Experience
1 if commutes	<b>0.388***</b> (0.021)	<b>0.051**</b> (0.021)	<b>0.617***</b> (0.021)
Observations	15,978	15,978	15,978
First-stage F-stat	2,817	2,817	2,817

## Evidence of Disutility:

- Cross-city commuting → **38.8% higher** stress levels
- Cross-city commuting → **5.1% higher** health concerns
- Cross-city commuting → **61.7% higher** bad commuting experiences

# Discussion

## Summary of Findings:

- Cross-city commuters earn **43.5% higher wages** (37.1% with alternative IV)
- Similar premiums across Jakarta and non-Jakarta workers
- Lower premiums for WFH workers (reduced commuting intensity)
- Commuting associated with higher **stress, health concerns, and negative experiences**

## Interpretation:

- Results align with **compensating wage differential hypothesis**

# Limitations

- **Cross-sectional data:** Cannot fully address unobserved heterogeneity
- **Instrument validity:** Potential correlation with unobserved factors (motivation, location preferences, risk tolerance)
- **Omitted variables:** Missing firm and employer characteristics in the dataset
- **Mechanism:** Cannot definitively confirm that disutility is the specific channel through which wages compensate commuting costs

# Suggestions

## Future Research Suggestions:

- Longitudinal data to address time-invariant unobservables where available
- Geospatial data for more precise identification
- Explore specific mechanisms and channels

# Thank You!

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# Appendix: Summary Statistics

Variable	Non-Cross-City Commuters	Cross-City Commuters	Total
Wage (Rp million)	4.45	6.98	5.30
In(wage)	15.04	15.52	15.20
Distance (km)	4.2	19.2	9.2
Time (minutes)	17.5	50.1	28.4
% Tertiary education	17.5%	42.5%	25.8%
% Works in Jakarta	37.5%	67.5%	47.5%
% Stressed	19.2%	41.9%	26.8%
% Bad experience	38.9%	74.9%	50.9%
N	10,701 (66.6%)	5,369 (33.4%)	16,070

- Commuters (33.4%), non-commuters (66.6%).
- Commuters have higher education, more works in Jakarta province, and earn **57% higher wages** on average.
- Commuters report **higher stress and negative experiences**.