Discussion on Mortgages, Subways and Automobiles, *Agarwal, Chua, et. al., 2025*

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ABFER: Real Estate and Urban Economics
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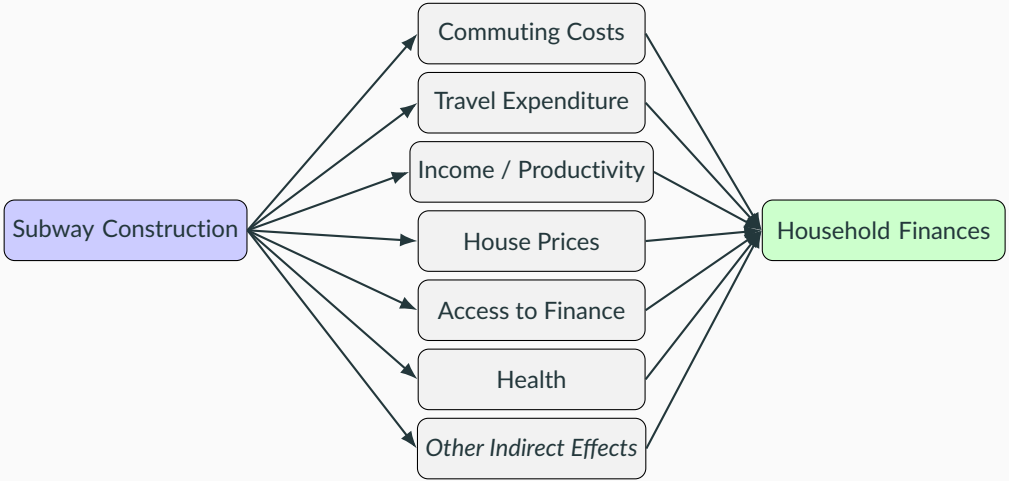
Usual disclaimer applies: opinions my own and not those of my employer.

Introduction, summary of results

Effects of subway construction on mortgages and automobiles



Research question, empirical design

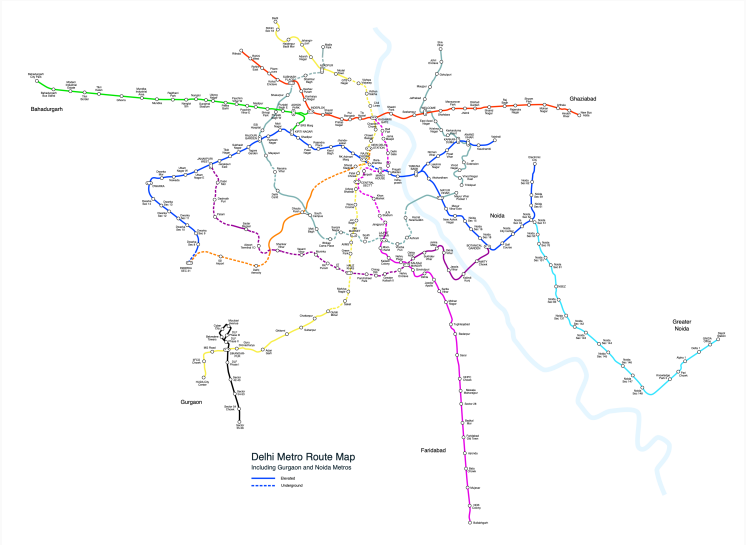
Motivation: Lack of evidence connecting infrastructure investments to household finances.

Research design:

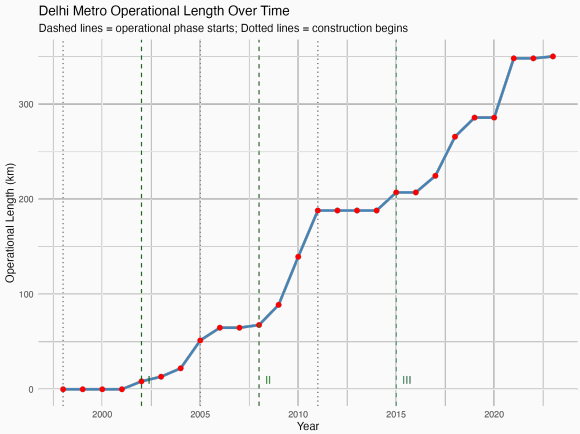
- Phased opening of metro stops in Delhi between 2015-2019.
- Postcodes that acquire a metro stop: Treated; postcodes with pre-existing or no metro stops: Control.
- Compare household-level outcomes in treated and control postcodes.
    - On mortgage delinquency and pre-payment.
    - On vehicle registrations for 2 to 4-wheeler vehicles.

Delhi Metro - Phase 1 and 2

Delhi Metro - Phase 3



Delhi Metro - Over the years



- Currently ~290 sations, ~390 km track length.
- More than 2 billion passengers a year; comparable to Shenzhen, Chengdu and Guangzhou.
- 10th busiest in the world, and (excluding China) 5th most extensive.

Summary of results

Treated postcodes: 41. **Control** (1): 59; Weak Controls (2): 29; Strong Controls (3): 30.

	Controls		
	1	2	3
Delinquency rate (29%)	-4.42 pp	-2.5 pp	-5.72 pp
Delinquency (7.2k)	-39.2%	-25.7%	-48.7%
Pre-payment rate (60%)	1.38 pp	-	1.93 pp
Pre-payment (84k)	10.2%	-	-

- Results associated with fewer registrations of 4-wheel vehicles, particularly lower-quality of such vehicles.
- Suggestive evidence: no impact on incomes and house prices in treated vs control areas.

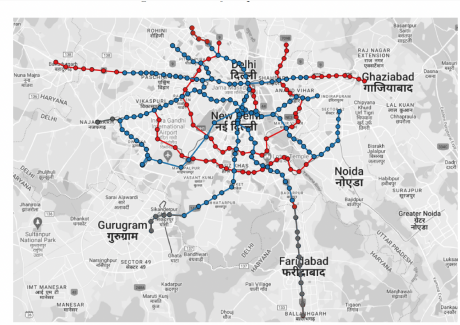
Contribution: Positive effect of subway construction on household finances—lower mortgage delinquencies—via lower transportation expenditure.

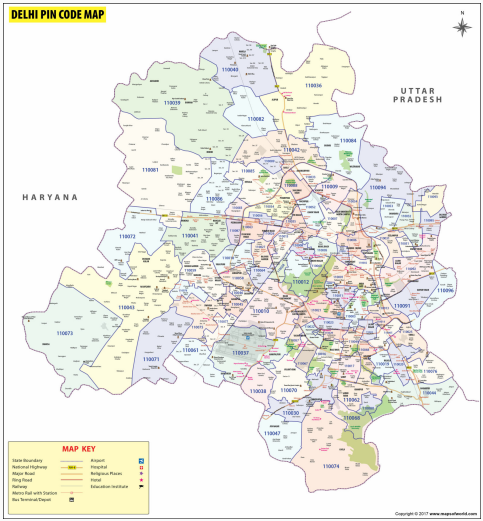
My comments

Summary of comments

- On redefining treatment for the Phase III expansion.
- On macroeconomic effects: on isolating house price and income effects.
- On the nature of delinquencies and prepayment seen in mortgage data.

C1 - On defining treatment for the Phase III expansion





C1 - On redefining the treatment variable

- Treated groups: those with a new station.
- Comparing households in postcodes with new stations with other postcodes has numerous challenges:
  - Station choice is not endogenous, and infrastructure investment often not a unique decision.
  - New stations may affect commuting times from previous stations: new nodes, new shortest paths.
  - Postcode are not uniform and some quite large: potential for spillover effects and reorganisation of economic activity across postcodes [introduced in 1972].
- While not directly addressing identification, following redefinitions to the treatment variable may improve the analysis:

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- Rather than assume treatment based on new stations, estimate the effect of new stations on a postcode's market access.
  - Simplest case: check changes in distance to city centre, where distance is given by d_i

$$\Delta MA_i = \frac{1}{d_{i,t_2}} - \frac{1}{d_{i,t_1}}$$

  - Option 2: consider all bilateral commute distances between a postcode and all other postcodes:

$$\Delta MA_i = \sum_j \left(\frac{1}{d_{ij,t_2}} - \frac{1}{d_{ij,t_1}} \right)$$

  - Option 3: Consider all cumulative bilateral commute distance between a postcode and all other postcodes, weighted by the target areas relative importance:

$$\Delta MA_i = \sum_j \left(\frac{1}{d_{ij,t_2}} \cdot X_j - \frac{1}{d_{ij,t_1}} \cdot X_j \right)$$

  - Recent studies provide a theoretical under-pinning for the third measure; e.g. Mexico City (Zarate, 2024) and Bogota (Tsivanidis, 2023).
  - Candidates for X_j: population density, average wages, cost of CRE.

C2.1 - On macroeconomic effects - House Prices.

- The previous challenges to identification suggest revisiting the null results on house prices and incomes.
- However, the absence of house price and income effects—even with a different research design—will not suggest a lack of a house price and income effects.
- For instance, Gupta et. al. (2020) document a sizeable increase in property prices, upto 4 years prior to the opening of the transit services.
- Redding and Turner (2014) survey empirical evidence on the impact of subways on house prices.
- Some studies have found positive effects. For instance, Gibbons and Machin (2005, London), Billings (2011, Charlotte), Ahlfeldt et. al. (2012, Berlin).
- Opportunity to assess these effects in a more recent expansion, in a developing economy and using stacked estimation.
- Substantial expansion in the scope of the study: though data limitations may require this to be done at a relatively aggregate level.
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C2.2 - On macroeconomic effects - Income .

- No effect on incomes: subject to the same concerns as in previous slides. Current evidence suggestive: no difference in delinquencies by private/public sector employees, or by gender.
- However, the mortgage data has a wealth of information on the income of mortgagors at a postcode level around the opening of stations.
- Weak evidence that average income of mortgagors is lower in post-periods. This is based on data aggregated at postcode level.
- A lot more can be done to document the nature of reorganisation, and combined with changes in market income and rents, can inform the specific areas newcomers sort into and why.

C3 - On the quantitative results linking infrastructure investments to household finance.

- What accounts for the high delinquency rates (29%)? Is this a product feature or a feature of the Indian mortgage market/product?
- Depending on the above:
  - Make a distinction between long-term and short-term delinquencies.
  - What is the average duration spent under delinquency? Transition matrix across the following states: Normal, Delinquent, Pre-paying
- How do we square high delinquency rates vs high pre-payment rates? Separate market segments?
- How do we square the substantial reduction in delinquency rates with reduction in 4-wheeler ownership: a much smaller proportion of all vehicle registrations?

	Full Sample		
	Obs.	Mean	
Panel A: Mortgage Variables			
Delinquency	361,598	0.29	
Delinquency Amount	361,598	7,212	
Prepayment	361,598	0.60	
Prepayment Amount	361,598	84,420	
Monthly Installment	361,598	24,271	

Conclusion

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- Important topic. important setting (in my unbiased opinion). Timely. Great data.
- Clearly argued. Easy to read. Transparent.

- Going forward:
  - Alternate criteria for treatment more suited to the setting.
  - A more careful consideration of macroeconomic and reorganization effects.
  - Potentially need additional data on rents, house prices, wages and population densities.