The Economic Dynamics of City Structure: Evidence from Hiroshima's Recovery
by Kohei Takeda and Atsushi Yamagishi

Discussion by Wen-Tai Hsu

Institute of Economics, Academia Sinica

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Summary

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- Questions:
  - Are city structure resilient to large shocks?
  - The dynamic mechanism of city structure.

- Atomic Bombing of Hiroshima
  - The epicenter was around the city center.
  - Population dropped from around 350,000 to 136,518
  - Nearly all building within 2 km were completely destroyed.
  - The outskirts were less affected ... Increase in population in the outskirts immediately after bombing.

- Empirical results:
  - The city structure was resilient: Population and employment around city center "almost" recovered within 5 years (1945-1950).
  - Observed locational characteristics do not explain the recovery.

Summary

- Develops a dynamic quantitative model to explore the mechanisms behind the resilience. The channels are
  - exogenous locational fundamentals, or
  - strong agglomeration forces that shape the city structure through coordinated expectations, or
  - It may be that both are important.
- Quantitative results:
  - Strong agglomeration forces are estimated.
  - Alternative equilibria entirely possible.
  - Self-fulfilling expectations of recovery significantly influenced the observed outcome
  - Sources of coordinated expectations: Government recovery plan, anchoring effect of salient location characteristics (e.g., transportation network and the castle), popular narratives of rebuilding.

Comparison with the Berlin-Wall model

- The paper is quite similar to the Berlin Wall paper (Ahlfeldt et al., 2015) in terms of the choice of topics, quantitative model, and estimation strategies.

- The main innovation is the dynamics, and the model is surprisingly neat.
  - Finite horizon $t = 1, 2, ..., T$. Easy to solve backward.
  - Migration friction: θ_t fraction of individuals are allowed to move, while $1 - \theta_t$ of them are not.
    - If $\theta_t = 1$, then the model is period-by-period static model (the Berlin-Wall model without housing/land).
    - If θ_t is low, individuals are likely to stuck in a location when location choices are made. Need to take into account all future outcomes.
  - Perfect foresight.
  - Part of the neatness comes from the removal of housing/land, relative to Ahlfeldt et al. (2015).

Comments and Suggestions

Contributions

- Addressing important questions:
    - The relevance of locational fundamentals, agglomeration forces, and expectations in the within-city contexts.
    - More difficult to address than cross-city context as the need for granular data
    - Even more difficult for historical studies
- Laudable effort and attention to details in every aspect of the paper.
    - Data
    - Empirical evidence on recovery
    - Neat modeling that can be applied in other dynamic urban questions.
    - Careful structural estimation and quantitative exercises.

Messages

The authors acknowledge that whether city structure is resilient to shocks depends on contexts.

- For war destruction, city structure is quite resilient. This paper might be the first to show this.
- Same for epidemics (Glaeser 2022).
- Some shocks may affect city structure significantly, e.g., transportation network, mass redevelopment plans, and others (Berlin Wall).

Land and Housing

Is it innocuous to remove housing and land in consumption and production?

- Missing the key distinction between a city center and its suburbs.

- Compensating differential: People in suburbs suffer from longer commute to enjoy larger residential space.

- When the model has commuting costs but no housing, suburbs are bad but empirically there are people.

- So, misses this compensating differential tends to exaggerate the locational fundamentals in the suburbs.

$$A_{it} = a_{it} \left(\frac{L_{it}}{S_i} \right)^{\alpha}, \qquad B_{nt} = b_{nt} \left(\frac{R_{nt}}{S_n} \right)^{\beta}$$

$$\ln a_{it} = \ln a_i^F + \ln a_t^* + \ln a_{it}^{\text{Var}}, \quad \ln b_{nt} = \ln b_n^F + \ln b_t^* + \ln b_{nt}^{\text{Var}}.$$

- If so, high population concentration and low locational fundamental in Central Hiroshima imply strong agglomeration force (coupled with expectations).
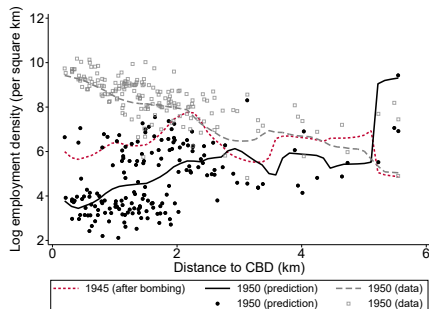
Outcomes under Locational Fundamentals Only

Figure 6: Population and employment distributions with no agglomeration forces
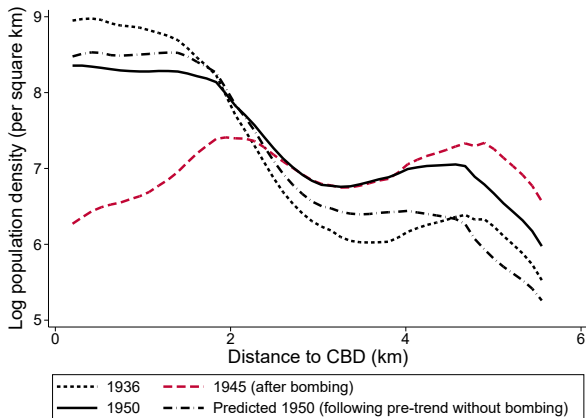

(a) Population
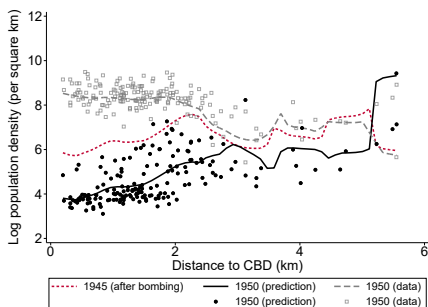
(b) Employment

This suggests a_i^F and b_n^F are higher in the suburbs.

The Phenomenal Recovery of Central Hiroshima

Important to document the phenomenal recovery of Central Hiroshima, but what are the locations 2 kilometers from the CBD?
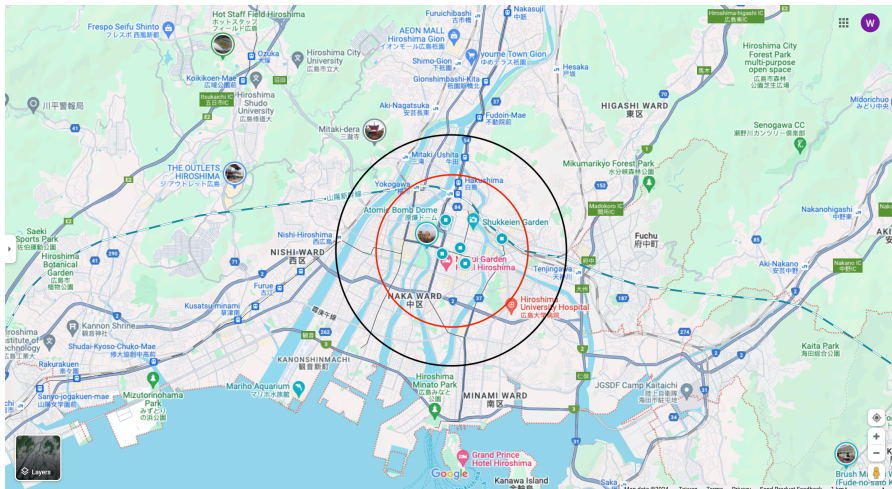
Figure 3: Population density by distance to city center

Hiroshima City

Central Hiroshima

More on Locational Fundamentals

Not sure whether locational fundamentals are unimportant because

- Incorporating land and housing will likely change the estimates of locational fundamentals.
  - Central Hiroshima may have higher locational fundamentals, rather than lower as in the current estimation
  - Suggestion: Put back land and housing, but treat the commercial and residential market as integrated, for tractability.
- Empirically, they find that observed locational fundamentals do not explain the recovery. But there could be missing variables.
  - Relative locational advantage, e.g., the fraction of flat-land within a 3-km circle. This is similar to market access, but market access usually has endogenous components, whereas this measure is simply geographic.

More on Locational Fundamentals

How to disentangle expectation from locational fundamentals?

- The authors: the quick recovery of the transportation network may have helped anchor the expectation.
- Railway tracks and stations might be destroyed by the bombing.
- But the network (i.e., the land for the railway lines and the public ownership of the land) was not.
- So, these locational fundamentals at Central Hiroshima that helped establish the city center were not taken away by the bombing.

Concluding Remarks

- Important to document the phenomenal recovery of Central Hiroshima.

- Agglomeration forces (and hence expectations) might still be important, but perhaps the effects of locational fundamentals are not nil.

- The case of Taipei: Second nature (transport network and redevelopment plans) seems to change city structure easily.

  - Railway and political center in the colonial era shifted the economic center from river banks to near Taipei Main Station.

  - Xinyi Planning Area gradually establishes a new CBD since 1990s.

- The empirical exercises and dynamic model can be used to analyze other cities.

- Take-home message for me: "Buildings and people" can be "recovered" even when the shocks are massive, but transport network and planning which affects where jobs are concentrated can change city structure.

Taipei
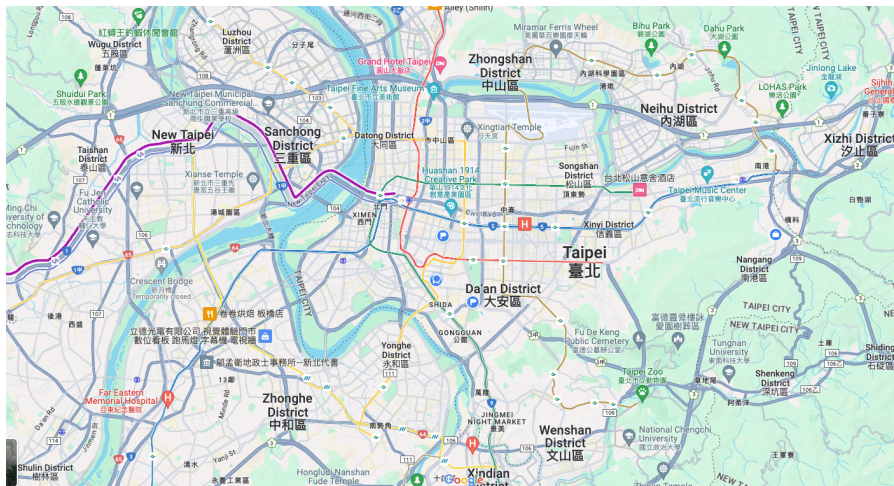
Other Comments and Suggestions

- The post-war phenomenal population growth in Hiroshima couldn't just come from natural birth and death.
  - Immigration must account for the bulk of it. Show how $\{\ln u_{ot}\}$ and $\{a_{i,t}, b_{i,t}\}$ change over time.

- Pre-war private property ownership was preserved. If the owners and their family members and relatives were all dead because of the bombing, the ownership goes to the government, I suppose? I am asking because much of Central Hiroshima was destroyed, and so presumably the government got substantial land ownership there. This implies that it is easy to rebuild and plan? These need to be clarified.

- Also, if private ownership rate was low at that time (so government ownership was high), how to reconcile this with the statement that most of the recovery efforts to build and move in come from private, not the government?

- Footnote 10: "The recovery council was formed in February 1945"? Before the bombing and the end of the war?

Other Comments and Suggestions

- Footnote 22: "The areas around Hiroshima station also provided convenient access to transportation but experienced much less destruction from the bombing, which could have made Hiroshima station the potential new center of Hiroshima". But Hiroshima Station is about 1 km from the "city center", and much of its area around it is less than 2 km from the city center. From the figures and regressions, within 2 km from the city center bounced back well, and this includes the area near Hiroshima Station. Better to check or clarify.

- Might be nice to compare with the Berlin Wall paper in terms of the importance of locational fundamentals. I think they show that locational fundamentals are somewhat important (of course agglomeration forces are important). E.g., why did the prewar CBD reestablished as a new CBD in the reunified Berlin?

- Where is the alternative CBD in Section 6's simulation? Readers may be curious.

Ahlfeldt, G. M., Redding, S. J., Sturm, D. M., and Wolf, N. (2015). The economics of density: Evidence from the berlin wall. Econometrica, 83(6):2127–2189.