Collective Landing: Exploring the Power of Housing Design to Improve Economic and Social Resilience

DAVID BIRGE
Massachusetts Institute of Technology

INTRODUCTION

Carl Schmitt's concept of *nomos* defines the control of physical territory as the fundamental action allowing an autonomous and self-regulated society to form.[1] (While land control has both negative/defensive and positive/normative aspects, here I will focus solely on the later.[2,3]) The positive control of land defines the incremental, value based decisions as to *where, when*, and *to what end* land is developed. As Lefebvre and Harvey have shown, *the totality of long-term land development decision making has a primary and recursive impact on the social, economic, and cultural trajectory of society itself.*[4] Contemporary planner-developer models pursue the "highest-and-best-use" of land — code for the greatest risk-adjusted financial return.[5] Under neoliberalism, governmental protection of public welfare (i.e. non-economic benefits) has eroded.[6] The result has been a series of spatially interdependent trends in increased housing costs[7], gentrification[8], food deserts[9], the gig economy[10], and delays in family formation[11], among others.

This project aims to reveal the latent power or capacity[12] of alternative development processes within the United States to provide middle-income Americans with broad self-control over social, spatial, and economic outcomes (Fig 1.) Specifically, using industrial land in Boston as a case study, and deploying a custom spatial-numerical housing cost model (SNHCM) (Fig. 8), this project explores how land-choice, housing unit design, and institutional design can improve the economic resilience[13] of a collective's members. This work forms a proof-of-concept phase in a larger research agenda exploring how integrated collective action across multiple domains can give households and communities command over their spatial, metabolic, economic, and institutional life-worlds (see: www.collectivemetabolism.org).
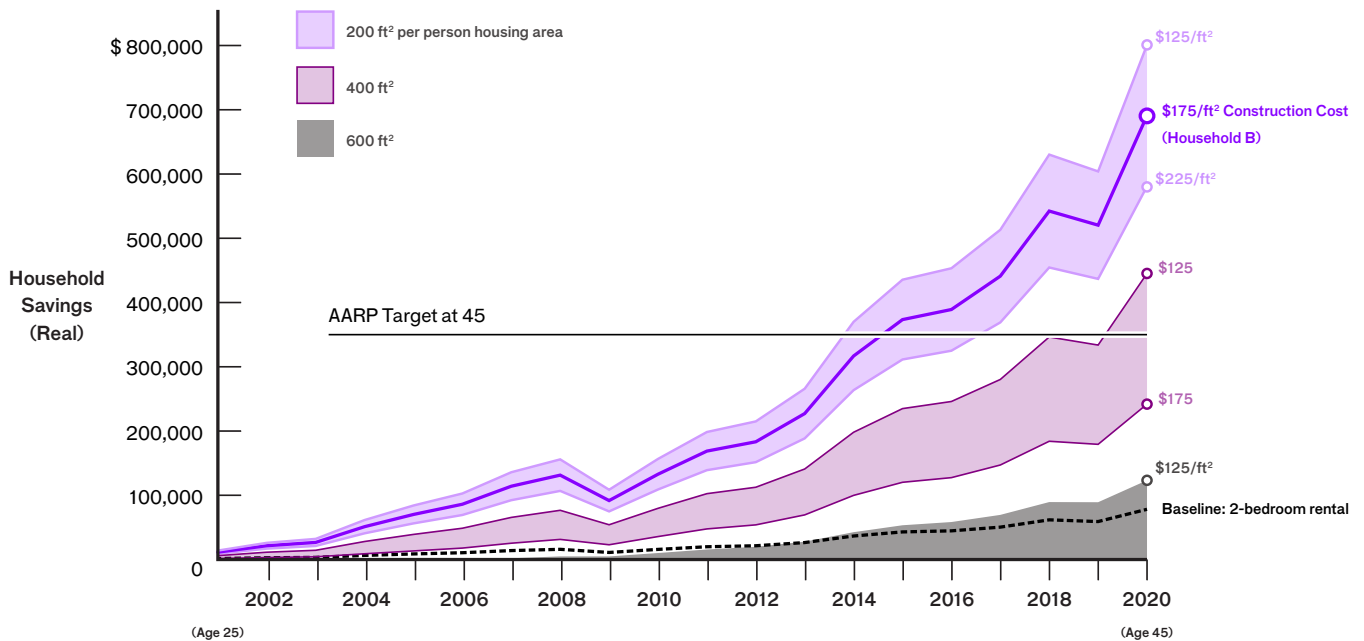

Figure 1. Inflation adjusted 20-year savings and returns (S&P 500) under various build-cost and area-per-person scenarios.

Figure 2. Shared living area for household B (see also Fig. 4). Rendering by Author.

MODEL

SNHCM links geometrically explicit inputs made in Rhinoceros™ with typical development proforma calculations.[14] Inputted surfaces and lines in Rhino represent complete construction assemblies (window, wall, floor, roof, foundation). Take-offs are automated and multiplied by cost-of-construction coefficients in Grasshopper.[15] Results are normalized to monthly/yearly cost of housing for ease of understanding. Simultaneously, household composition[16], income[17], taxes[18], and consumer spending ratios[19] are used to calculate take-home pay. The impact of collective purchasing and other forms of resource sharing can be calculated at this stage. Finally, historic inflation and investment return rates are used to determine the long-term savings for the modeled household over a given time-period. By changing spatial configurations or construction system or financial input parameters, designers can compare baseline scenarios with alternative designs.

EXAMPLE OUTCOME

With the model in hand, a 20,000 ft² industrial site[20] was selected in Somerville, MA and a building-scale spatial system was designed that achieves lower cost through the following strategies:

[1] Frame and in fill system provides efficient structural support and MEP services while supporting flexible use over time (Fig. 3).[21]

[2] Mixing and sharing of private and semi-private spaces to increase effective usable-space-per-person while lowering total-space-per-person (Fig. 3).[22]

[3] Voided bays defined by frames can be flexibly specified by residents and allows for some informal/self-construction (Fig. 4).[23]

Three theoretical households, or "bayholds", were invented to test the system: A) two artist couples; B) two single-child families (6 people total); and C), a group of young entrepreneurs seeking a live-work space for a start-up. Due to word limits, I will only outline the spatial design and economic impacts for household B.

With income of $70,000 for each couple (75% AMI in Boston in 2015)[24], typical spending and savings habits[25], and paying rent for a typical 2-bed apartment (380 ft² per person)[26], each couple would have less than $100,000 in retirement savings after 20 years-- well below the AARP recommendation.[26] These same couples, with identical consumption habits, but now living in a partially self-designed and self-built apartment propoosd in this project (Fig. 2) with 200/ft² per person, and at a total development cost of $245/ft², would have a monthly housing cost of $1,075/month (18% of income).[28] The lower housing cost would allow significantly more yearly savings, resulting in $692,000 saved after 20 years (2 times the AARP recommenda-tion at 45 years).[29] The rendering of the generous, double-height

**Land-Use, Structural Bay,
Collective Space**

Site is divided into 150 space psarking lot, and a courtyard building with planted or covered central courtyard.

Building uses a 20' x 20' structural bay to ensure efficient and cost-effecitve construction.

Infill-Structure

Structural system provides backbone for MEP services. Structural walls are thickened and electric, water, sewer lines are run both horiztonally and vertically, allowing flexible location of bathrooms and kitchens within the spatial bays.

The structural shell and wall system, designed by an architect and engineer, takes care of the major life-safety issues within the building. Users are free to design and build within the system provided.

Division of Space

Each floor is divided into roughly 50% private apartment space and 50% semi-private space, accessible to all members on a floor. Each wing of a floor could be organized around shared interests or themes (e.g. childcare, entreprenuership, art, scholarship, sport), or, around friendships and sub-collective social units.
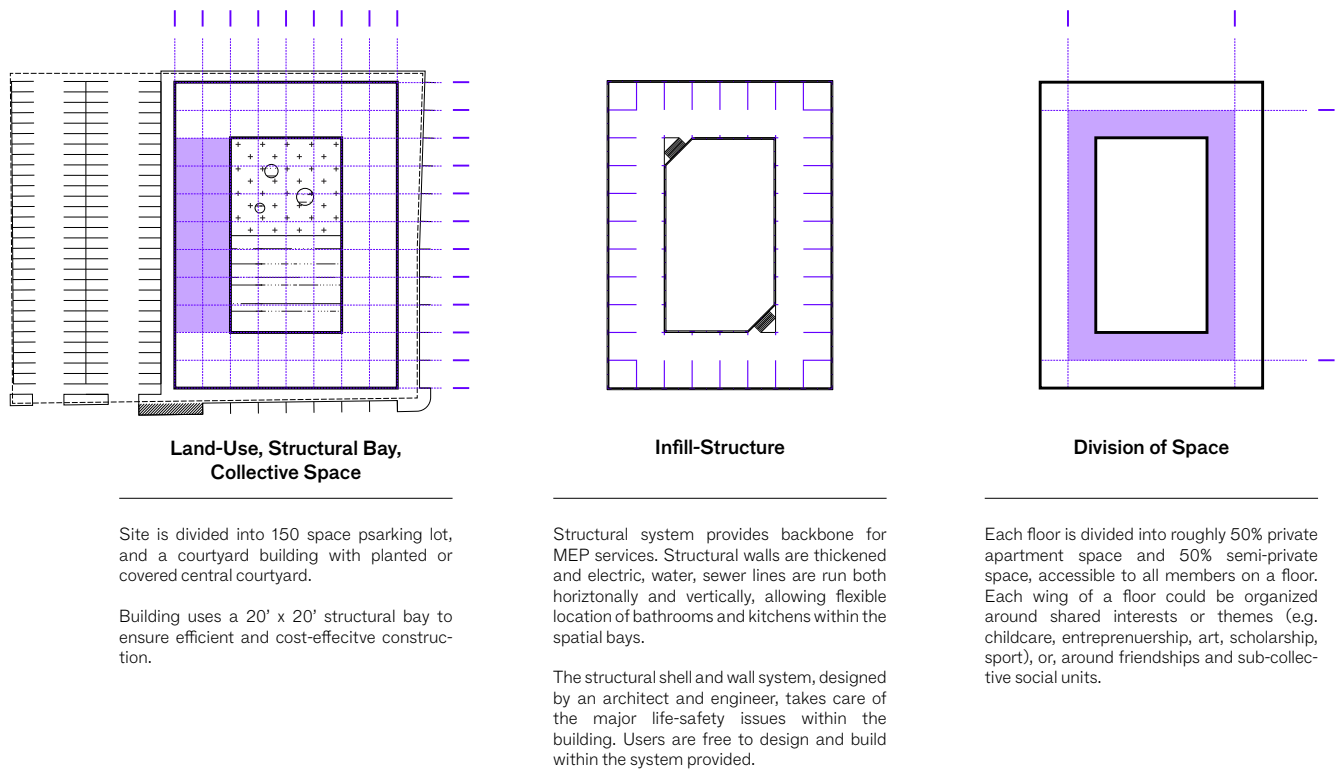
Figure 3. Cost reduction strategies.

playspace shared between neighboring apartments aims to show that affordable and efficient does not need to mean poor-design or space-constricted (Fig. 2). While absolute space per person is relatively low, sharing boosts the effective usable space per person to over >300/ft^2. Moreover, self-construction allows space to be rapidly reappropriated as lifestyles change.

CONCLUSION

Design can be a powerful tool for improving the long-term economic resilience of American families while maintaining spatial well-being. By lowering the cost of housing and simultaneously providing space and capital for other collective economic institutions such as food co-ops, car-sharing, and other material "libraries", new collective housing typologies might allow an alternative path for American's to regain their financial security and autonomy. The financial gains outlined by the model and case-study shown here raises an obvious question as to why this does not happen more often. The difficulty of getting hundreds of households to self-plan and execute rezoning, building design, institutional design, and loan acquisition for a multi-million dollar project is daunting. As such, while spatial design offers a powerful lever to lower housing costs, the financial, logistical, and sociological design of communities may be the harder part. Nevertheless, European models show that the social challenges are not insurmountable. If the challenge can be overcome even a few times, seed collectives might initiate

entirely new forms of urban development and novel urban typologies within American cities (Fig. 5).

Both the challenges and opportunities briefly described here outline a future research agenda. My hope is that this project will spur renewed interest in the role that spatial/construction system design can have in enabling social autonomy and empowerment of citizens. Within academia, the innovative and rigorous design of these systems, well within our purview, is under investigated. This is partly due to the current fetishization of formalisms and provocation.[30] And though within practice new housing options are slowly emerging, they will likely remain limited by profit seeking and regulations.[31] It falls on schools of architecture, therefore, to initiate substantive research in this area.[32]
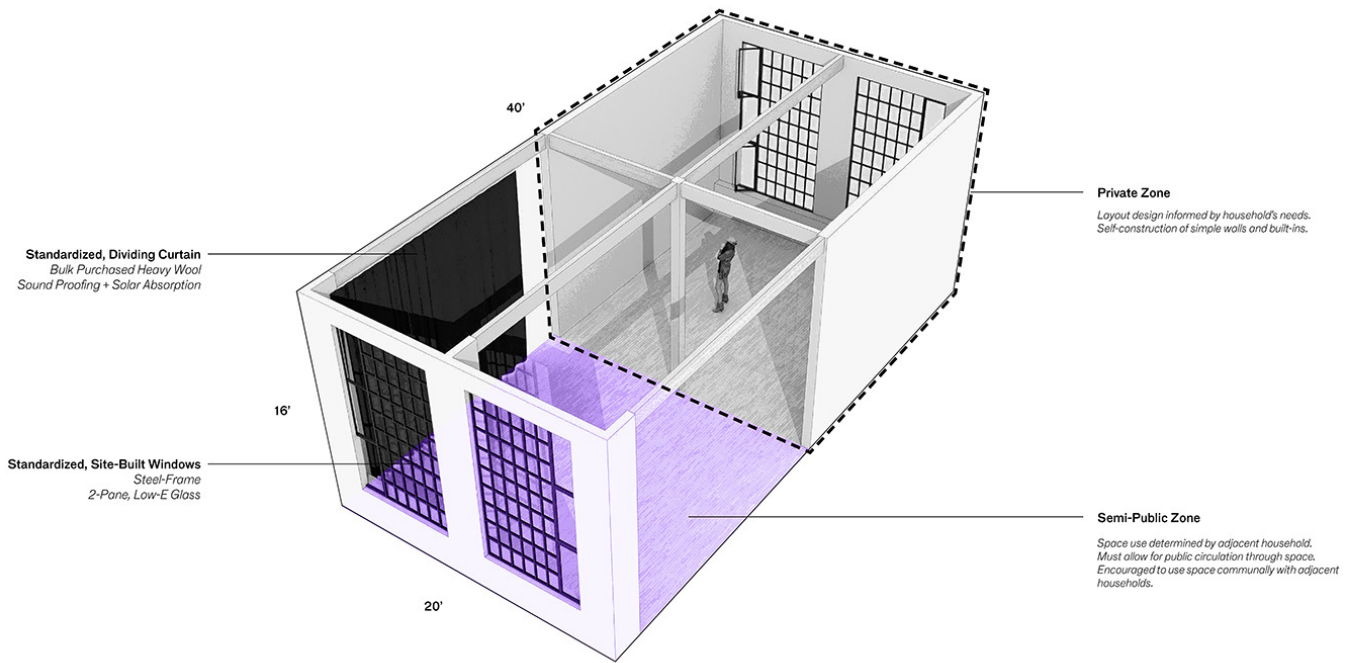
Standardized, Dividing Curtain
*Bulk Purchased Heavy Wool
Sound Proofing + Solar Absorption*

Standardized, Site-Built Windows
*Steel-Frame
2-Pane, Low-E Glass*

40'

16'

20'

Private Zone
*Layout design informed by household's needs.
Self-construction of simple walls and built-ins.*

Semi-Public Zone
*Space use determined by adjacent household.
Must allow for public circulation through space.
Encouraged to use space communally with adjacent
households.*

Figure 4. Diagram of spatial bay with semi-public and private spatial division.

Figure 5. Speculative urban design showing replication and expansion of initial collective.
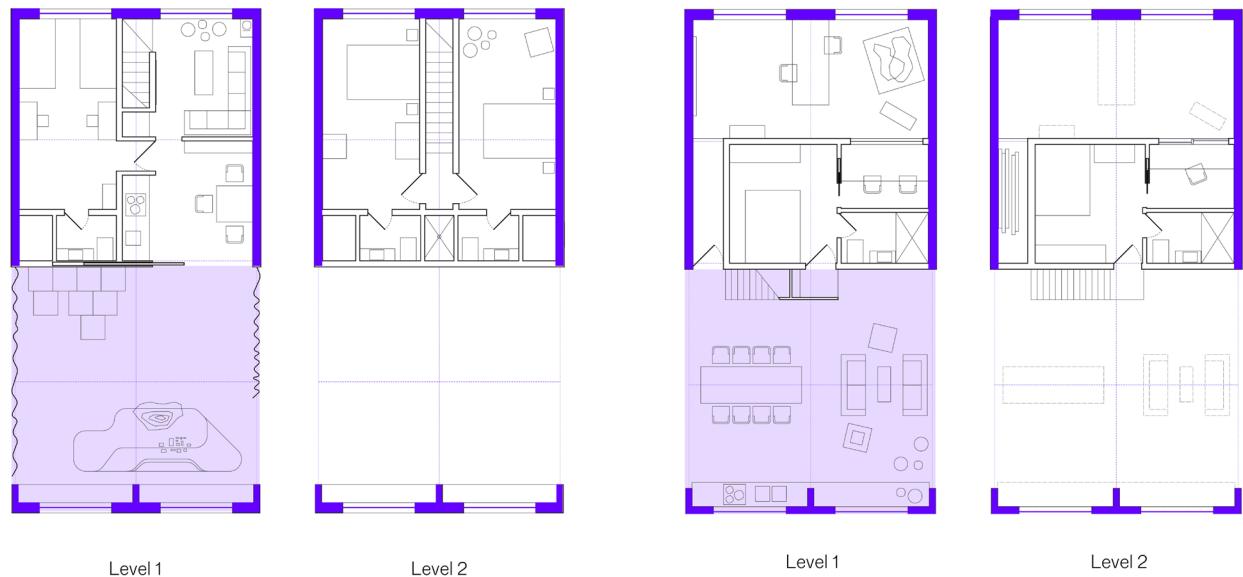
Figure 6. Floor plan of household B (left) and household A (right) to show variations within structural frame.

ENDNOTES

1. Schmitt, Carl. *The Nomos of the Earth in the International Law of Jus Publicum Europaeum*. Translated by G. L. Ulmen. (New York: Telos Press Publishing, 2006).

2. Within the context of this research it is assumed that the rights and privileges of land ownership and development are protected by a federal or state government. In this way, "societal" development within the frame of communal ownership of land is limited to those acts already legally protected. Nevertheless, in America, the history of communes and self-organized communities is diverse. Much can be done within a liberal society.

3. Krieger, Alex. *City on a Hill: Urban Idealism in America from the Puritans to the Present*. (Cambridge, Massachusetts: Belknap Press: An Imprint of Harvard University Press, 2019).

4. Geographers, especially those within the Marxist camp, provide analysis of this phenomenon. See: Henri Levebvre, Edward Soja, David Harvey, Stuart Elden, and Neil Brenner.

5. Munizzo, Mark A., and Lisa Virruso Musial. *General Market Analysis and Highest and Best Use*. 1 edition. (Mason, OH: South-Western Educational Pub, 2010).

6. Borras, Saturnino. "The Underlying Assumptions, Theory, and Practice of Neoliberal Land Policies." In *Promised Land: Competing Visions of Agrarian Reform, 30*. (Food First Books, 2006).

7. Fishman, Robert. "The Global Crisis of Affordable Housing: Architecture Versus Neoliberalism." *Architectural Design* 88, no. 4 (2018): 22–29. https://doi.org/10.1002/ad.2317.

8. Wyly, Elvin K, and Daniel J Hammel. "Gentrification, Segregation, and Discrimination in the American Urban System." *Environment and Planning A: Economy and Space* 36, no. 7 (July 1, 2004): 1215–41. https://doi.org/10.1068/a3610.

9. Alkon, Alison Hope. "Food Justice and the Challenge to Neoliberalism." *Gastronomica* 14, no. 2 (2014): 27–40. https://doi.org/10.1525/gfc.2014.14.2.27.

10. Zwick, Austin. "Welcome to the Gig Economy: Neoliberal Industrial Relations and the Case of Uber." *GeoJournal* 83, no. 4 (August 1, 2018): 679–91. https://doi.org/10.1007/s10708-017-9793-8.

11. Marzulla, Michelle. "Through a Glass, Darkly: U.S. Marriage Discourse and Neoliberalism." *Journal of Homosexuality* 58, no. 6–7 (July 1, 2011): 758–74. https://doi.org/10.1080/00918369.2011.581919.

12. For discussion of the broad concept of systemic capacity, see pages 1-22 of: DeLanda, Manuel. *Philosophy and Simulation: The Emergence of Synthetic Reason.* 1 edition. (London ; New York, NY: Continuum, 2011). For a discussion on more specific principles of adaptive capacity of social systems, see: Jones, Lindsey, Eva Ludi, and Simon Levine. "Towards a Characterisation of Adaptive Capacity: A Framework for Analysing Adaptive Capacity at the Local Level." (Overseas Development Institute, 2010).

13. Economic resilience is measured here as the 20 year savings of a family at real stock market return rates from 1999-2019.

14. For example: https://files.hudexchange.info/resources/documents/CommercialMixedUseProForma.xls

15. RS Means. "2015 Cost Data Books | RSMeans Construction Estimating Books," 2015. https://www.rsmeans.com/products/books/cost-books.aspx.

16. https://www.census.gov/topics/families.html

17. https://www.census.gov/topics/income-poverty/income/data/tables.html; https://www.bls.gov/oes/current/oes_71650.htm#00-0000

18. https://www.irs.gov

19. https://www.bea.gov/data/consumer-spending/main

20. 33 Inner Belt Rd, Somerville, MA 02143

21. Pages-Ruiz, Fernando. *Building an Affordable House: Trade Secrets to High-Value, Low-Cost Construction*. (Newtown, CT: Taunton Press, 2005).

22. Bhatia, Neeraj, and Antje Steinmuller. "Spatial Models for the Domestic Commons: Communes, Co-Living and Cooperatives." *Architectural Design* 88, no. 4 (2018): 120–27. https://doi.org/10.1002/ad.2329.

23. Bernhardt, Anne-Julchen, and Jorg Leeser. "NEUBAU: Flexible Self-Build Cities in Germany." *Architectural Design* 87, no. 5 (September 2017): 30–37.

24. http://www.bostonplans.org/housing/income,-asset,-and-price-limits (Study first conducted in 2015)

25. https://www.bea.gov/data/consumer-spending/main (Data is for 2015, for a two person family making $75,000)

26. Average rent for 2-bedroom in 2015 was $2,500 for 1,145 sq.ft. See: http://www.somervillema.gov/zoning/resources/Somerville-HNA-12-2015.pdf

27. Return rate = 7%, Inflations rate = 1.5%; AARP. "AARP Retirement Calculator - Retire The Way You Want." AARP. Accessed June 19, 2019. http://www.aarp.org/work/retirement-planning/retirement_calculator.html.

28. For comparison, residential development in Boston cost ~$275/ft2 in 2015 according to the Dukakis Center Housing Cost Analysis

29. I assume each household begins savings at 25. Retirement goals are calculated for age 45. See: https://www.aarp.org/work/retirement-planning/retirement_nest_egg_calculator/

30. Harries, Karsten. *The Ethical Function of Architecture*. (MIT Press, 1998).; Leach, Neil. *The Anaesthetics of Architecture*. (MIT Press, 1999).

31. Examples include: Nightingale (https://nightingalehousing.org/), The Collective (London, NYC), Pier Aureli's work at the AA, WeLive (NYC). Other examples are found on www.housinginternational.coop/co-ops and http://architectanddeveloper.com/category/resources/.

32. An Avery Index abstract search for ("low-cost housing" OR "affordable housing" OR "low cost housing") returns only 600 results. A search for ("private residence" OR "private hosue") returns 3,000. The interest of the field is clear, and arguably problematic.

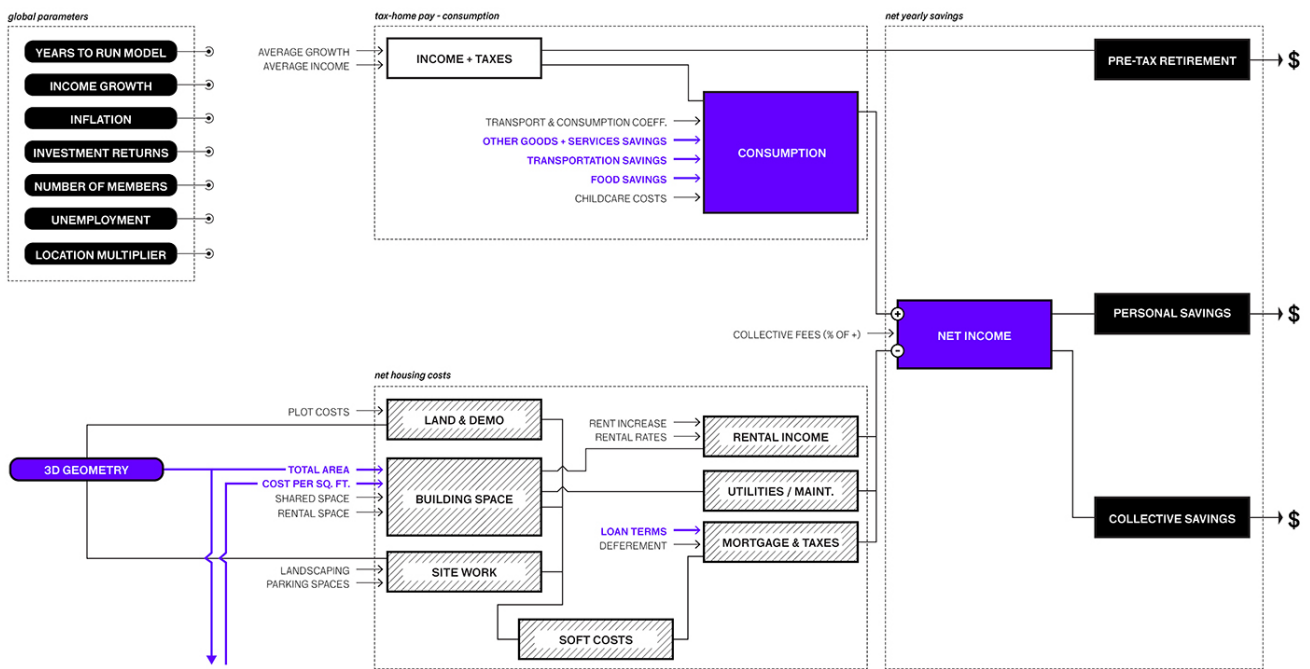Figure 7. Example of a self-designed and partially self-constructed collective housing courtyard interior. Rendering by Author.

Figure 8. Schematic diagram of Grasshopper script.