New Urban Econ Research Shows the Macroeconomic Benefits of Big Cities

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In March 2020, vast modern cities shut down as never before. The conversations, handshakes, crowds, and venues that make cities so attractive and productive suddenly became threats. In this context, a recent working paper by Gilles Duranton and Diego Puga, "Urban Growth and Its Aggregate Implications," offers insight into the promise and limits of urban economies.

The new paper is a substantial advance in urban economic theory, bringing together several streams of scholarship and providing theoretical grounding to estimates of the macroeconomic cost of land use regulation.[1] Duranton and Puga's top-line result seems to confirm previous research on the same question by Chang-Tai Hsieh and Enrico Moretti, but the mechanics behind Duranton and Puga's result take into account the benefits and costs of urban agglomeration in much richer ways. Besides providing a useful estimate that others can cite, Duranton and Puga show that the positive spillovers of cities substantially exceed the negative spillovers.

BIG NUMBERS

Hsieh and Moretti's paper, which is widely cited in policy circles,[2] uses a model from macroeconomics in which wages fall as population rises in each metropolitan area ("metro").[3] It finds that deregulating land use in the three most productive metros (New York, San Francisco, and San Jose) leads to a national 8.9 percent increase in output. Unintuitively, that output growth shows up in the cities that lose migrants more than in those that gain migrants.

Duranton and Puga simulate the same policy—deregulating the top three metros—and find the same result. For example, consumption rises by 8.2 percent. But the similarities end there. Duranton and Puga's output gain from deregulation would be far higher, but they subtract the rising costs of commuting and congestion. However, the degree of deregulation that they consider is radical: the top metros rise to populations of 40 million each, about twice the size of the New York City metro today.[4] This is good to know, but well beyond the ambitions of current zoning reform proposals.

Understanding how Duranton and Puga arrive at this result, and the limits of their approach, is important for making plausible policy predictions. It would also be helpful for the authors to simulate some modest deregulations in the next update to their working paper.

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1. While much of the paper is technical, it is exceptionally well written. Readers with a general economics background can profitably read the introduction, section 6, section 8, and the conclusion. Gilles Duranton and Diego Puga, "Urban Growth and Its Aggregate Implications" (working paper, December 16, 2019), https://diegopuga.org/papers/hcgrowth.pdf.
2. See, for example, Council of Economic Advisers, *Economic Report of the President*, February 2016; Council of Economic Advisers, *Economic Report of the President*, February 2020; Salim Furth, "The Two-Board Knot: Zoning, Schools, and Inequality," *American Affairs* 1, no. 4 (2017); Richard Florida, "The Urban Housing Crunch Costs the U.S. Economy about $1.6 Trillion a Year," *CityLab*, May 18, 2015; Vanessa Brown Calder, "Zoning, Land-Use Planning, and Housing Affordability" (Policy Analysis No. 823, Cato Institute, Washington, DC, October 18, 2017); Mike Kingsella, "Tech Commits to Housing – What Does It Mean for Affordability and Availability?," *Up For Growth*, November 8, 2019; Matthew Yglesias, "America's Dual Housing Crisis and What Democrats Plan to Do about It, Explained," *Vox*, July 30, 2019; and Affirmatively Furthering Fair Housing, 85 Fed. Reg. 2041 (proposed January 14, 2020).
3. Chang-Tai Hsieh and Enrico Moretti, "Housing Constraints and Spatial Misallocation," *American Economic Journal: Macroeconomics* 11, no. 2 (2020): 1–39.
4. Duranton and Puga's model stops the cities at 40 million only because they impose an arbitrary cap.

CONNECTING THEORY TO EMPIRICS

Theoretical models of cities have paid relatively little attention to land use regulation,[5] although regulations are "first-order features of the US urban system."[6]

Empirical studies of regulation, for their part, have used theory lightly and loosely. For example, a *Quarterly Journal of Economics* paper by Alberto Saiz gives a theoretical expression derived for a model city with no regulation.[7] The paper goes on to estimate reduced-form equations that include regulation and plug the result back into the elasticity formula. That disconnect between theory and empirics does not occur in Duranton and Puga's paper.

Unlike in most previous papers, Duranton and Puga's regressions all estimate equations that emerge from the theoretical model.

Their model is a tour de force of technical urban econ: a system of endogenously forming linear cities with free migration and random as well as systematic growth determinants. The national economy grows endogenously as a result of human capital growth, which comes from socially heritable knowledge gained via endogenous education and city-specific learning-by-doing. There are urban externalities via the concentration of innovation, learning-by-doing, commuting distance, and traffic congestion. City governments implement an impact fee to manage growth for the benefit of incumbents.

They elegantly reduce all that complexity to four key parameters:

- How much further do people drive as a city grows?
- How much slower does traffic become as a city grows?
- How much more do people earn from locating in a bigger city?
- How much more valuable is work experience in a bigger city?

The "'fundamental tradeoff' of urban economics" is that cities create more of both positive and negative externalities (spillovers to other city residents) as they grow.[8] The fact that city size and human wealth and well-being have grown together suggests that the balance of externalities is positive, at least up to the observed size of large cities.

In Duranton and Puga, the key positive externality is that innovation and work experience have greater payoffs in larger cities. And the key negative externality is that mobility diminishes as cities grow. Both ideas are simplifications and could be expressed many other ways; these are capable stand-ins for other benefits and costs that scale with size.

5. This thin literature is reviewed in section 5 of Gilles Duranton and Diego Puga, "Urban Land Use," in *Handbook of Regional and Urban Economics*, ed. Gilles Duranton, J. Vernon Henderson, and William C. Strange, vol. 5 (Oxford: Elsevier, 2015), 467–560. In a backhanded exception, Graeme Guthrie uses a model to argue that regulation may not be the source of high prices, but only after assuming that the entire city must be single-family homes on lots of identical size. Graeme Guthrie, "House Prices, Development Costs, and the Value of Waiting," *Journal of Urban Economics* 68, no. 1 (2010): 56–71.

6. Duranton and Puga, "Urban Growth and Its Aggregate Implications," 36.

7. The theoretical expression defines a price elasticity of supply, which governs how fast each city grows when prices rise. Alberto Saiz, "The Geographic Determinants of Housing Supply," *Quarterly Journal of Economics* 125, no. 3 (2010): 1253–96.

8. Duranton and Puga, "Urban Growth and Its Aggregate Implications," 2, quoting Masahisa Fujita and Jacques-François Thisse, *Economics of Agglomeration: Cities, Industrial Location, and Regional Growth* (Cambridge: Cambridge University Press, 2002), 93.

TAKING URBAN COSTS SERIOUSLY

Duranton and Puga note that urban economists have "devoted little attention" to estimating costs, "focusing instead" on benefits.[9] An exception is Alain Bertaud. His book *Order without Design: How Markets Shape Cities* spends a great deal of space discussing urban costs. City planners, Bertaud contends, have neglected their crucial role of planning public-sector infrastructure in ways that complement private-sector activity.

Almost as an aside, Duranton and Puga make two substantive advances in the study of urban costs. In the standard urban model, all residents commute to the city center. But that's not true, of course. In Duranton and Puga's model, someone who chooses to live one mile farther from downtown will have a longer commute, but it will be less than a mile farther because they have different workplaces. They call the rate at which a commute grows with distance from downtown an "urban cost parameter."

The second advance is to show, from the logic of the model, that there are three different ways to estimate that urban cost parameter. It can be estimated directly: how much do people drive based on where they live? The model implies that the parameter can also be estimated from home prices, since people with longer commutes pay less for their houses. Likewise, in the model, larger cities have higher downtown prices, providing a third way to estimate the same parameter.

Of course, the real world is much more complicated. One would not expect estimates based on driving distance, within-metro home prices, and between-metro home prices to all line up the way Duranton and Puga's model forces them to. But they do. The three estimates are 0.0729, 0.0734, and 0.0721; i.e., doubling the distance from downtown increases one's commute distance by just 7 percent. This is the "taking the model to the data" equivalent of pitching a perfect game.

CHOOSING REGULATION

Commuting distance is the limiting factor on urban growth from a potential migrant's perspective. But the congestion of existing commutes is, as Duranton and Puga show, the more fundamental limit to growth, because it induces current inhabitants to vote for stricter regulation.

They model local political economy as a once-in-a-generation choice that sets a regulatory fee at the level that maximizes incumbent well-being. Newcomers must pay the fee in order to build a house at the edge of the city. This implicitly caps the number of migrants.

POLICY SIMULATIONS

The authors match the model to US metro data, under the implicit assumption that the largest metros are the most productive. Then they simulate the model under different regulatory regimes, either capping metro size (and destroying houses!) or removing regulations.

With each simulation they can report both the gross and the net increase in income (if one accepts commuting time as "negative income"). The simulations where they destroy large numbers of homes are not very useful; the broader impacts of small-city policy are obscured by the (obviously) massive costs to those whose homes are destroyed. In any case, no one except Philip Bess is suggesting this.[10]

9. Duranton and Puga, "Urban Growth and Its Aggregate Implications," 24.
10. I wish I were kidding. Philip Bess, "God and Man in Nature's Metropolis" (lecture, Eliot Society, College Park, MD, January 20, 2018).

Total urban deregulation would lead, in Duranton and Puga's model, to several megacities arbitrarily capped at 40 million. Nominal income would grow 34.9 percent; real income would grow 25.7 percent. The nonmetropolitan population would drop from 75 million to 4 million.

A useful addition to the paper would be simulations of moderate policies, such as a 10 percent decrease in planning regulations.

Also useful, but a little more work to achieve, would be an extension of the model to allow regulatory costs to differ for idiosyncratic reasons. This would, among other things, allow the authors to better match the model to real-world estimates of productivity. The San Jose metro area is extremely productive but not very large; regulatory intensity (and land unavailability) helps explain that gap. In fact, one can imagine an extension where the authors match the model to productivity, not size, and back out implicit regulatory costs. Detroit, rather than showing up as a high-productivity, high-regulation city (because of its size), would show up as a low-productivity city with free entry, which is more accurate.

WEAKNESS

The principal weakness in Duranton and Puga's work, as in Hsieh and Moretti's, is the lack of individual heterogeneity. It is reasonable to believe that people's contributions to innovation vary more than their contributions to traffic. It is also reasonable to think that more-innovative individuals have a greater incentive to relocate to places where their innovations will be more richly rewarded.

Thus, Silicon Valley and Manhattan attract especially productive, high-income people. Even when the absolute number of workers is low, as in Silicon Valley, the concentration of complementary talents can be enough to achieve large agglomeration benefits through selective migration to innovation clusters.

Contrary to the models, the next 35 million people to move to the Bay Area would probably not be as tech savvy or as risk loving as the first 5 million. The next 20 million people to move to New York would include a lower proportion of investment bankers willing to work 70-hour weeks.

Thus, although policy writers ought to cite Duranton and Puga with at least as much as enthusiasm as they have Hsieh and Moretti, the bolder predictions from homogeneous agent models are unlikely to be realized. The flip side of this is that the existing, regulation-constrained populations of the most productive cities must be much more productive than a homogeneous agent model can give them credit for being.

SPILLOVER EFFECTS

Although the most extreme predictions of agglomeration models should be met with skepticism, the main message is one that has philosophical as well as economic value: the spillovers in urban areas, what economists call "externalities," are mostly positive.

In introductory textbooks, economists universally introduce negative externalities first and with greater emphasis.[11] But if living close to other people created mostly negative value, cities would be poor. The rich would live in Aspen

11. The first externalities mentioned in the following textbooks are onion breath, antibiotic-resistant bacteria, pollution, and smog, respectively. Armen Alchian and William Allen, *Universal Economics*, ed. Jerry Jordan (Carmel, IN: Liberty Fund, 2018),

and Nantucket—as indeed they do when they do not need to be productive.

Instead, the biggest cities are the most productive places for entrepreneurs. These cities pay the highest wages. The home prices, which catch all the unobservable positives and negatives of city life, are highest in the densest locales. The biggest job markets yield the highest early-career wage growth.[12] Even in already dense New York, adding a new apartment building attracts more amenities to a city block.[13]

As Bertaud argues, the job of city planners is to ameliorate traffic and other forms of congestion to allow the powerful positive externalities to do their work. Duranton and Puga argue that current zoning is too strict from a national point of view, but just right from a local homeowner point of view. Breaking out of the current equilibrium will require creativity.

THE URBAN RECOVERY

The 2020 COVID-19 pandemic represents the revival of an urban cost as old as cities: the risk of disease spreading among a concentrated population. The initial wave of the virus has been admirably contained in hyper-dense Asian cities.[14] It remains to be seen whether transit-dependent cities will have more difficulty recovering. But the role of transportation should not be overstated: all agglomeration economies rely on human interactions through which a contagion can quickly spread.[15]

Disease is now, as ever, a threat to the extended interpersonal network that defines a thriving city. The benefits of concentration, so clearly elucidated in Duranton and Puga's pre-crisis paper, cannot be unlocked without physical safety.

City planners and public health departments can enable the recovery by investing in infrastructure that reduces the risk of disease transmission, whether of SARS-COV-2 or future viruses. Public handwashing stations at transit stations and restaurants, hands-free doors, wide sidewalks, and downtown sanitation workers may be high-return investments in 2020, 2021, and beyond.

A city's ability to respond quickly if and when the coronavirus flares up in future years will be crucial to minimizing the human and economic cost of each outbreak. The specifics of public health policy are beyond the scope of this paper, but their conceptual relationship to city thriving is familiar: containing the negative spillovers from agglomeration will unlock the larger, positive externalities.

37; Tyler Cowen and Alex Tabarrok, *Modern Principles of Economics*, 2nd ed. (New York: Worth Publishers, 2011), 175; N. Gregory Mankiw, *Principles of Economics*, 1st ed. (Orlando, FL: Dryden Press, 1998), 10; Steven Rubb and Scott Sumner, *Economic Principles: A Business Perspective* (New York: Worth Publishers, 2019), 161.

12. Jorge de la Roca and Diego Puga, "Learning by Working in Big Cities," *Review of Economic Studies* 84, no. 1 (2017): 106–42.

13. This partly offsets the supply-induced fall in rent that follows new apartment construction. Xiaodi Li, "Do New Housing Units in Your Backyard Raise Your Rents?" (working paper, December 16, 2019).

14. As of this writing, in April 2020.

15. Salim Furth, "Automobiles Seeded the Massive Coronavirus Epidemic in New York City," *Market Urbanism*, April 19, 2020.

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Salim Furth is a senior research fellow at the Mercatus Center at George Mason University. He studies regional, urban, and macroeconomic trends and policies and has testified before the US Senate and House of Representatives. Previously, he worked at the Heritage Foundation and Amherst College. His writing has been featured in *National Affairs*, *American Affairs*, *The City*, and *Public Discourse*, and he wrote regularly for the *Wall Street Journa*l's *Think Tank* blog. He earned his PhD in economics from the University of Rochester in 2011.