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Housing "Affordability" and Responses During Times of Stress: A Brief Global Review

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This paper is based on a presentation to the City University of Hong Kong Workshop on "Post-crisis Housing Market and Financial Stability: Recovery Without Affordability?" held virtually on July 9, 2020, with revisions.

That presentation and this paper are in turn based partly on several larger reviews of housing affordability, the coronavirus and its effects on housing and urban development, and potential shocks. Many colleagues have commented on and otherwise contributed to those efforts, including Brent Ambrose, Shlomo Angel, David Barker, Alain Bertaud, Julia Coronado, Morris Davis, Mike Eriksen, Eugene Flynn, Allen Goodman, Jacques Gordon, Richard Green, Marja Hoek, Harvey Jacobs, Kyung-Hwan Kim, Charles Ka Yui Leung, David Ling, Jaime Luque, Duncan Maclennan, Antonio Mello, Stani Milcheva, Norm Miller, Bertrand Renaud, Andy Reschovsky, Jenny Schuetz, Dale Whittington and Jiro Yoshido. Seminar participants at USC and Penn State as well as the participants in the City University of Hong Kong Workshop also provided useful suggestions. Naturally, none of these colleagues are responsible for the results.

I. INTRODUCTION

In recent years, the literature on housing "affordability" has exploded. Here are a dozen or so examples representing hundreds of papers. For data sources and evaluation, for example Ahir and Loungani (2019), Kallergis et al. (2018), Lupton and Vaisman (2016). Research papers abound, see for example Diamond and McQuade (2019), Leishman (2015), Albuouy, Ehrlich and Liu (2016) and Leung, Ng and Tang (2020). Policy studies are represented by Bertaud (2010), Freeman and Schuetz (2017), Glaeser, Gyourko and Saks (2005). There are many advocacy pieces such as Peppercorn (2016) and Charles and Guna (2019). Papers such as Quigley and Raphael (2004) blend some combination of the above.

But this conference takes place in 2020, when the Sars-COV-2 pandemic (hereafter the coronavirus, or simply the pandemic) is sweeping the globe. Problems which are analyzed under the rubric "housing affordability" predate the coronavirus, of course, but the pandemic is exacerbating these problems, both directly and indirectly.

Certainly, the pandemic will be top of mind to many for the rest of 2020 and another year at least. But the pandemic is not the last such shock we are likely to face in the next few decades.

The next section of this paper will review, briefly and non-technically, a few salient points about the pandemic and its effect on economies. The following section will discuss housing affordability in general, and add a few germane observations relevant to the current situation. Next we discuss some policy options, in general and in light of the pandemic. We end the paper with a very brief catalog of selected possible additional future shocks, examples of what might be faced after (and possibly during) the present pandemic.

II. THE ENVIRONMENT: THE PANDEMIC AND THE GLOBAL ECONOMY

A. Data on the Coronavirus

We begin with some basic data on the coronavirus. Figure 1 presents country level data on confirmed cases as of early October 2020, plotted by a commonly used measure of GDP per capita. Note the logarithmic scales. Each circle represents a single country, and the area of the circle is proportional to its recent population. Each circle is centered with a three letter ISO code identifying the country; a list of all the codes is available at: https://www.iban.com/country-codes.

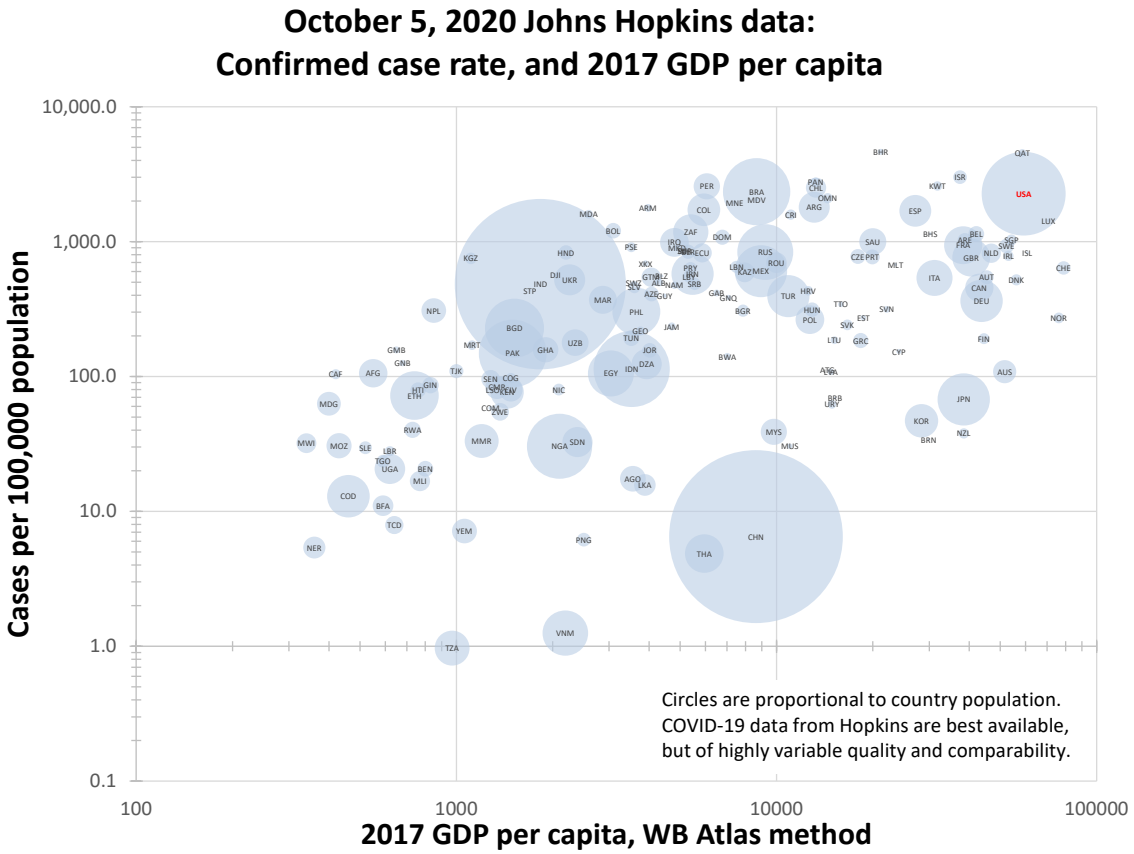

Figure 1

COVID-19 data from Johns Hopkins University's website are among the best comprehensive data readily available, but are still of highly variable quality and comparability. And of course, by the time this paper sees print, updating this data on this fast-moving pandemic will be necessary.[1]

Taking the data at face value, there appears to be a slight tendency for higher income countries to have higher population-adjusted caseloads. Several possibilities could underly such a pattern, and they are not mutually exclusive. While the outbreak apparently originated near Wuhan China, it's not surprising that the first cases outside China were countries with substantial travel linkages, in Europe and the United States. And while every country faces data challenges, lower-income countries have fewer resources, broadly speaking, so many do less

[1] See the Johns Hopkins University site https://coronavirus.jhu.edu/map.html or the coronavirus library updated regularly at http://reudviewpoint.blogspot.com/2020/03/a-small-posting-on-big-problem.html.

testing and therefore uncover fewer of the cases extant.[2] Future research will undoubtedly spend more time examining excess deaths, that is, spikes in mortality relative to long term trends. The United States is only one country that appears to undercount cases and deaths by a significant amount (Woolf et al. 2020).

Figures 1 is of course static. A convenient source for country specific trends is Our World in Data. We will not reproduce their charts here but an examination of their site at https://ourworldindata.org/coronavirus demonstrates that the time path of countries at similar levels today can be quite different. For example as of this writing, the United States and Brazil have similar caseloads (roughly 2,300 cases per 100,000 people) but in May when the U.S. was at about 500 per 100,000, Brazil was at 160; by the beginning of September, Brazil had caught up to the U.S. China of course started off ahead of other countries, as it was the epicenter of the first noticeable outbreaks, but with rigorous constraints on travel and strict public health measures put in place they have apparently kept cases at a low level since.

[2] See Schellekens and Sourouille (2020). While broadly low-income countries have extra challenges regarding resources, including public health institutions, as Arntsen (2020) notes, a number of countries that have experienced SARS, MERS and Ebola epidemics "punch above their weight" in such basic public health measures as testing and contact tracing.

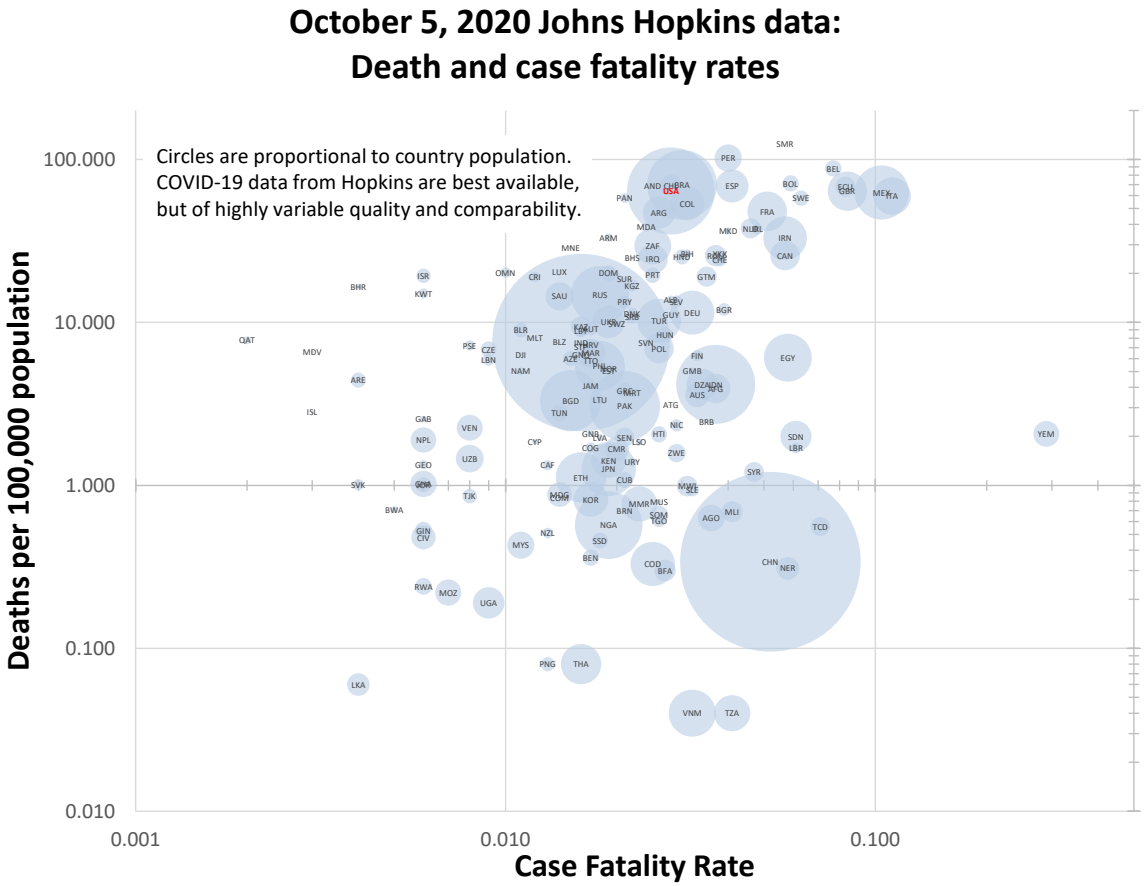

Figure 2

Figure 2 presents two more key variables, deaths per 100,000 population, and the case fatality rate. The United States is somewhere in the middle on the case fatality rate, but with about 2,300 deaths per 100,000, the U.S. has one of the highest death rates in the world. Our 210,000 deaths (early October 2020) are about five times the level we expect given the U.S. share of world population. For those who still think COVID-19 is equivalent to a typical flu season, U.S. deaths from influenza averaged 34,000 over the past five seasons.

Full discussion of Figures 1 and 2, all the possible qualifications, and detailed discussions of policies and determinants would take us too far afield for such a short note. But with over a million deaths worldwide, that itself probably a significant undercount, and still rising into the fall, the death toll from the virus already exceeds annual tolls from tuberculosis, malaria, and several other serious diseases (Deaton 2013).

Deaths are the most severe outcome and the one that many of us track most carefully, but it is only one cost of the pandemic. Morbidity, financial costs, shutdowns in the economy, medical costs, effects on housing, employment and many other spillovers from this virus are further

testaments to the disease's seriousness. A few of these, particularly housing, will be discussed further later in this paper. But first let us examine a few basics about how such a pandemic progresses, and how it may be stopped.

B. Some Very Basic Epidemiology[3]

Every beginning business or economics students, or student of epidemiology, is familiar with the properties of exponential growth, the first panel of Figure 3. Exponential growth is basically a process of repeated doubling of some variable, and early on our students are introduced, and properly amazed, at the implications of a long run of exponential growth at some non-trivial rate. The classic if apocryphal story from the 13th century Syrian scholar Ibn Khallikan still provides the best introduction. The story is of a king who offered to reward the inventor of chess. That worthy made a simple request; he asked the king for a grain of wheat on the first square of a chessboard, followed by 2 grains on the next square, 4 on the third, and so on. The king foolishly agreed, according to the story, before he computed 2^{64} which is actually a very large number indeed.[4] Thus physicist Albert Allen Bartlett's famous comment that "the greatest shortcoming of the human race is our inability to understand the exponential function."

[3] See Saracci (2010) for a brief and non-technical introduction to some other important concepts in epidemiology. MIT's Department of Biology has an excellent series of online video lectures about the science of the pandemic at https://biology.mit.edu/undergraduate/current-students/subject-offerings/covid-19-sars-cov-2-and-the-pandemic/.

[4] $2^{64} = 1.8 \times 10^{19}$ = 18 billion billon grains of wheat; that's about 400 years of today's annual wheat production.

Nonlinear growth processes

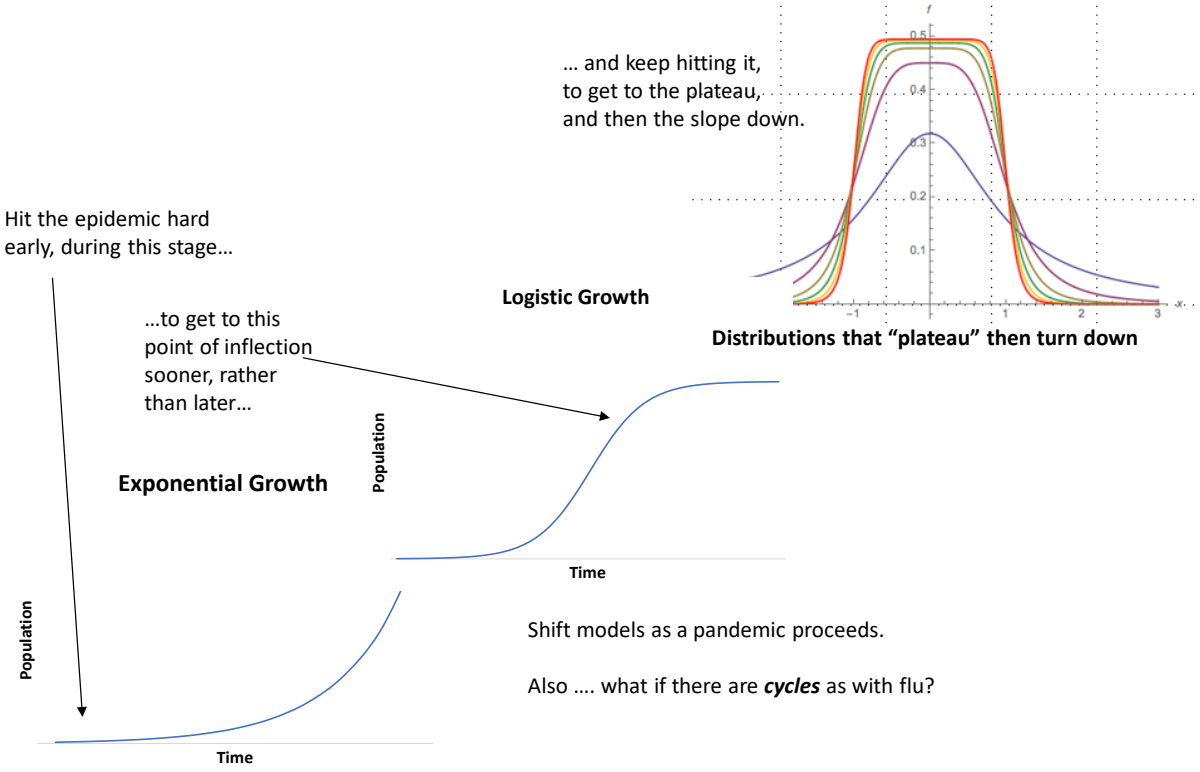

Figure 3

The relevance of this story, and of the exponential function, for the problem at hand is well known. Stop an epidemic early, before it overwhelms the public health system, and becomes a pandemic.

Of course, all the exponential processes we concern ourselves with, whether the spread of viruses or the growth of economic variables, have bounds, giving rise to another famous comment, by economist Herb Stein, "when something can't go on forever, it will stop." Many exponential growth processes slow down, or even morph into some other model entirely.[5] That includes epidemics. That is, the exponential function is only a useful description of epidemics and other growth processes early on. Even if there is 100% infection, with a finite population there *will* be a limit on how many people can be infected; in virtually all real world

[5] Another example: from 1996 to 2006, average real house prices grew by 7 percent per annum in the U.S. Investors and others who expected those growth rates to continue indefinitely – and there were more than there should have been – hadn't thought through the implication that caught the Syrian king: that continued 7 percent real growth in an economy growing at most 3 percent implies that asymptotically housing would become nearly the entire economy. Herb Stein strikes again.

cases, before that limit is reached, the growth process will slow down. In a stylized way it will move from looking like an exponential growth to, say, a logistic growth process, where there is a point of inflection (the second panel of Figure 3).

But if epidemics ever go away, they need to turn down some day. We need a third function, at least.

One candidate might be a Gaussian ("normal") process: growth appears exponential at first, peaks, then turns down. But Gaussian processes have a sharp peak, i.e. are bell shaped. An epidemic might be flatter on top. Weibull and other distributions might work better, i.e. the frequency distributions of infections, deaths etc. will not be strictly normal. Modelers examine related distributions that are "flat on top," have other properties, as in the third panel of Figure 3.[6]

Of course, that does not exhaust the possibilities, e.g. that there will be cycles or waves of periodic infection.

In terms of simple mathematics, our task is to attack the pandemic, or any serious infection, *early,* while the growth curve is still flat. How to do that is another matter. The next section presents some simple principles, known to all readers by now, that are proven effective tools for controlling such an epidemic.

C. A Thumbnail Guide to Public Health Measures in a Pandemic

In a pandemic, public health policy *is* economic policy. The idea that there is a sharp trade-off between public health measures and the economy is a false dichotomy (Lin and Meissner 2020). Figure 4 illustrates the three key policies that underly a successful, *early* response to infectious disease. Those are: test widely but appropriately for the presence of the disease; when tests are positive, quarantine the infected; and trace their contacts (Peto et al. 2020). Countries which took these steps early, like Korea, were largely successful in restraining the course of the pandemic, and largely avoided costly lockdowns (Choi 2020; Kucharski et al. 2020). Countries which did not – notably the United States – suffered high initial rates of infection, hospitalizations and deaths, and *then* introduced costly and poorly designed lockdowns. These were often highly politicized, incomplete, and ill-timed at best. Mask wearing has been sporadic, and has strangely morphed into a hot-button political issue. In general, much of the United States has neglected the serious policies required to stem local outbreaks and keep them under control (Altman 2020; Gerstein 2020; Yong 2020).[7]

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[6] The third panel of Figure 3 is discussed at https://stats.stackexchange.com/questions/203629/is-there-a-plateau-shaped-distribution. Extensive discussion of these and other models can be found at Chowell et al. (2016) and Sietos and Russo (2013).

[7] Korea and the United States are used here as examples. A detailed panel database of government responses to the pandemic is documented in Cheng (2020) and can be found at https://www.coronanet-project.org/.

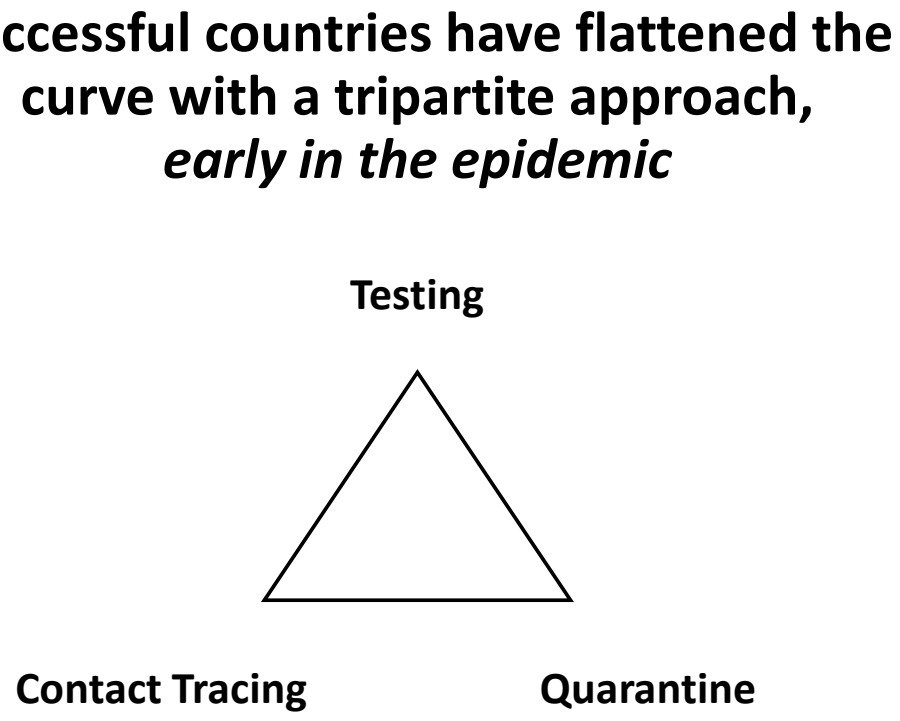


Figure 4

Of course, there are many other steps to be taken in support of the tripartite approach. Individuals need to wear masks, practice social distancing, and wash hands often and thoroughly. Governments need to ensure a plentiful and well-distributed supply of personal protective equipment (PPE) to health care workers and others in regular contact with the public such as transport workers, grocery clerks, etc. Macro and micro policies will be required to support incomes. An effective national health system, a government that relies on the best evidence as it evolves, transparency of information, and social trust are additional prerequisites of success. Shutdowns/shelter-in-place may be required if the tripartite approach is not in place sufficiently early. Ongoing study and rollout of treatments, and accelerated development of vaccines, will require substantial efforts by private and public sector alike. Eventually these will require widespread, subsidized dissemination of therapies and vaccines.

Testing but especially contact tracing and quarantine are much more feasible early in any epidemic. Once the epidemic is well established in the population the resources both financial and human grow along with the caseload, that is in early days exponentially. Furthermore, when large numbers of people are affected and tracked and quarantined, political opposition

may be more substantial. That's why it's important to test heavily and combine the testing with effective contact tracing and quarantine early on.

D. Economic Growth and Decline During and After the Pandemic

The pandemic has strained health systems, has put millions out of work at one point or another, disrupted supply chains, and inflicted simultaneous supply shocks and demand shocks on most national economies. The global economy has undoubtedly experienced a contraction larger than the initial months of the Great Financial Crisis/Great Recession. No consensus label has yet appeared, but we'll follow Diebold (2020) and take the Pandemic Recession as our working title.

Figures 5 and 6 plot data from 159 countries for which we were able to obtain estimates of 2019 GDP growth and forecasts of 2020 GDP growth from either World Bank World Economic Prospects or OECD Economic Outlook. The World Bank has much better coverage of lower- and middle-income countries but little country specific detail on much of Europe; whereas OECD presents separate results for many of the higher income countries.[8]

[8] Several countries are contained in both databases; the World Bank and OECD estimates/forecasts were similar over these two years, and where there was overlap, Bank data are used here. See https://www.oecd-ilibrary.org/economics/data/oecd-economic-outlook-statistics-and-projections_eo-data-en and https://www.worldbank.org/en/publication/global-economic-prospects#overview to obtain the data. The horizontal axis is 2017 GDP per capita in dollars using the World Bank's Atlas method. These are available from https://datacatalog.worldbank.org/dataset/world-development-indicators. We used 2017 data instead of the latest WDI year, 2018, because there were a number of missing values for 2017, and the differences between 2017 and 2018 did not make a material difference in the charts.

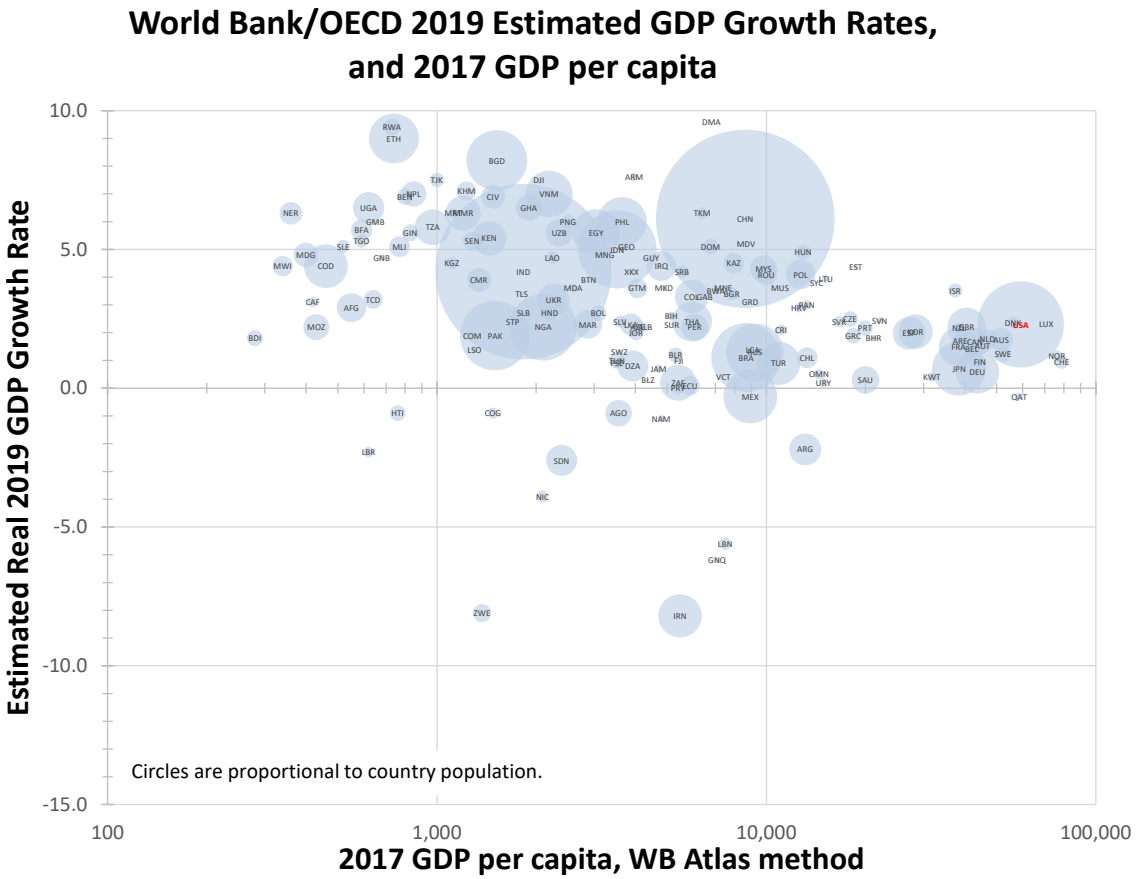


Figure 5

Taking these 2019 growth estimates at face value, Figure 5 shows that just before the pandemic, most economies were growing. The IMF's World Economic Outlook projected 3 percent aggregate global growth. Among the roughly 20 economies failing to grow pre-pandemic, the worst performers were Iran and Zimbabwe, shrinking by 8 percent; Equatorial Guinea and Lebanon, declining by 6 percent; Nicaragua declining by 4 percent and Sudan 3 percent; Argentina down 2 percent. At the other end, China was estimated to grow at 6 percent, about the same rate as the Philippines, Egypt, Tanzania and Myanmar. Ghana and Cote d'Ivoire were edging towards 7 percent growth while Rwanda and Ethiopia turned two of the best performances at 9 percent. The other Asian giant, India, grew at 4 percent. Korea's growth rate of 2 percent was disappointing for that long run top performer; the U.S. was just a bit over 2. Overall, while China was slowing down from the top growth rates of the previous decade, a number of African countries were performing well, albeit from a lower base.

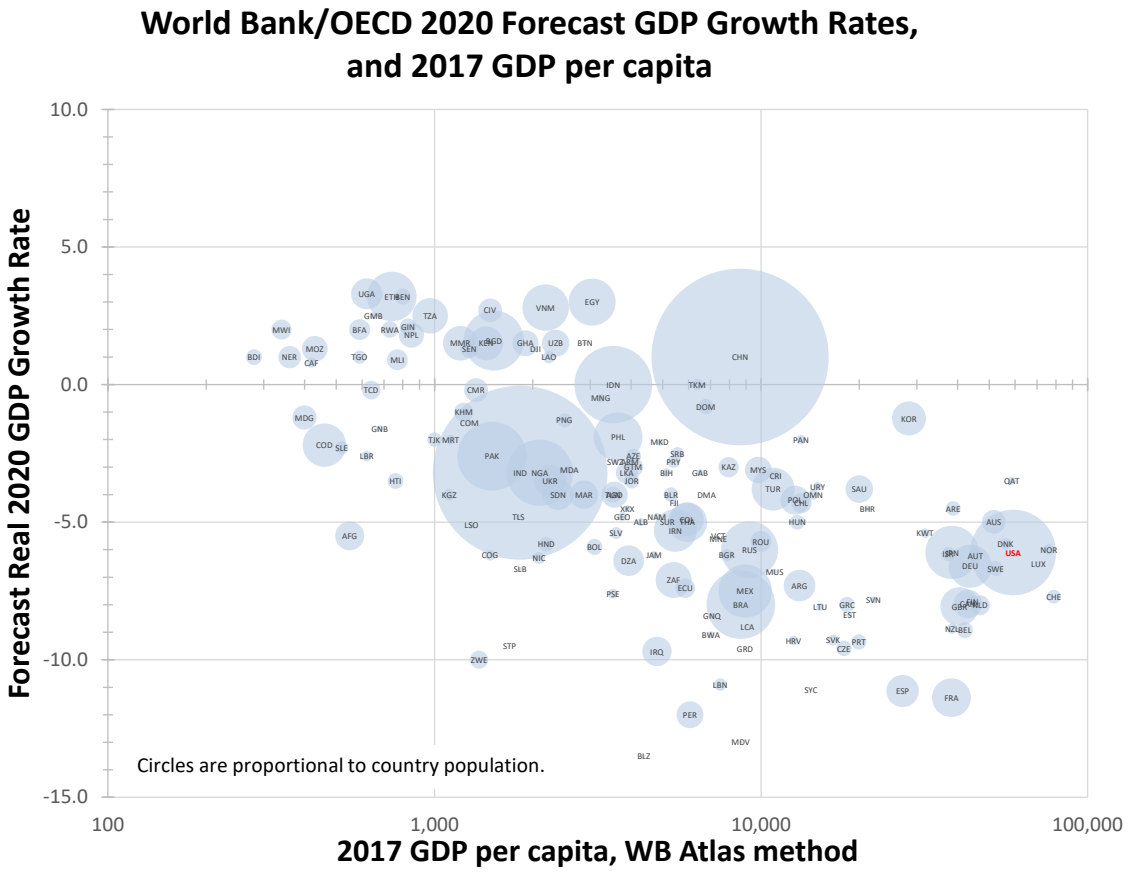


Figure 6

Figure 6 shows the decline in GDP is forecast to hit most countries. Overall, taking the World Bank and OECD 2020 GDP growth estimate forecasts at face value, these institutions expect world output to fall by about 5 percent in 2020. This is more than double the 2 percent decline in global GDP between 2008 and 2009, the height of the Global Great Recession.

Of the 159 countries for which either World Bank or OECD presents forecasts, 23 countries are forecast to have a GDP decline of 10 percent or more including such major economies as Peru, Iraq, France, Spain, Portugal, Belgium, the Czech Republic and Slovakia as well as Botswana, usually one of Africa's top performers. Among countries forecast to have substantial 7 or 8 percent declines we find the United States, India, and Russia. China's decline is forecast to be 5 percent.

Why does a 5 or 10 percent decline in GDP matter so much? The problem is not entirely the decline in GDP *per se*. If U.S. real per capita GDP falls by 10 percent, that country is back to the level of the beginning of 2014. If it falls by 20% (a larger drop than the U.S. saw in any year during the Great Depression), that takes the U.S. back to early 2002.

In terms of levels and material standard of living, life in the United States was certainly not intolerable then. The problem is that these losses are very unevenly distributed; in general they will fall more on the bottom of the income distribution. There's also the problem of loss aversion, that people feel the negative psychological effects of a 10 percent loss in income much more than the positive effects of a similarly sized increase in income.

A 5 or 10 percent decline in a country with much lower levels of income, with less in the way of government and social safety nets, would be an even more serious matter. For example, in lower-income countries, the pandemic puts recent progress in the decline in extreme poverty at risk. At the country level, research confirms that poverty rates decline whenever GDP grows faster, and also when the distribution of income becomes more even (Bourguignon 2004, Lakner et al. 2020). Table 1 presents the World Bank's projected global increases in extreme poverty, i.e. below the oft-used $1.90 per day threshold.[9] The Bank's June 2020 Global Economic Prospects forecasts an increase in economic inequality (larger Gini coefficients) as well as slower growth; the Table presents their estimates of the number of people and percentage of global population below this very low threshold based on alternative outcomes for growth and distribution. Their baseline case projects 71 million more individuals crashing back below this poverty threshold, and under alternative scenarios this number could easily double or more.

Table 1

Scenarios for effect of COVID-19 on 2020 extreme poverty ($1.90/day) from World Bank										
		Impact on global poverty headcount (millions)					Impact on global poverty rate (percentage points)			
		Increase in each country's Gini index					Increase in each country's Gini index			
		No change	1%	2%	5%		No change	1%	2%	5%
Growth in each country's real GDP	Baseline	71	90	105	162		0.9	1.2	1.4	2.1
	Downside	100	116	131	188		1.3	1.5	1.7	2.4
	2% less than downside	124	141	158	217		1.6	1.8	2.0	2.8

[9] These particular simulation results can be found at https://www.worldbank.org/en/topic/poverty/brief/projected-poverty-impacts-of-COVID-19. The $1.90/day poverty threshold has many limitations and many critics, but we present it here as a first look at such issues.

And of course, the ongoing recession is not just about GDP or income, or even poverty. Just to bring in one of many other crucial outcomes, from Ann Case and Angus Deaton, Deaths of Despair and the Future of Capitalism:

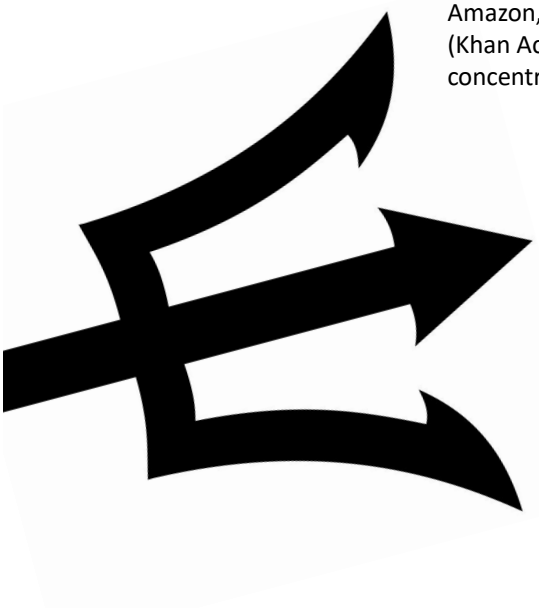
> *Jobs are not just the source of money; they are the basis for the rituals, customs, and routines of working-class life. Destroy work and, in the end, working-class life cannot survive. It is the loss of meaning, of dignity, of pride, and of self-respect that comes with a loss of marriage and of community that brings on despair, not just or even primarily loss of money.*

What shape can we expect for a recovery post 2020, or later? V, or U or L? Or the Nike "swoosh" (sharp decline, slow but steady rebound)? Or a W? The "usual suspects" – the World Bank, the IMF, OECD among others – also present forecasts for 2021. I have not presented those here. Most of those forecasts show a sharp rebound in 2021.

As always, the farther out we forecast – even two years instead of one – the shakier our ground. As much as I would like to see a sharp rebound in 2021, several barriers come to mind. In this situation, the economy is hostage to the virus, and unfortunately in October 2020 we are already seeing the resurgence many expected, as schools, restaurants, places of worship and other closed. As already alluded to, the U.S. response has been hamstrung by our politics; one could quickly list a few dozen other countries where the government response has ranged from disappointing (UK?) to disastrous (Brazil?) with many (India?) somewhere in between. Even countries with strong responses, like New Zealand, are grappling with a rebounding virus at this writing. On the plus side, the resources and speed devoted to vaccine development are unparalleled; but having one or more safe and effective vaccines in hand, say as 2021 dawns, will still require the better part of another year, if not more, to produce and distribute globally.

Whether recovery comes in 2021, or some time later, there will be other large issues to grapple with. Two immediately come to mind. The first issue, alluded to above, is that the recovery is likely to be very unequal. Figure 7 was developed with the U.S. in mind, but can readily be adapted to other countries. The second issue is that such a severe recession, accompanied by social and political disruptions, sows the seeds of slow growth going forward. Many countries will find their students' education seriously disrupted for at least two years. In the worst cases, students are out of school altogether, and in the "best" cases students in richer countries are learning online, which is a very imperfect substitute for in-class education. This hit to human capital will not easily be made up, and may well retard growth for many years past the recession itself.

V, U, L or W recovery – or maybe a "Trident?"
The distribution of income and wealth is about to worsen.



Beneficiaries of asset price inflation under Fed policies; tech firms, streaming platforms e.g. Google, Zoom, Netflix; selected pharma and biotechnology firms; apex online retailers with delivery channels e.g. Amazon, Walmart; food delivery. Online education (Khan Academy, Coursera). M&A will increase as firm concentration goes on steroids.

Middle class white-collar employees able to work from home; residents of cities/regions adopting effective public health policies, with high trust cultures wearing masks etc.; owners of single-family suburban housing.

High-school-and-below educated workers; households with fragile balance sheets; airline and other transport industries; hospitality and leisure sectors; bricks-and-mortar retail; much of the "gig economy" e.g. Uber; state and local governments and their employees; taxpayers in general; many charities; universities; highly leveraged commercial real estate, especially in CBDs.

Figure 7

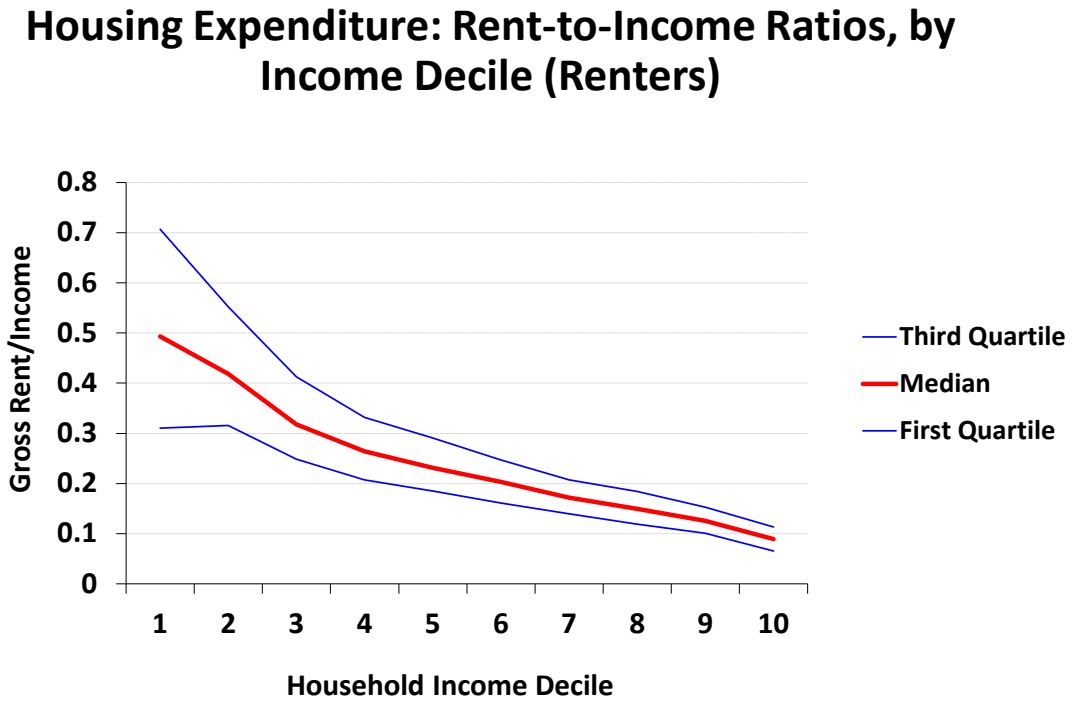
III. HOUSING "AFFORDABILITY:" CONCEPTS AND DEFINITIONS

"Affordable housing" has many meanings:

- Sometimes, what people are willing to pay.
- Sometimes, what people ought to pay.
- Sometimes, housing units that rent or sell for moderate amounts (e.g. rents less than 30 percent of income, or houses selling for less than $100,000).
- Sometimes, housing units in particular housing programs (e.g. public housing or Section 42 LIHTC units).
- Sometimes, housing units utilized by particular kinds of households (e.g. very low income).

A. Affordability from the Demand Side

Housing "affordability" is often measured by some threshold rent-to-income or price-to-income ratio. Such measures can be useful but also misleading, and always incomplete. Studies across a wide range of countries find that within markets the income elasticity of demand is positive but less than one, that is housing is a necessity (Malpezzi and Mayo 1985; Whitehead 1999; Malpezzi and Wachter 2012). This means rent-to-income ratios and similar measures based on some kind of budget share will systematically be higher for low income households because of basic preferences.



Source: 1993 American Housing Survey

Figure 8

Figure 8, taken from Green and Malpezzi (2003), uses American Housing Survey data to illustrate how housing's budget share actually changes with income within the United States.

To prepare Exhibit 3 Green and Malpezzi began with about 60,000 individual survey households, renters and owners. We sorted that data into 10 income deciles, where decile 1 is

the lowest income group, and decile 10 is the highest. We then focused on renters, and calculated the rent-to-income ratio for about 20,000 individual survey households. Within each income decile, we then calculated the median of the individual rent-to-income ratios. The thick red line in the middle presents the median rent-to-income within each of the 10 deciles. The blue lines above and below the median line are similar calculation for the first and third quartiles of rent-to-income within each group.

The pattern is strong and obvious. Budget shares fall as incomes rise, consistent with what economists call inelastic demand; in plain English, housing, like food, is a necessity. Further, the variance within deciles falls dramatically as income rises. This general pattern holds up even if we control for other household characteristics. Homeowner demand, not shown, is similarly inelastic. Whitehead (1999) and Malpezzi and Wachter (2012) review some of the large academic literature that repeatedly confirms the patterns in Figure 8. We have a lot more to learn about these cross-country patterns; but it seems clear that within a market, housing is a "necessity," i.e. a good with an income elasticity of demand less than one.

The key result for our purposes is that the constant rent-to-income ratio threshold used in most affordability calculations runs counter to the empirical evidence of how households actually spend their money. If we adopt the willingness-to-pay or ability-to-pay perspectives, we'd have this threshold rising as incomes fall. Making such a change is unrealistic, however, partly because it's complicated, and partly because it would be politically untenable. We will later use the standard affordability thresholds, but aware that as long as we use such a simple approach, "unaffordability will always be with us."

The usual threshold metrics are based on averages or medians; within market variance matters too. Nevertheless, these thresholds are ubiquitous, and simple measures can still be useful diagnostics if used keeping their shortcomings in mind. Choosing the best thresholds, the cleanest shirt in the dirty laundry, requires micro data and careful analysis to supplement simple diagnostics.

B. Other Elements of Affordability: the Distribution of Incomes, Transportation and Services; Homelessness

"Affordability" problems are not just about rents and/or housing values. When we examine the usual ratios, rent-to-income, price-to-income ratios and the like, obviously they are formed from two numbers. Only one of those numbers is primarily about the housing market. Affordability in any meaningful sense has to take account of incomes, as well as rents and prices, as emphasized in Leung, Ng and Tang (2020).

Related issues of concern can be extended further, to examine the role of wealth, demographics, and various special categories of housing consumers. These might include housing targeted for seniors, the disabled, refugees, students, military and veterans, particular

elements of the workforce including teachers and public safety workers, nursing and hospice care, housing for the incarcerated as well as the recently released, shelter from domestic violence and other forms of supportive housing. See, for example, Newman (2001), Fakhoury et al. (2002), OECD (2015).

Homelessness is another category which is broader than it first appears, as research demonstrates the homeless are by no means a homogenous population. These are important issues that we will not be able to address in this short note, although the pandemic and its related e current presentation. See, for example, Ellen and O'Flaherty (2010) and Plouin (2019) for general discussion, and Banerjee and Bhattacharya (2020) and World Health Organization (2020) for discussion of homelessness in the context of the pandemic.

When we examined the decline in GDP, above, we were examining aggregates which are correlated with, but not the same as, incomes. And as is well known, the distribution of income within a country is just as important a diagnostic for housing affordability as housing costs. Figure 9 presents representative data from the UK to remind us of this fact.[10]

[10] Data and figure retrieved from https://ourworldindata.org/incomes-across-the-distribution.

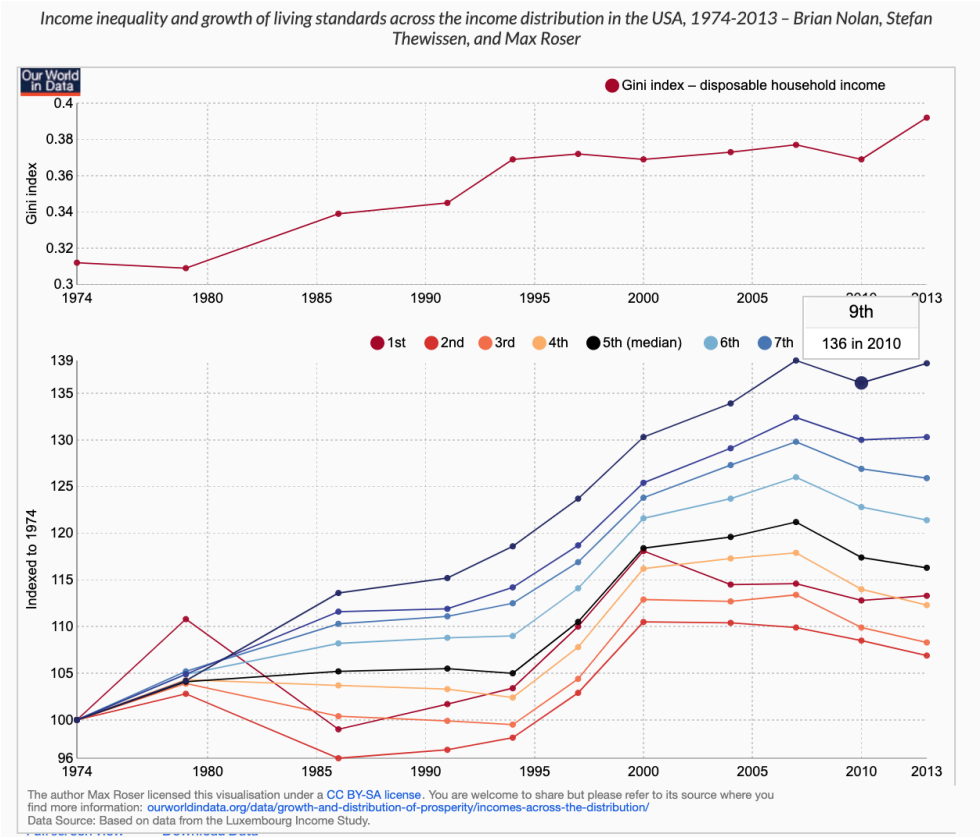


Figure 9

Utilities are an important component of shelter costs, whether households pay directly, or through their landlord.

Other recurrent costs, such as property taxes and maintenance need to be paid, or passed through in higher rents.

Transportation costs and housing costs are inextricably linked. Often, moving to a more affordable location means higher transportation costs.

Low-income urban households often don't own automobiles, which places an additional constraint on their location: they need to find a unit near public transit. See Glaeser Kahn and Rappaport (2008).

C. Affordability and Housing Supply

Figure 10 takes another shot at the idea of a simple median or average as a "sufficient statistic" for the state of a housing market. Depending on the distribution of units on offer, a market with a higher average or median rent (or market value) can actually have more "affordable" housing.

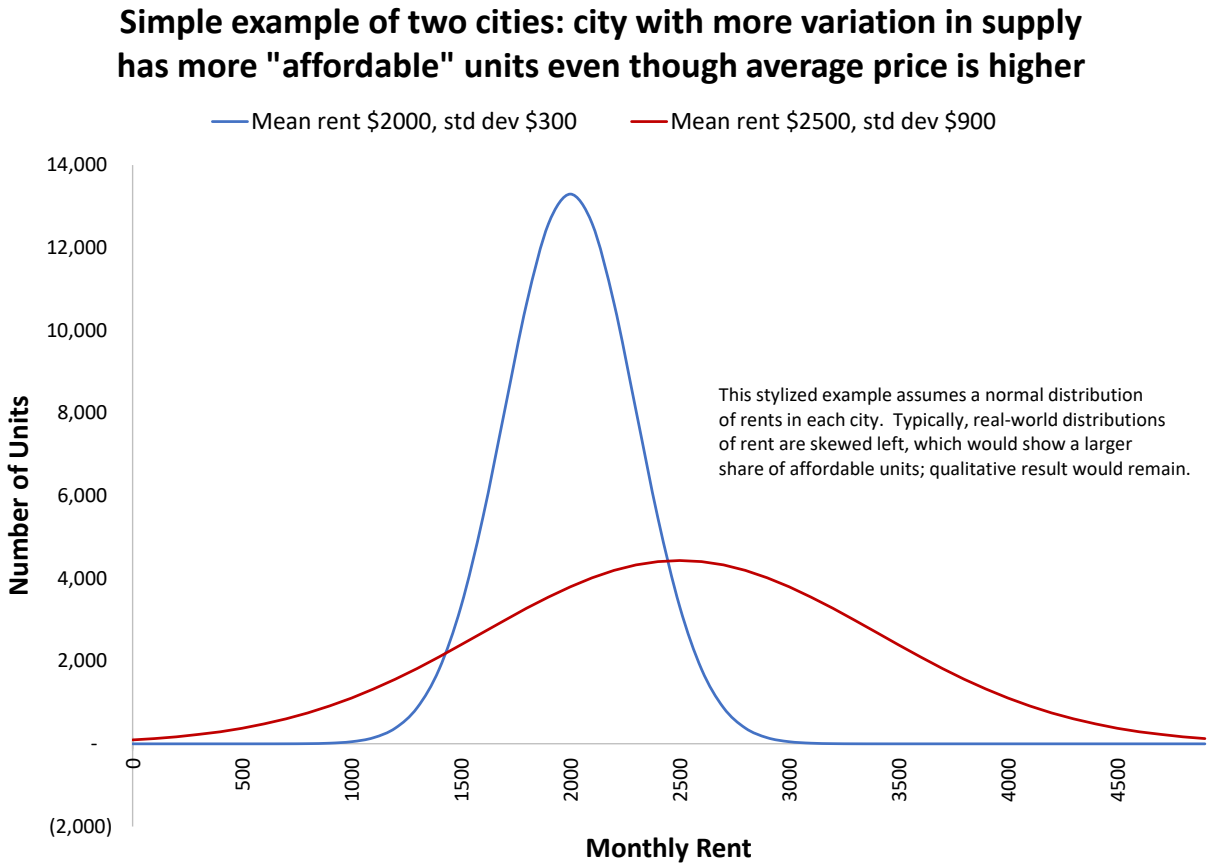


Figure 10

Figure 10 is very stylized, extremely so, to make the point an obvious one. When our focus is on the mean or median price or rent, we can miss important characteristics of the market.

In Figure 10, one city, which we'll call Bluetown, has an average rent of $2000 per month with a narrow standard deviation of $300. The other city, Red City, has a higher average rent, but a much wider variation in types of houses and costs of same. In Red City units on offer at $1,000 and even some at $500, But in Bluetown city if you want something at $1,000 or less, you are out of luck.

Of course from an affordability perspective, the worst of all possible worlds could be a narrow distribution at a very high price – a blue distribution shifted to the right.

Side note: in the real world, the distribution of rents and values usually truncated on the left, and skewed more to the right, compared to the nicely symmetric distribution that we show here. In such a market, the average or mean rent or value will be greater, sometimes substantially greater, than the median. None of this departure from normality negates the point we've made with this Figure: cities with a wider distribution of housing product on offer are more affordable, everything else equal.

Sometimes it's important to focus on a particular market segment, e.g. if there is a "missing middle" of the market or market is no producing for low income households. A well-functioning market produces for the high-end as well, or programs for the middle and low end will not succeed.

There are numerous examples of markets not so producing in which low-income production programs are taken over by higher income but poorly housed households (especially if these latter are politically well-connected). See for example the case of Nairobi's public housing in the 1980s (Westin 1985). Nevertheless, housing markets are often tilted against low income consumers. See examples from Malaysia (Hannah et al.), Africa (Rust et al.)

Another common fallacy in discussion of "affordable" housing is to focus exclusively, or nearly so, on the price and composition of new construction. In all but the fastest growing countries, new construction is generally 1-3% of the total stock in any given year.

Programs that try to mandate "affordable" new construction are rarely effective. For example, studies of U.S. "Inclusionary zoning" programs find that at most 3-7% of new units are labeled "affordable." Even at full bore new construction, 7% of 3% is 0.2% of a city's housing stock.

Despite the common focus on public production programs (public housing, council housing) most affordable housing comes from "filtering." That is, as homes age, they often filter down to become affordable housing.

Specifically, as units "filter down," they pass from higher-income households (owners or tenants) to lower-income households. Units can also "filter up"—that is, pass from poor households to those with higher incomes, if a neighborhood is undergoing "revitalization" or "gentrification."

There are three different definitions of filtering:

- "Income filtering," based on changes in the income of households living in the unit;
- "Price filtering," based on changes in price per unit of housing services from a unit ; and
- "Quantity filtering," based on changes in quantity of housing services from a unit.

Figure 11, from Rosenthal (2014) illustrates income filtering in U.S. housing.

Rosenthal repeat income indexes: renter filtering in the U.S.

Renters of new housing are, on average, the highest income renters. (No surprise!)

As units age, filtering occurs and average incomes of tenants served declines, by about 2 percent per year; until relative incomes level off when units are about 30 years old.

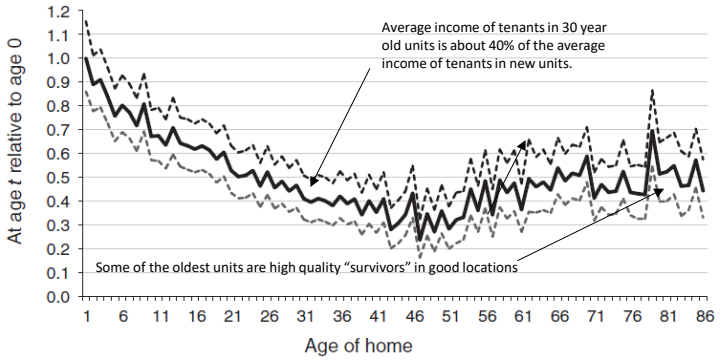


Figure 11

There are ways to make filtering more effective; and for that matter, some perverse policies can impede it. Among best practices we can mention:

- Don't unduly restrict new construction, even at the high end. Today's new construction is tomorrow's filtered, "affordable" housing.
- High income tenants will not go away; without new construction, there will be more "filtering up," i.e. gentrification of desirable older properties.
- Be careful about regulations, taxes etc. that discourage the subdivision of existing units, "granny flats," reasonable numbers of unrelated roommates.
- Maintain/improve transportation networks and public schools, complementary investments benefiting all but especially low- and moderate-income households.
- Undertake applied research on possible "omitted middle" housing stock and, if necessary, remedies.
- Mobility, turnover, can increase the effectiveness of filtering. Don't impede!

IV. SOME POLICY RECIPES

There are many books and papers that advocate a simple solution to housing affordability, sometimes referred to as a "silver bullet" solution. Malpezzi (2015) lists some of them and provides representative references; Figure 12 is reproduced from that presentation.

Sometimes it seems like the answer to housing problems is simple. There are advocates for each of the following as the "silver bullet" that will "solve most housing problems."

- More public housing.
- Get rid of public housing.
- Control rents.
- Get rid of rent controls.
- "Sites and services" projects (low cost land development).
- Give households formal title to their houses and land.
- "Inclusionary zoning" that requires developers to build a certain amount of "affordable" housing.
- Upgrading houses and neighborhoods.
- Stop "gentrification."
- Recognize housing as a fundamental "right."
- Smaller lot sizes, higher density.
- Community land trusts.
- More mass production techniques in housing construction.
- "Henry George" 100% taxation of land rent.
- Lower mortgage rates, lower down-payment requirements, lengthen mortgage maturities.
- Strengthen mortgage underwriting and reverse policies on the preceding bullet point.
- Increase private investment.
- Penalize "speculators."
- *Many more we could list…*

Notice that the "silver bullet" solutions on offer are often inconsistent, and sometimes diametrically opposed.

Figure 12

Bouillon (2012), InterAmerican Development Bank, Room for Development evaluates such solutions well:

"There is no silver bullet to solve the complex maze of housing issues… but there are discernible paths in the right direction. The solutions should be tailored to local needs, comprehensive, and attend to the different aspects of the problem. They should be pragmatic, rather than ideological…"

In this section, drawing on a number of policy reviews including Angel and Mayo (1993), Bertaud (2018), Bouillon (2012), Glaeser and Gyourko (2008), Hoek-Smit (2011), Malpezzi (2015), Salvi del Pero et al. (2016) and Whitehead (1999), among others.

Taken as a whole, those studies argue that the fundamental causes of affordability problems are usually the result of some combination of

- Low incomes, highly unequal distributions of income, poverty (these three are related but they are not the same)
- Inappropriate land use and development regulations
- Difficult physical geography
- Market failures in housing finance
- Government failures in housing finance
- Inadequate infrastructure

Cutting through housing affordability problems can often be fruitfully approached through a two-pronged approach. On the supply side, reform real estate institutions and regulations, as emphasized in many of the sources above as well as Barker (2006) and Monkkonen and Ronconi (2013). On the demand side, some form of housing voucher or allowance is often an efficient and equitable way to subsidize appropriate households, as emphasized above and in Griggs and Kemp (2012). Globally, many countries have been moving from supply-side programs (public housing, council housing) to demand-side programs, as documented in Hills et al. (1990).

Housing allowances or vouchers take on a particular importance whenever there is need for emergency income support. Detailed policy options were developed for the U.S. during the Great Financial Crisis by Davis et al. (2009) and Foote et al. (2009). The circumstances were somewhat different then, when the initial focus was on households facing mortgage defaults in the face of high unemployment and the collapse of a housing price boom; now renters are among the first in line for help. Nevertheless, readers of those plans will find a number of general principles that can be readily adopted to conditions in other countries and in a situation where renters and homeowners alike face defaults.

On the regulatory front, systems vary enormously from country to country, and sometimes within countries. Here we present some general observations that can help frame one's reading of more detailed explorations like Bertaud, Barker, and others.

Cost and benefit of regulatory actions is often difficult. Consider a system of "regulatory triage." Figure 13 presents a simple overview schema. Some regulations have benefits that clearly exceed costs – e.g. well-designed fire codes. Retain these, enforce them, and consider strengthening where necessary.

Some regulations have costs that clearly exceed benefits. To give one example, Mumbai's overly stringent FSI (floor space index, often called FAR or floor area ratio in other countries) has been shown to be an example of such a regulation by Bertaud (2004). Relaxation is indicated (and is underway).

The cost-benefit ratio of other regulations may be indeterminate. In such in-between cases we may temporarily table the discussion while we focus on the other regulations that require strengthening, or modification, or removal. But in due course, more applied research may shed new light on this third class.

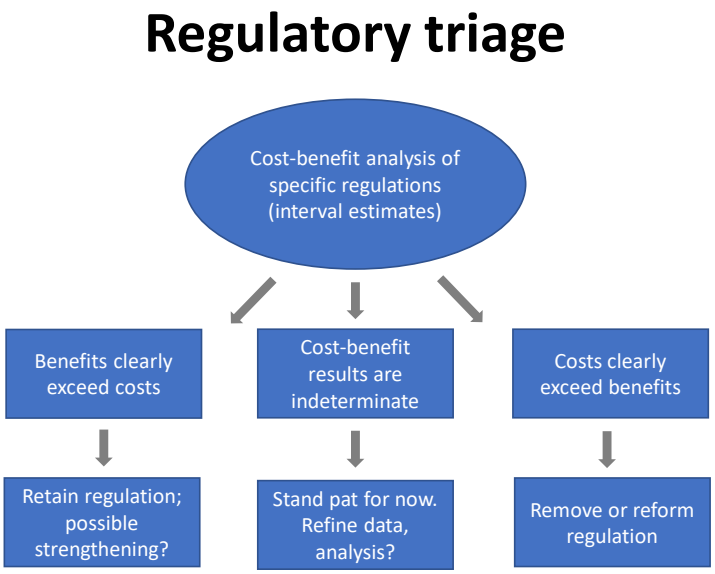


Figure 13

During the pandemic several classes of regulation have come to the fore and posed some thorny questions. One in particular that comes up is imposing or strengthening rent controls, in the face of significant numbers of renters facing unemployment. This is usually coupled with a discussion of "second generation" rent controls, which vary in design but are generally less draconian than the sorts of controls put in place in many countries during wartime (Fetter 2016), or the strict controls on the housing occupied by Indian civil servants. Arnott (1995) presents a thorough survey of the design issues in second generation controls; Turner and Malpezzi present a wealth of empirical evidence on costs and benefits of different types of controls.

The idea that we'd use the pandemic as an opportunity to implement "modern" rent control raises some issues. True, second generation rent control is better than the old-fashioned rent freezes, but over time they can perform poorly on both efficiency and distributional grounds.

In fact a central lesson of the Turner-Malpezzi review of rent control research is that the distributional effects can actually be perverse.

This discussion of policies, focusing some broad comments on housing allowances and regulations, hardly exhausts the subject. Other important issues that we've said little about here, but which would be discussed more fully if unconstrained would surely include more on the special problems faced in low-income informal settlements (Buckley 2020); finance (Hoek; Renaud); infrastructure (Banerjee and Morella 2011; Litman 2013) and the political economy of reforms (Kim and Kim 2000). Readings cited throughout this paper can provide additional details about how to evaluate and improve a wide range of housing policies, and perforce, affordability.

V. SCENARIOS; FUTURE STRESSES?

Figure 14

At the 2018 AREUEA/AsRES conference in Songdo (near Seoul) Korea, I presented a draft of "The Future of Real Estate," a joint project with Morris Davis and Julia Coronado. Obviously, we nailed our prediction! Well, not really, it was the last point mentioned on a slide full of risks.

Cities are resilient to shocks, even pandemics. But not *necessarily* to trends. An epidemic/pandemic, a hurricane, a bombing, are one-time shocks, of limited duration. Cities, their populations, and their housing stocks can recover from extreme shocks, even weapons of mass destruction (Davis and Weinstein 2002); especially with an appropriate government response. Contrast East and West German cities and housing stocks post WWII.

Climate change (including but not limited to sea level rise) is not a limited duration shock. It's a permanent shift in the environment. Venice, Mumbai, New York, Miami, Guangzhou, Newport News are among many cities facing something much more difficult than a pandemic, over the next century.

Changes in demand, technology can be shocks, or trends. A trend: steelmaking is not coming back to Pittsburgh or Birmingham. Cities can adapt to trends, e.g. changing economic base; such adaptation is costly and requires appropriate business and public policies.

The pandemic is a shock. By itself, it also serves as a catalyst for ongoing urban decentralization. If we learn from the pandemic and improve public health measures and political responses, we'll be much better prepared for future pandemics. (And perhaps other shocks).

Climate change, technological change (ubiquitous high-quality telecommunication, the Internet of Things, AI, virtual reality…), increased migration including growth in refugee populations are among trends that will fundamentally affect the location and form of cities going forward. Will political systems rise to the challenges, or will continuing polarization and the attractions of "blood-and-soil" politics inhibit required responses?

VI. REFERENCES

Ahir, Hites, and Prakash Loungani. "Managing House Price Booms: Evolution of IMF Surveillance and Policy Advice." In Hot Property, 83-95: Springer, 2019.

Albouy, David, Gabriel Ehrlich, and Yingyi Liu. "Housing Demand, Cost-of-Living Inequality, and the Affordability Crisis." National Bureau of Economic Research, 2016.

Angel, Shlomo, and Stephen K Mayo. Housing: Enabling Markets to Work. Washington D.C.: World Bank., 1993.

Arntsen, Emily. "To Deal with Covid-19, the Us Should Look to Countries in Asia and Africa." Northeastern University, 2020.

Banerjee, Debanjan, and Prama Bhattacharya. "The Hidden Vulnerability of Homelessness in the Covid-19 Pandemic: Perspectives from India." SAGE Publications Sage UK: London, England, 2020.

Banerjee, Sudeshna Ghosh, and Elivira Morella. Africa's Water and Sanitation Infrastructure: Access, Affordability, and Alternatives. World Bank, 2011.

Barker, Kate. Barker Review of Land Use Planning: Final Report, Recommendations. UK Treasury: Her Majesty's Stationery Office Books (TSO), 2006.

Bertaud, Alain. "Mumbai FSI Conundrum: The Perfect Storm: The Four Factors Restricting the Construction of New Floor Space in Mumbai." 2004.

———. Order without Design. MIT Press, 2018.

Bouillon, Cesar Patricio, ed. Room for Development: Housing Markets in Latin America and the Carribean. Washington, DC: Inter-American Development Bank, 2012.

Bourguignon, François. "The Poverty-Growth-Inequality Triangle." In Poverty, Inequality and Growth, edited by Agence Française de Développement, 69: Proceedings of the AFD-EUDN Conference, 2003, 2004.

Buckley, Robert M. "Targeting the World's Slums as Fat Tails in the Distribution of Covid-19 Cases." Journal of Urban Health, 2020.

Case, Anne, and Angus Deaton. Deaths of Despair and the Future of Capitalism. Princeton University Press, 2020.

Charles, Alice, and Dilip Guna. "10 Ways Cities Are Tackling the Global Affordable Housing Crisis." World Economic Forum, 2019.

Charlton, Emma. "This Is the Critical Number That Shows When Housing Breaks Down." World Economic Forum, 2019.

Cheng, Cindy, Joan Barceló, Allison Spencer Hartnett, Robert Kubinec, and Luca Messerschmidt. "Covid-19 Government Response Event Dataset (Coronanet V. 1.0)." Nature human behaviour 4, no. 7 (2020): 756-68.

Chowell, Gerardo, Lisa Sattenspiel, Shweta Bansal, and Cécile Viboud. "Mathematical Models to Characterize Early Epidemic Growth: A Review." Physics of life reviews 18 (2016): 66-97.

Coronado, Julia, Morris A Davis, and Stephen Malpezzi. "Real Estate and the Economy: Some Recent History, and Future Scenarios." Songdo, South Korea: Presentation to the Asian Real Estate Society, 2018.

Davis, Donald R, and David E Weinstein. "Bones, Bombs, and Break Points: The Geography of Economic Activity." American Economic Review 92, no. 5 (2002): 1269-89.

Davis, Morris A., Stephen Malpezzi and François Ortalo-Magné. "The Wisconsin Foreclosure and Unemployment Relief Plan (Wi-Fur)." James A. Graaskamp Center for Real Estate, http://www.bus.wisc.edu/realestate/wi-fur/.

Deaton, Angus. The Great Escape: Health, Wealth, and the Origins of Inequality. Princeton University Press, 2013.

Diamond, Rebecca, and Tim McQuade. "Who Wants Affordable Housing in Their Backyard? An Equilibrium Analysis of Low-Income Property Development." Journal of Political Economy 127, no. 3 (2019): 000-00.

Diebold, Francis X. "Real-Time Real Economic Activity: Exiting the Great Recession and Entering the Pandemic Recession." National Bureau of Economic Research, 2020.

Ellen, Ingrid Gould, and Brendan O'Flaherty. How to House the Homeless. Russell Sage Foundation Publications, 2010.

Fakhoury, Walid KH, Alison Murray, Geoff Shepherd, and Stefan Priebe. "Research in Supported Housing." Social psychiatry and psychiatric epidemiology 37, no. 7 (2002): 301-15.

Fetter, Daniel K. "The Home Front: Rent Control and the Rapid Wartime Increase in Home Ownership." The Journal of Economic History 76, no. 4 (2016): 1001-43.

Foote, Chris, Jeff Fuhrer, Eileen Mauskopf, and Paul Willen. "A Proposal to Help Distressed Homeowners: A Government Payment-Sharing Plan." http://www.bos.frb.org/economic/ppb/2009/ppb091.htm.

Freeman, Lance, and Jenny Schuetz. "Producing Affordable Housing in Rising Markets: What Works?". Cityscape 19, no. 1 (2017): 217-36.

Gerstein, Daniel M. "Assessing the Us Government Response to the Coronavirus." Bulletin of the Atomic Scientists 76, no. 4 (2020): 166-74.

Gibb, Kenneth, Duncan Maclennan, and Mark Stephens. "Innovative Financing of Affordable Housing International and Uk Perspectives." York, UK: Joseph Rowntree Foundation, 2013.

Glaeser Edward, L., and Joseph Gyourko. "Rethinking Federal Housing Policy How to Make Housing Plentiful and Affordable." American Enterprise Institute for Public Policy: Project of National Research Initiative (2008).

Glaeser, Edward L, Joseph Gyourko, and Raven E Saks. "Why Have Housing Prices Gone Up?". American Economic Review 95, no. 2 (2005): 329-33.

Glaeser, Edward L, Matthew E Kahn, and Jordan Rappaport. "Why Do the Poor Live in Cities? The Role of Public Transportation." Journal of Urban Economics 63, no. 1 (2008): 1-24.

Green, Richard K., and Stephen Malpezzi. A Primer on U.S. Housing Markets and Housing Policy. American Real Estate and Urban Economics Association Monograph Series. Washington, D.C.: Urban Institute Press, 2003.

Griggs, Julia, and Peter A Kemp. "Housing Allowances as Income Support: Comparing European Welfare Regimes." International Journal of Housing Policy 12, no. 4 (2012): 391-412.

Handbury, Jessie. "Are Poor Cities Cheap for Everyone? Non-Homotheticity and the Cost of Living across Us Cities." NBER Working Paper No. 26574, 2019.

Hannah, Larry, Alain Bertaud, Stephen Malpezzi, and Stephen K Mayo. "Malaysia: The Housing Sector; Getting the Incentives Right." World Bank Sector Report 7292 (1989).

Hills, John, Franz Hubert, Horst Tomann, and Christine ME Whitehead. "Shifting Subsidy from Bricks and Mortar to People: Experiences in Britain and West Germany." Housing Studies 5, no. 3 (1990): 147-67.

Hoek-Smit, Marja C. "Government Policies and Their Implications for Housing Finance." In Housing Finance in Emerging Markets, 49-81: Springer, 2011.

Kallergis, Achilles, Shlomo Angel, Yang Liu, Alejandro M Blei, Nicolas Galarza Sanchez, and Patrick Lamson-Hall. "Housing Affordability in a Global Perspective." Cambridge, MA: Lincoln Institute of Land Policy (2018).

Kim, Chung-Ho, and Kyung-Hwan Kim. "The Political Economy of Korean Government Policies on Real Estate." Urban Studies 37, no. 7 (2000): 1157.

Kucharski, Adam J, Petra Klepac, Andrew Conlan, Stephen M Kissler, Maria Tang, Hannah Fry, Julia Gog, John Edmunds, and CMMID COVID-19 Working Group. "Effectiveness of Isolation, Testing, Contact Tracing and Physical Distancing on Reducing Transmission of Sars-Cov-2 in Different Settings." medRxiv (2020).

Lakner, Christoph, Daniel Gerszon Mahler, Mario Negre, and Espen Beer Prydz. "How Much Does Reducing Inequality Matter for Global Poverty?" (2020).

Leishman, Chris. "Housing Supply and Suppliers: Are the Microeconomics of Housing Developers Important?". Housing Studies 30, no. 4 (2015): 580-600.

Leishman, Chris, and Steven Rowley. "Affordable Housing." The Sage handbook of housing studies (2012): 379-96.

Leung, Charles Ka Yui, Joe Cho Yiu Ng, and Edward Chi Ho Tang. "What Do We Know About Housing Supply? The Case of Hong Kong Sar." Economic and Political Studies 8, no. 1 (2020): 6-20.

———. "Why Is the Hong Kong Housing Market Unaffordable? Some Stylized Facts and Estimations." Federal Reserve Bank of Dallas: Globalization Institute Working Paper 380, 2020.

Lin, Peter Zhixian, and Christopher M Meissner. "Health Vs. Wealth? Public Health Policies and the Economy During Covid-191." COVID Economics (2020): 85.

Litman, Todd. "Transportation Affordability: Evaluation and Improvement Strategies." (2013).

Lupton, Shaw, and Ehtan Vaisman. "Naturally Occuring Affordable Housing." In NAAHL and ULI Symposium, 2016.

Malpezzi, Stephen. "Housing Policy in Developing/Emerging Markets: Ingredients, Techniques and Recipes." In Symposium on Sustainable Global Urbanization. Philadelphia: Penn Institute for Urban Research, 2015.

———. "Myths and Realities of Affordable Housing: Some International Lessons." Presentation to University College London Conference, The Case of Affordable Housing: A Global Perspective on Financing and Institutional Ownership, 2019.

———. "A Teaching Library on Covid-19, Health Care, the Economy, and Real Estate." PowerPoint library, 2020.

Malpezzi, Stephen, and Stephen K. Mayo. "The Demand for Housing in Developing Countries: Empirical Estimates from Household Data." Economic Development and Cultural Change 35, no. 4 (July 1987): 687-721.

Malpezzi, Stephen, and Susan M. Wachter. "Housing Demand." In International Encyclopedia of Housing and Home, edited by Susan J Smith: Elsevier, 2012.

Miller, Norman G. "Blurred Lines, Disruptions and the Future of Real Estate." Presentation to MIT Conference on Real Estate, 2017.

Monkkonen, Paavo, and Lucas Ronconi. "Land Use Regulations, Compliance and Land Markets in Argentina." Urban Studies (2013).

Newman, Sandra J. "Housing Attributes and Serious Mental Illness: Implications for Research and Practice." Psychiatric Services 52, no. 10 (2001): 1309-17.

Peppercorn, Ira. "Can We Create Affordable Housing in the World's Fastest Growing Cities?": Yale Insights, 2016.

Peto, Julian, James Carpenter, George Davey Smith, Stephen Duffy, Richard Houlston, David J Hunter, Klim McPherson, et al. "Weekly Covid-19 Testing with Household Quarantine and Contact Tracing Is Feasible and Would Probably End the Epidemic." Royal Society open science 7, no. 6 (2020): 200915.

OECD. Integrating Social Services for Vulnerable Groups: Bridging Sectors for Better Service Delivery. Paris2015.

Plouin, Marissa. "Affordable Housing and Homelessness: Challenges across the OECD." In Presented to the UN Expert Group Meeting on Affordable Housing and Social Protection Systems for all to Address Homelessness. Nairobi, 2019.

Quigley, John M, and Steven Raphael. "Is Housing Unaffordable? Why Isn't It More Affordable?". Journal of Economic Perspectives 18, no. 1 (2004): 191-214.

Renaud, Bertrand. "The Financing of Social Housing in Integrating Financial Markets: A View from Developing Countries." Urban Studies 36, no. 4 (1999): 755-73.

Renaud, Bertrand M. "Mortgage Finance in Emerging Markets: Constraints and Feasible Development Paths." Mortgage Markets Worldwide. Blackwell (2009): 253-88.

Rodrik, Dani. One Economics, Many Recipes: Globalization, Institutions, and Economic Growth. Princeton University Press, 2008.

Rosenthal, Stuart S. "Are Private Markets and Filtering a Viable Source of Low-Income Housing? Estimates from a Repeat Income Model." American Economic Review 104, no. 2 (2014): 687-706.

Rosling, Hans, Ola Rosling, and Anna Rosling Rönnlund. Factfulness: Ten Reasons We're Wrong About the World--and Why Things Are Better Than You Think. St Martin's Press, 2018.

Salvi del Pero, Angelica, Willem Adema, Valeria Ferraro, and Valerie Frey. "Policies to Promote Access to Good-Quality Affordable Housing in OECD Countries." OECD Social, Employment and Migration Working Papers No. 176, 2016.

Saracci, Rodolfo. Epidemiology: A Very Short Introduction. OUP Oxford, 2010.

Schellekens, Philip, and Diego M Sourrouille. "Covid-19 Mortality in Rich and Poor Countries: A Tale of Two Pandemics?". World Bank Policy Research Working Paper, no. 9260 (2020).

Siettos, Constantinos I, and Lucia Russo. "Mathematical Modeling of Infectious Disease Dynamics." Virulence 4, no. 4 (2013): 295-306.

Turner, Bengt, and Stephen Malpezzi. "A Review of Empirical Evidence on the Costs and Benefits of Rent Control." Swedish Economic Policy Review 10, no. 1 (2003): 11-60.

Westin, Richard B. "Kenya: Economic Development and Urbanization Policy." World Bank Report No. 4148-KE, 1985.

Whitehead, Christine ME. "Urban Housing Markets: Theory and Policy." In Handbook of Regional and Urban Economics, edited by Paul Cheshire and Edwin S Mills, 1559-94: Elsevier, 1999.

Woolf, Steven H, Derek A Chapman, Roy T Sabo, Daniel M Weinberger, and Latoya Hill. "Excess Deaths from Covid-19 and Other Causes, March-April 2020." Jama 324, no. 5 (2020): 510-13.

World Bank Group. "Global Economic Prospects." Washington, D.C., 2020.

———. World Development Indicators 2020. World Bank Publications, 2020.

World Health Organization. "Actions for Consideration in the Care and Protection of Vulnerable Population Groups for Covid-19." (2020).

Yong, Ed. "How the Pandemic Defeated America." The Atlantic, August 4, 2020 2020.