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Work-From-Home:
Commuting and Productivity in Ricardian Cities

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Abstract

In the theoretical section of this paper we model the location of workers and firms (jobs) within a Ricardian city. Output per worker depends on firm location through 2 channels: how close the firm is to other firms and how often its workers attend on site.Workers select attendance rates trading off commute costs against greater productivity (wges). This creates spatial patterns in attendance, which in turn impacts firm location decisions. Ricardian rent compensates for these patterns. In the empirical section, we use the data on building attendances over time and across space to estimate the determinants of WFH. The predictions of the theoretical section line up quite well with our empirical work. They also are supported by other empirical work which examines changing rent and price patterns in cities.

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1. Introduction

Work from home (WFH) has gained widespread recognition as a labor market practice that is commonly associated with the arrival of Covid 19. The literature on WFH is primarily empirical and has been somewhat limited by sources of data. Research to date could probably be summarized as follows.

1). Surveys of workers, done after Covid began focus mainly on discovering patterns in WFH behavior across occupations, industries and types of skills.[1]

2). Other literature suggests that IT technology was already beginning to support "teleworking" and that the pandemic simply pushed forward a trend that is likely to be more permanent.[2]

3). Little information has been gathered by directly surveying firms or establishments. However, job Listings have been studied and report much lower offers of WFH. The press also regularly reports on "company" plans for the full return to on-site work in selected industries.[3]

4). Most of these data sources are not geo-coded so that analysis of spatial patterns within cities in WFH by either workers or firms is largely missing.

5). There are only a few studies that try to formally model how WFH originates, evolves and could alter the internal functioning of cities and housing markets.[4]

This study uses data on office building attendance rates, across thousands of buildings, weekly, since just before the onset of Covid. We know where each building is located and are able to blend this with Government Lodes records and BLS zip level data on industry mix. This creates 3 important metrics: the centrality of the building's location, the expected average commuting distance of workers employed in each building and a building's WFH proclivity based on industry mix. This helps fill the data gap in points 3) - 4) above.

To add to the theoretical undertanding of WFH, this paper models attendance at work as a longer run decision made by workers that are also selecting both a residence and workplace location within a city. In a Ricardian spatial equilibrium workers select both a location of work and of residence, as well as making a choice about their rate of job attendance. Attendance choice is conditional on the location choices. Firms pay workers the value of their productivity which varies over space for two reasons. Output per worker depends on both "external" and "internal" agglomeration. The former arises from proximity to workers in other firms and has a long literature. Internal agglomeration arises

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[1] See: Adams et al (ABGR, 2020), Dingel (2020)

[2] For example: Autor et al (2022), BLS (2026, 2023)

[3] Hansen et al (2023) and www.axios.com/2025/01/01/back-to-work-office-companies

[4] Monte et al (2023), Delventha et al (2022); Davis, Ghent, Gregory (2024)

from the learning, mentoring and collaboration that occurs between workers within firms. It is hypothesized to depend on the rate of on-site attendance at work. For firms' wages to vary perfectly with productivity they must depend both on where a firm locates and what it expects for a worker attendance rate at that location. A Firm cannot "force" workers to come to work – ultimately it pays them, or promotes them more when they do so. With no other considerations, this stylized framework would imply that overall city output will be highest when everyone attends work physically, every day, and all work is at one location.

Of course everyone cannot live or work at the same location. Residential Ricarding rent will have to compensate workers both for variation in their productivity as well as commuting costs. Productivity variation will come from a worker's choice of attendance (internal agglomeration) as well as where to work. Firm Ricardian rent will have to compensate employers for the differences in spatial productivity that arise from both external agglomeration as well as worker attendance. In the theoretical section of the paper we model all of these considerations within a continuous Ricardian spatial model and characterize the features of the equilibrium. In the empirical section, we use the data on building attendances over time and across space to estimate the determinants of WFH. The predictions of the theoretical section line up quite well with our empirical work. They also are supported by other empirical work which examines changing rent and price patterns in cities.

2. A Spatial Model with Agglomeration.

Begin with Figure 1. Here we have defined a Ridardian city that origiates from competitive bidding for land use between commercial uses (jobs) and worker residences – resulting in 2 separate districts.[5] At no loss of generality, each worker occupies a unit of land – both for its residence and commercially at its workplace. Inward commuting occurs with a cost per unit of distance that depends on both the location of home t ($b>t>m$) and work T ($m>T>0$). The distance a worker commutes is (t-T) this is then multiplied by their chosen attendance rate (a). The rate of attendance (days per week or month) is one of two factors that determines output per worker in the city Q. Spatial variation in Q is central to the model and productivity originates from two sources: internal and external agglomeration.

Internal agglomeration depends on the attendance rate (a) of workers. The impact of attendance on output most likely exhibits diminishing returns. Being at

[5] Alonso (1964) first specified this urban form using a neo-classical Ricardian (1817) model.

work 1 day per week or month is probably essential, while missing one day has an almost negligable impact. Hence the second derivative of Q with respect to attendance (a) is less than zero.[6]

External agglomeration most simply makes Q dependent on how close to all other jobs is any given firm's location.[7] In a cicular city (shown in Figure 1 along only the radial dimension) the center of the circle is the point closest to more jobs than any other point.[8] Moving out T miles from the center, this metric of external agglomeration declines and ouput falls until it reaches a minimum at distance m – the edge of the employment district. In our analysis, the second derivative of Q with respect to T plays no role, but the second *cross* derivative can. If firms locate at a greater distance T they lose productivity from *less* external aggomeration. If this makes internal agglomeration (attendance) more impactful on productivity then the two types of agglomeration are in some sense *substitutes* and the 2nd cross derivative of Q (between a and T) is positive. If less external agglomeration also makes internal agglomeration less impactful, then they can be thought of as *compliments* and the 2nd cross derivative (between a and T) is negative. These properties of output per worker are shown in (1).

$$(1) \qquad Q(T,a): \frac{\partial Q}{\partial T} < 0, \quad \frac{\partial Q}{\partial a} > 0, \quad \frac{\partial^2 Q}{\partial a^2} < 0, \quad \frac{\partial^2 Q}{\partial a \partial T} <> 0$$

In this setup, aggregate output (and income) per worker is theoretically highest if everyone works as close as possible to all other workers, and does so full time at their work site. With this technology, we can now describe the Ricardian rent that characterizes a spatial equilibrium as jobs and workers spread themselves out across urban space.

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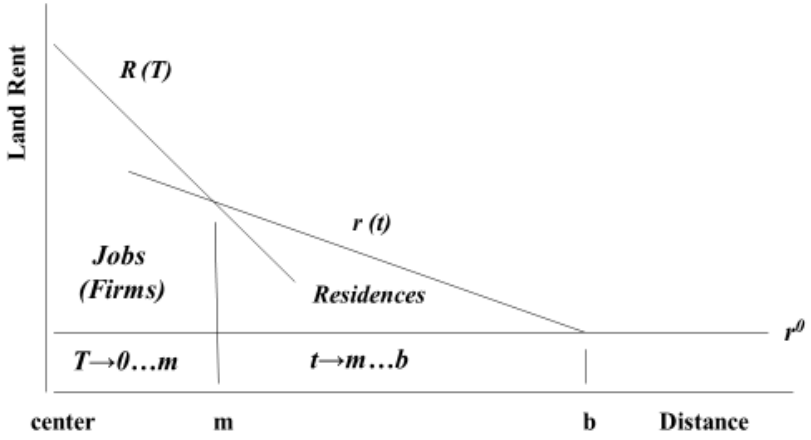
[6] Internal agglomeration is not well researched by economists, but recent studies have examined the relative productivity changes that may occur following the adoption of WFT: Gibbs et al (2021). Other research shows workers are also willing to accept lower wages that go along with WFT (Cullen, 2025).

[7] Models of external agglomeration between firms begin with Ogawa and Fujita (1980), then Anas (1996). More recent empirical work includes Fallick et al (2006). External agglomeration is an important consideration in the literature on employment decentralization and the evolution of Polycentric metropolitan areas White (1980), McMillan and Smith (2003), Wheaton (2004).

[8] Consider a circular commercial district with Euclidian travel in any direction. Compare any other location to the center and construct a perpendicular bisector at the midpoint of a line connecting that point with the center. The share of other firms that are closer to the center always exceeds the share closer to the alternative location. The alternative location share declines with distance.

Figure 1: Centralized Urban Structure



3. WFH choice and Residence.

We begin considering the decision that workers make about how often to attend work (a) and how this varies by where they live. They are paid the value of their their output which depends on where they work (here fixed at T) as well as how often they choose to attend that work. Their net income however, must incorporate and subtract off transportation (commuting) cost. This depends both on where they live as well as work. Commuting distance varies from zero when t=T=m up to some maximum amount when T=0 and t=b. Commuting costs per mile are a constant (k) and of course are proportional to attendance (a). All of this generates a rent for residential sites r(t) which must compensate for the combined spatial variation both in worker income (output) and commuting costs. This is in expression (2).

(2) $$r(t) = Q(T, a) - ka(t - T) + r^0$$

Given their location of work (T), for any potential residence location (t) workers should select the level of attendance (a) that maximizes their income net of travel costs or alternatively their ability to pay rent above some opportunity cost r^0. This yields expression (3) in which the marginal product of greater attendance must equal the marginal impact of attendance on commuting cost. Since (3) holds for any residence location t we can totally differentiate it to obtain the impact of changes in residence on the selected level of attendance. In (4) we get the almost

obvious result that attendance drops as workers live at greater distances.[9]

$$\frac{\partial Q}{\partial a} - k(t - T) = 0 \qquad (3)$$

$$\frac{da}{dt} = k \Big/ \frac{\partial^2 Q}{\partial a^2} \quad < 0 \qquad (4)$$

4. WFH choice and Workplace location

Worker output-minus-commuting-cost depends not only on residential location, it also depends on where the worker is employed (distance T). As such, worker choice of attendance should vary with (T) as well as (t). To determine the impact of T on the level of attendance that results as (3) holds we again totally differentiate that expression with respect to both (a) and now (T) and then rearrange to get the result in expression (5).

$$\frac{da}{dT} = - \left[\frac{\partial^2 Q}{\partial a \partial T} + k\right] \Big/ \frac{\partial^2 Q}{\partial a^2} \quad >< 0 \qquad (5)$$

Signing the overall impact on attendance from working at a firm which is located at greater T (with less external agglomeration) is more involved. We rely on the signs and features of the output function Q in expression (1). With these, we can say that since the denominator in (5) is always negative the derivative in (5) is clearly positive as long as the bracketted numerator is as well. This will be true in three cases:

- If the output function is separable (in T and a) and hence the cross derivative is zero.

- If attendance (a) and T are substitutes then a positive cross derivative between the two ensures that the bracketted numerator on the RHS of (5) is positive.

- If attendance (a) and T are compliments, but the magnitude of the (in this case) negative cross derivative still is less than the marginal cost of travel, k.

In all these cases, worker attendence will be higher if they are employed at a location which is farther from the center (closer to them). Only when the two types of agglomeration are very strong compliments is it possible for expression (5) to be

[9] The Bick et al (2023) worker survey shows evidence that commute times are a determinant of whether workers return from WFH.

negative. Hence, and most likely, as workers are employed by suburban firms (those at farther T) they use some of the resulting reduction in their commute distance for increased attendance and its resulting higher income.

Since workers are optimizing attendance at every residential location, we can employ the envellope theorem to determine the spatial slope of the residential Ricardian rent gradient. This is always negative. It depends on the cost per mile of travel only now with the added consideration of the attendance rate (frequency of travel). Note that using expression (4), the second derivative of r with respect to t is positive and residential rents will be convex in distance.

$$(6) \qquad \frac{dr}{dt} = \frac{\partial r}{\partial t} = -ka < 0 \ , \quad d^2r/dt^2 = -\mathrm{k}\ da/dt > 0$$

5. Firm Location

For firms, there is only the choice of location (T) and so commercial Ricardian rent R must offset any spatial variation in productivity be it from internal or external sources of agglomeration. As firms move outward (greater distance T) they will clearly loose output from a reduction in external agglomeration. But this move also brings them closer to the residences of their workers. From the discussion around expression (5) this raises the liklihood that worker attendance will be higher. Hence, in (7) the slope of the commercial Ricardian rent gradient (R) will depend on the net effect of these two factors.

$$(7) \qquad R(T) = Q(T, a) + Q^0$$

$$dR/dT = \partial Q/\partial T + \partial Q/\partial a \, da/dT$$

The simple equilibrium outlined in Figure 1 and formalized with expressions 1 through 7 suggests 3 hypotheses about what empirical patterns we should observe in a range of urban data.

(a). When attendance is variable and chosen to be partial (as opposed to full and mandated) attendance is less the further workers reside from their workplace.

(b). When attendance is variable and chosen to be partial (as opposed to full and mandated) attendance is higher for a firm that is located outward and generally

closer to their workers' residences.

(c). When attendance is variable and chosen to be partial (as opposed to full and mandated), the rent gradient of firms becomes flatter with distance as greater worker attendance now helps to offset the loss of external agglomeration.

(d). When attendance is variable and chosen to be partial (as opposed to full and mandated), residential rent gradients will also be flatter.

6. Firm Centrality

It is important at this point to raise the question of whether any flattening of firm and household rent gradients, once WFH is introduced, could actually rearrange the centralized urban form shown in Figure 1 - an arrangement that depends on firm rent gradients being more steeply sloped than residential. When full attendance is mandatory, this equilibrium requires that the loss of external agglomeration to firms (with an outward movement in T) is larger (in dollars) relative to the additional commuting cost of workers - if they move outward. With endogenous and variable WFH firm rents now flatten as they also incorporate the product of how much productivity improves with greater worker attendance and how much worker attendance increases as firms move outward. The slope of the residential rent gradient is directly proportional to the (now chosen and presumably lower) attendance rate - so it also flattens. Conceivably, and depending on how much rents flatten for each use, the centralized urban form shown in Figure 1 might unravel, leading to some alternative arrangement involving land use mixing and/or employment dispersal.

It's useful to investigate two extreme cases within the current model. In the case where there is no internal agglomeration everyone chooses full WFH, and residential rents are flat. External agglomeration still remains and this insures declining firm rents and hence centrality. With no internal agglomeration but required full time attendance at work, wages paid must vary negatively with T as firms capture the savings in worker commuting. This means that wages net of (required) commuting are constant – and so residential rents are flat. Firm profits again decline with T (as do their rents) and so centrality also results.

7. Empirical Studies of changes in Spatial Rent or Price Gradients.

While no previous studies have directly examined the model's prediction of WFH patterns by location within cities, there is a growing and significant literature on changes in spatial rent gradients. These involve empirical analysis both for

firms and residences, prior to and after the onset of Covid19. Consistent with the model, these reveal compelling evidence of flattening with respect to distance. Studies of changes in residential house price gradients include Kim et al (2022), Gupta et al (2021), Bloom et al (2021). Studies of changes in commercial price or rent gradients are fewer, but include Gosh et al (2022). These also find flattening. To date, none of this work addresses the important comparison of the relative changes in gradients between the two uses.

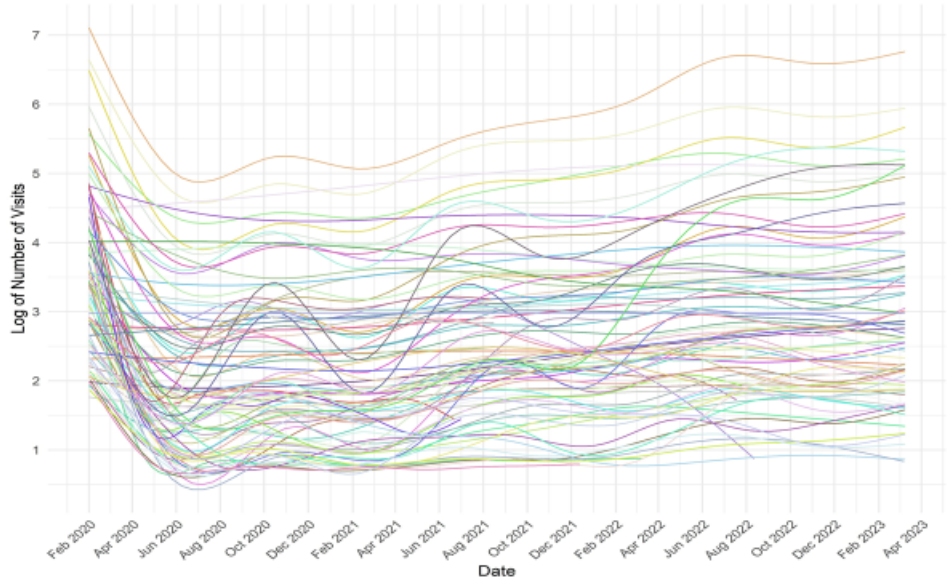
8. Data on Office building Attendance (Kastle).

The primary data used in this paper is collected from the Largest US company that operates turnstile-type entrances in major office buildings, Kastle Systems. Kastle maintains detailed daily data on each employee authorized to enter a buidling and creates an metric of what share of authorized employees entered at least once.[10] The company shows that this data is consistent with other (survey) information on the emergence of Hybrid Work as Covid progressed and then receeded. Hybrid Work is thought to result in a daily pattern within weeks where more attendances occur Tuesday-Wednesday-Thursday as opposed to Mondays and Fridays. For the purposes of this paper, we abstract from the interesting question of coordinating daily attendances and simply measure overall WFH with weekly average daily attendance – from early February 2020 through the first week of April 2023.

In Figure 2 we illustrated the raw weekly average data for each of 90 office properties in the San Francisco market: Individual building can differ considerably in size and so the vertical axis depicts the natural log of raw attendances. In all subsequent analysis our metric normalizes building attendance into a rate – relative to its average attendance over the first 8 weeks of 2020. Occasionally buildings after Covid can have rates greater than one – if they were significantly vacant prior to the onset of the virus. Our sample has 2157 buildings in 114 US CBSA. The CBSA geography best constitues the notion of a "market", within which the Ricardian equilibrium as depicted in Figure 1 can exist.

[10] Kastle Systems also tabulates total entrances and entrances by visitors.

Figure 2: Office Attendance in San Francisco (90 Buildings)



In Figures 3 and 4, we tabulate up the individual property data into market level relative attendance rates – for 11 of the largest CBSA. The two figues look quite similar but have an important difference. Figure 3 is just the the simple average of *buildings*, while Figure 4 weights each building by its pre-covid raw attendance (effectively the number of daily workers). With these weights, the averages in Figures 4 reflect average *worker* attendance rates. Average worker attendance rates are lower than average buidling rates because attendance in general is lower in larger buildings with more workers. In these 11 CBSA, and since the Covid virus, average office building attendance dropped to around 30% and has recovered back to about 75%. Average attendance of office workers (as calculated) dropped to 20% and has recovered only to around 55%.

Figure 3: Building Attendance Trends, 11 US Metros

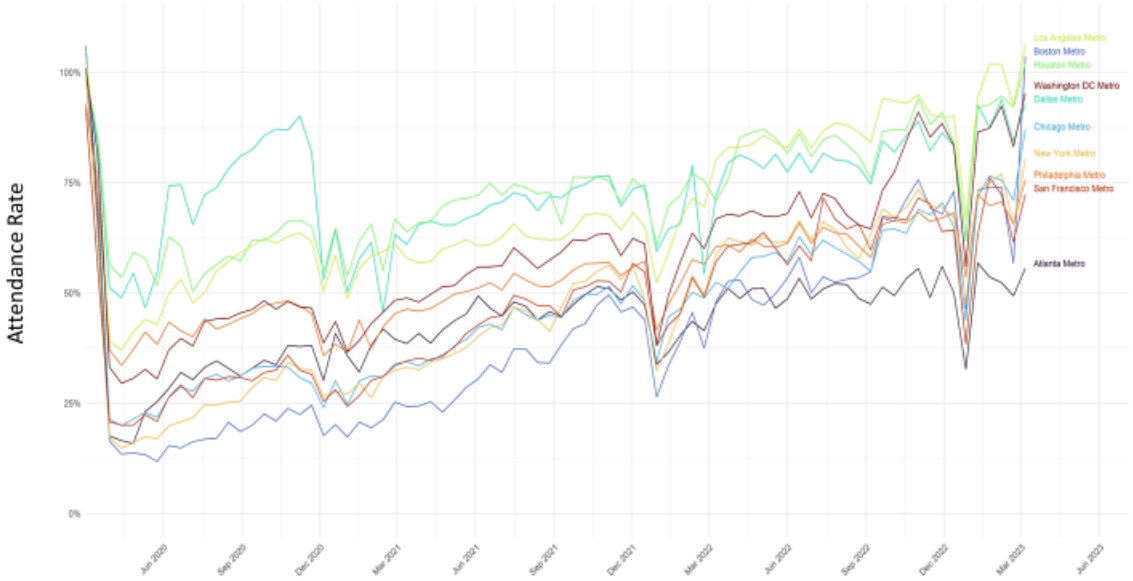
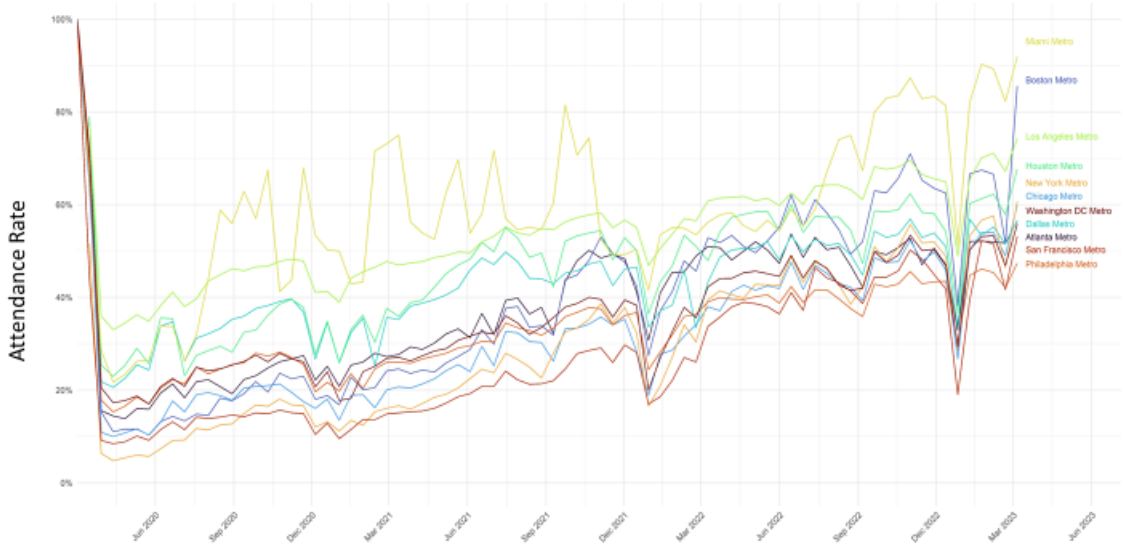


Figure 4: Worker Attendance Trends in 11 US Metros

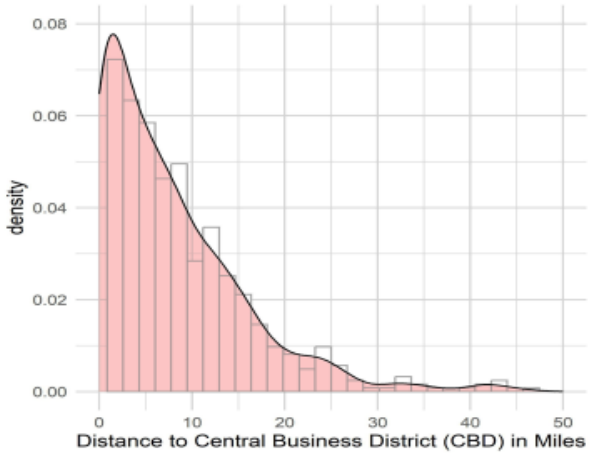


9. Data that accompanies each Office building: Location and Lodes records .

The Kastle data comes with its location identified by ZIP. In many CBSA large individual buildings or properties in a common "office park" have their own ZIP code. Only in small MSA or more remote suburbs does the ZIP represent an approximate geo-code. Using ZIP geo locations we calculated the straight line distance between each building and the CBD of its encompassing CBSA. This should enable us to test hypothesis (a) that WFH is more common for firms located outside of the urban center. Figure 5 shows the PDF of this variable across the 2157 buildings. That said, 10 miles is close to the edge of Nashville and much more central in New York. In the statistical analysis that follows, we will rely on the inclusion of CBSA fixed effects to make this adjustment.

Figure 5: Building Distance to CBD

(2157 US Buildings)

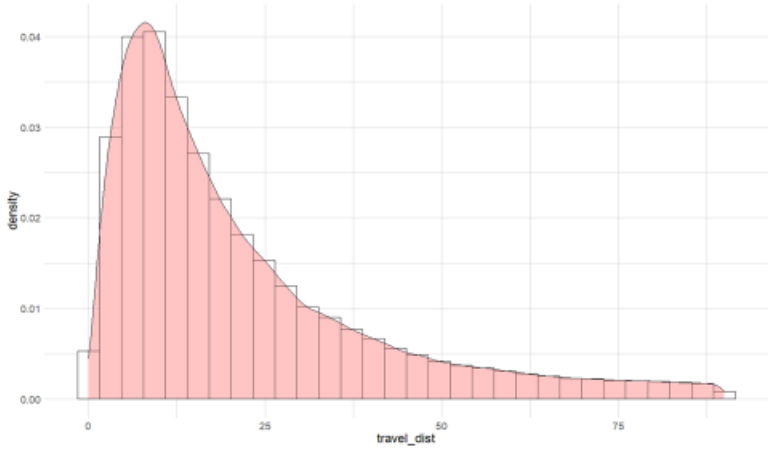


Our theoretical discussion in hypothesis (a) also predicts that the the average commute distance of a building's workers is a (positive) determinant of WFH. In a simple monocentric urban form commute distance and firm location are highly correlated, but within a more general polycentric urban form the two metrics could be quite different. To measure the average commute distance of a building's workers we again rely on the building ZIP code and construct a metric from the Lodes data files. This administrative data has records for each tax-filer with a home and work ZIP.[11] In the Lodes data, the work ZIP is adjusted for cases

[11] https://lehd.ces.census.gov/data/

where a W2 form originates from a location different from where actual work occurs. With this data we compute the average straight-line commute distance for all workers employed in each buildings's ZIP. The PDF of this data is shown in Figure 6.

Figure 6: Building Average Commute Distance
(2157 US Buildings, Lodes data)

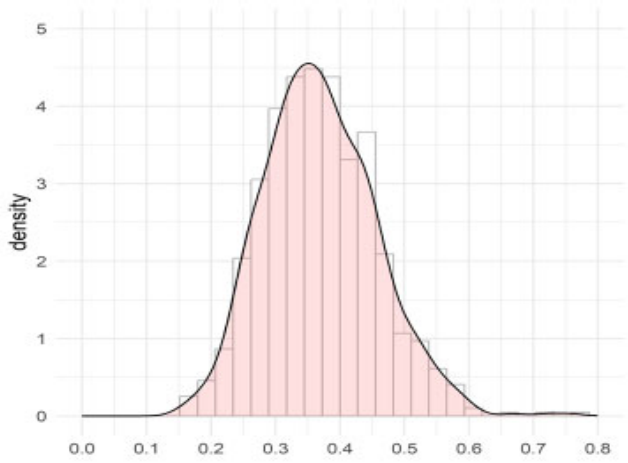


10.Controling for Industry mix within each Office building.

Our Literature review suggested significant patterns in WFH by occupation and industry, but the Kastle data does not break down the tenancy of each of its buildings. The BLS, however, has establishment level data on the number of workers by industry code for all ZIPs. With this we weight up the overall WFH proclivity percentages calculated by Adams-Prassl,Boneva-Golin-Raugh (ABGR, 2020) for each building ZIP's mix of industries. Unfortunately this calculation can only be done across industries and not occupations (which are not available by ZIP place of work). In Figure 7 we present the PDF of this calculated WFH proclivity across the Kastle buildings. The ABGR average is 35% which corresponds to an attendance rate of 65%. This is much higher than average worker attendances in Figure 4 (for the same period as the ABGR survey). This is likely because ABGR covers all industries while the Kastle attendance rates apply only for office-occupying types of indusries. The ABGR survey also asks its repondents a different question than the metric calculated from the Kastle data.

Figure 7: Building ABGR WFH Proclivity

(2157 US Buildings)



In Table 1 we present the Correlation matrix for our 3 constructed variables: ABGR industry mix, building CBD distance, worker Commute distance. The main conclusions are that office buildings with tenants that are more conducive to WFH tend to be located centrally and employ workers that tend to have longer commute distances.

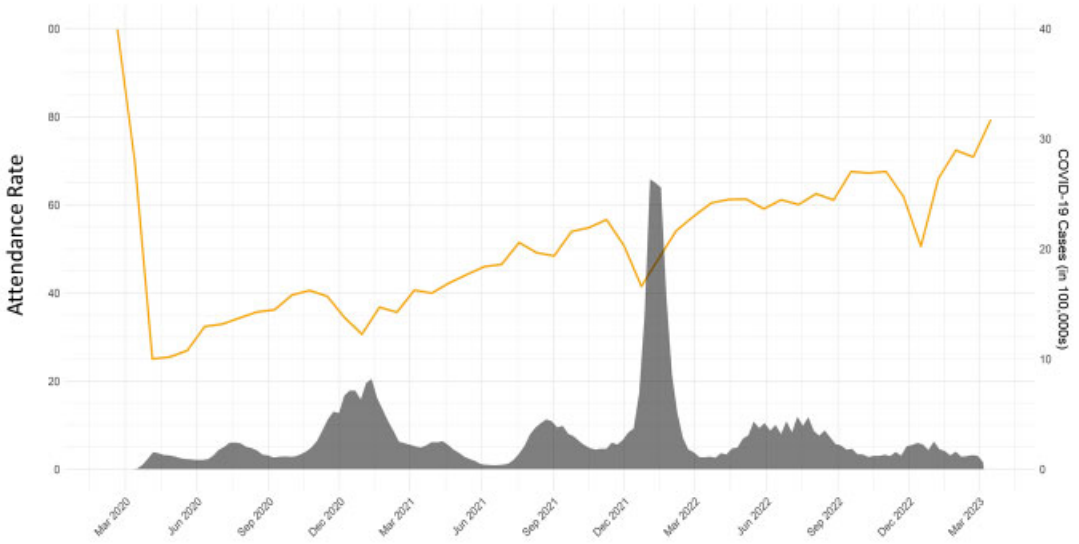
Table 1: Building (ZIP) Correlations

	ABGR WFH	Commute Distance	CBD Distance
ABGR WFH	1	0.28	-0.35
Commute Distance		1	-0.05
CBD Distance			1
N = 2157 buildings			

11. Covid rates in the surrounding county.

The movements over time in weekly building attendance, as shown in Figures 2-4, are not smooth and its reasonable to suspect that these fluctuations might be related to Covid infection rates over the 3 years for which we have data. Weekly rates of new Covid infections were collected and published at the county level over this period and almost all of our CBSA encompass more than one county – providing some independent variation in Covid cases across building locations within each CBSA. In Figure 8, we compare new Covid cases *nationally* with a composite measure of work attendance across all 114 of the CBSA in our sample of 2157 buildings. New Covid cases show clear spikes during the winters of 2020-21, and 2021-22, but by 2022-23 the vaccine had become quite effective and the reporting of Covid cases had declined. Simple inspection suggests there appear to be associated drops in attendance during all three winters.

Figure 8: US Building Attendance rate, New Covid 19 Cases



12.The multivariate impact of Covariates on attendances: 2020-2023.

The main purpose of the empirical portion of our research is to examine spatial variations in WFH within a CBSA. This necessitates that we control for both longer term trends and seasonal attendance patterns in the models we estimate. To do this we use a full set of 172 (weekly) time Fixed Effects. Our theoretical discussion also makes in clear that building distance to the CBD and

average commute distance could depend on a host of structural features in each market (population, income transportation system…). To control for these we include 114 CBSA fixed effects. In Table 2 we present a range of models – starting in the first column with just the combined 286 Fixed effects. As a baseline model this explains 21.5% of the sample varriance in building attendance. Given that we use the log of attendance as our dependent variable, any of our other covariates will act similarly to those in a Proportional Hazard formulation – proportionally shifting the common fixed effects time pattern higher or lower.

Moving from left to right in Table 2 as we add covariates the R^2 increases only by a few percentage points. Clearly, there is considerable heterogeneity in building attendance, quite likely the result of a range of ommitted data such as: *leased* occupancy, differences between building tenancy and those of its ZIP averages, and individual firm or tenant policies.

Our three main convariates, ABGR estimated WFH based on industry mix, Average ZIP commute distance and building distance to the CBSA Center are all highly significant. Furthermore their coefficients are of the correct sign and remain relatively stable as other covariates are added to the model. Using the log of attendance as the dependent variable, all covariates were tested in linear and log form to determine what best form explains the common LHS variable. Highest fit results are shown.[12]

The Impact of local (county) Covid rates is peverse (positive). Remember that this is relative to a national FE trend pattern so it reflects the impact on a building of being in a county that had higher than average Covid within that CBSA and at a given time period. Still it is hard to come up with an explanation for why buildings in a county with higher *relative* Covid incidence should have higher rather than lower attendance. We experimented with using the change in Covid case rates at one or more lag, but could never get a significant negative coefficient. The final column is representative of this effort. Possibly there is reverse causality at work if having high WFH levels in a county's office buildings (low attendance) actually reduces the county's incidence of Covid. We have not pursued this to date.

In terms of economic impact a building 15 miles further from CBD has its time path of attendance shifted 12% (points) higher. When the building has an estimated worker commute that is 15 miles longer, worker attendance over time is 7.5% (points) lower. Finally, a 15 percentage point greater likelihood of WFH

[12] In this draft all regression models are unweighted.

based on industry mix results in a 9% (points) lower attendance pattern. These all seem quite meaningful.

Table 2: Model of building Attendance over time, across buildings.

Dependent Variable: Log Attendance Rate

	Dependent variable:					
	Occupancy Rate Log					
	(1)	(2)	(3)	(4)	(5)	(6)
ABGR WFH proclivity log		-0.685***	-0.613***	-0.557***	-0.556***	-0.556***
		(0.008)	(0.009)	(0.009)	(0.009)	(0.009)
Commute Distance			-0.004***	-0.005***	-0.005***	-0.005***
			(0.0002)	(0.0002)	(0.0002)	(0.0002)
Distance to CBD				0.008***	0.008***	0.008***
				(0.0002)	(0.0002)	(0.0002)
Covid Rate (in 1000) Log					0.016***	0.016***
					(0.002)	(0.002)
Covid Rate (in 1000): t-1 minus t-2 Log						0.002
						(0.003)
Weekly Fixed Effects	X	X	X	X	X	X
CBSA Fixed Effects	X	X	X	X	X	X
Observations	310,482	310,321	310,321	310,321	310,321	310,321
R^2	0.215	0.231	0.233	0.235	0.235	0.235
Note:						*p<0.1; **p<0.05; ***p<0.01

13. Conclusions/extensions

We have shown that the variables hypothesized to impact building attendances (WFH) in our theoretical Ricardian model are in fact supported in the data. A troubling results, however, is the low fit of our estimating equations. One explanation might be that the assumption built into them is that the covariates proportionally shift a *common* time pattern of attendances. Perhaps location or commuting costs alter the shape of this time pattern. To investigate this most simply we might split the sample by time periods into decline (2020) and recovery (2021-23). Perhaps covariates have differential impacts at various stages.

The Kastle data also allows us to study additional questions, most directly the emergence and extent of hybrid work. Hybrid work manifests itself in partial WFH, with on site attendances strategically occurring when collaboration between a firm's workers is required. Our data should allow us to not only examine the average weekly attendance but also the daily variance around that: are all employees attending once weekly or are 20% attending each day and are those the same or different clusters of workers? What patterns are there in this? Studying

Hybrid work, raises a set of more detailed questions about how internal agglomeration works. Companies should have the ability to manage and coordinate attendance days so as to extract the various synergies that occur within the boundaries of their firm.

When we consider the synergies that might occur between the attendance decisions of different (but spatially proximitous) firms there is no mediation. We have labelled this as external agglomeration and it is a true economic externality. Does the R&D group in one firm attend on the same days as that group in other firms? Ditto for Sales and Marketing. If synergy between the workers of *different* firms is the source of external agglomeration then these choices need mediation. The final externality associated with WFH is traffic demand. If everyone works only 1 (different) day then congesion almost vanishes and urban transporation capacity can be reduced. If everyone works on 1 (identical) day then perhaps cities will have an even worse traffic peak problem than than they have had historically.

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