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Will CoWorking Work?

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I. Introduction.

There has been extensive discussion in the last decade about the role of Information Technology (IT) and Artificial Intelligence (AI) in improving productivity and altering jobs [Accenture (2017)]. Much of the recent discussion has focused on the potential role of AI and IT to revolutionize the service sector. Brynjolfson (2015), Autor (2015), Ford (2015), Frey and Osborne (2013) and Mckinsey (2017) all explore the question of how Artificial Intelligence can replace humans in accomplishing of a wide range of service tasks. But AI and IT can also expand the service sector and make it more productive by eliminating "under used capital". It does this by enabling individuals to "share" or rent resources or assets (hence creating a service) that they otherwise might own or use exclusively. In transportation, ride hailing services (e.g. UBER) are able to keep cars in greater use by sharing them across clients. Similarly, households with underutilized residential space can rent it out through AirBNB – providing a new type of Hotel service. Most recently, the use of office space has seen the promotion of a "disruption" model similar to Hoteling - called CoWorking [NYT (2008), Atlantic (2018)]. Here office space is rented "on the fly" by workers in need of part time, temporary, or variably located office space use. Models supplying this have been implemented by the likes of Regus, WeWork, and Industrious. Such providers hail themselves as a coming revolution in the way that companies use office space – replacing traditional corporate occupancy, wherein each worker has "dedicated" space at one site with part time "space on demand" at potentially variable sites. Clearly the ability of such a scattered workforce to work cohesively within firms depends on the ability of IT and AI to link workers into the traditional role provided "theories of the firm" [Williamson (1991)].

The goals of this paper are two. First we outline a set of parameters that determine if CoWorking can both be profitable and attract clients. For the former, CoWorking must be able to pay landlords rent that is equivalent to traditional dedicated space rent – and then *profitably* sublet the space on an "as needed" basis to the very workers who previously would have occupied dedicated space with traditional corporate leases. To attract corporate clients, companies must find that paying higher part time rent for space "on demand" is both cheaper than dedicated space, and results in a workforce that is equally or even more productive. .

After outlining this theoretical framework, we examine, in a small sample, buildings that have significant space leased to CoWorking companies – relative to a selected peer set of similar properties but with only traditional tenancy. Using data from RCA covering sales transactions between 2016 and 2018, we test for whether net income per square foot is higher or lower in the "subject" (i.e. CoWorking) properties relative to their selected peers. Higher income could suggest that CoWorking is indeed a profitable business model and beginning to push up the rents that landlords command. Alternatively it might mean that Landlords regard CoWorking as a "risky" tenant and demand higher rent to offset this risk. To resolve this question we also examine if the sale of properties with CoWorking tenancy occurs at a higher transactions price per dollar of income or at lower cap rates. If cap rates are higher (lower prices per dollar of income) then owners and investors are demanding an adjustment for risk. Lower cap rates (higher sales prices) would suggest that CoWorking is profitable, and eventually will pay higher rents as it expands its share of market tenancy. In this case, buildings that are attractive to CoWorking firms would command a growth premium. Our results show that buildings with an ever larger share of CoWorking tenancy transact at lower prices (higher cap rates) and have little or no difference in income.

II. Can CoWorking be profitable?

We begin by examining CoWorking from the vantage of a service firm operating between landlords and the ultimate corporate clients using space. In many respects CoWorking companies operate like hotel operators. Each unit of space be it an office cubicle, "pad" or room has a potential occupancy of say 40 hours a week x 52 weeks a year. If it can be booked for each of those hours then "occupancy" is 100%. Booking 40 hours for 26 weeks, or 20 hours weekly for 52 weeks generates an effective occupancy *rate* (OC) of 50%. If we assume that each of these arrangements is economically equivalent, the CoWorking firm charges an hourly rent that is R_c and receives a yearly gross income that times occupancy and 2080 or: OC x 2080 x R_c.

Since each unit of space is potentially used by different tenants at different day/times tenants cannot provide their own typical office services (phones, Wi-Fi, printing, photocopying, furniture, coffee…). This becomes a largely fixed cost for the CoWorking service provider (E dollars yearly per unit of space).

Finally, we assume that CoWorking must contract for space from property owners or landlords with a long term lease at the same yearly rent as is paid by corporations for dedicated space (R_d). Combining this discussion, the profits earned by CoWorking will be:

$$OC \times 2080 \times R_c - E - R_d \qquad (1)$$

For expression (1) to be positive, there is a lower bound on the hourly rent that CoWorking has to charge relative to the yearly rent from traditional dedicated corporate tenants.

$$R_c \geq (E + R_d) / (2080\ OC) \qquad (2)$$

As an illustration, if traditional dedicated space rent is $50.00 per year per square foot, occupancy 50% and expenses $10.00 per year per square foot, then CoWorking has to charge the yearly equivalent of $120.00 per square foot or $.0577 per hour in order to break even.

Here we should introduce some caveats. Traditional rent for dedicated space is usually made under a long term contract (e.g. 5-10 years). Similarly, CoWorking providers acquire their space under long term contract. A landlord can rightly question whether the business model of CoWorking service firms has the same stable revenue source with which to pay that rent as say law firms, insurance companies, banks or other traditional tenant. CoWorking revenue is dependent on a wide variety of short term rents. Maintaining high occupancy under fluctuating market conditions could prove difficult. If Landlords view their CoWorking tenants as less "credit worthy", they could well ask for yearly rents that are higher than those from traditional tenants R_d which in turn means that CoWorking client rents will have to be proportionately greater than the lower bound in expression (2).

Expression (2) is graphed in Figure 1, where on the horizontal axis we have the rent landlords receive from traditional tenants and on the Vertical axis the hourly rent charged by CoWorking to their clients. The red line is the minimum profitable hourly rent and the shaded area represents ever more profitable hourly client rent paid to CoWorking firms by their clients.

III. Can CoWorking attract clients?

In our analysis of CoWorking viability, the second condition is that corporate clients must find that renting flexible space part time for their workers at the hourly rate R_c is advantageous to renting full time dedicated space at R_d. In the simplest case let a firm be composed of N employees each requiring S sqft of space when they "work" at the office. With traditional dedicated space, the firm leases N x S square feet at the yearly rate R_d.

Now let's model the actual use of this space in a very simple way. Suppose that the firm needs these employees at their space only some fraction (T) of the total time they are working. We can assume this total time is the same 2080 yearly hours as in the previous section. When not residing at the "office", employees are on the road, working from home. But now let's furthermore assume that collaboration requires that employees always be at the firm at the same time. In this case the firm uses the full N x S square feet but for only a fraction T of the 2080 day-hours that they have it leased for. Notice that in this case each worker can have the same dedicated space when they "dock" at the firm. At the other extreme, we could assume that there is no need for the workers to overlap in their spells of occupancy. In this case the firm actually need use only N x S x T sqft of space, but it is used all the time. Some overlap still occurs as different collections of N x T workers occupy the space for one of 1/T periods each period being 2080 x T hours long. Let's label the degree of required worker collaboration L, and have it range from a high of 1/T to a low of 1. In this case the space that the firm actually *needs* to occupy can be represented as:

$$N \times S \times T \times L \tag{3}$$

With complete worker overlap (full collaboration where L=1/T) the firm needs the full N x S square feet, although only for just T fraction of time. With complete worker independence, (L=1) they actually need to lease only N x S x T square feet, and then have it used continually by different groups of workers (each sized N x T). There is however an important difference. Every time a worker comes to the firm in the first case, she can occupy the *same* dedicated space. In the second case, space is "hotelled" internally across the firm's workers. We have, most importantly, presumed that having space shared across workers in no way diminishes either worker or space productivity. In other words "dedication" by itself is not important.

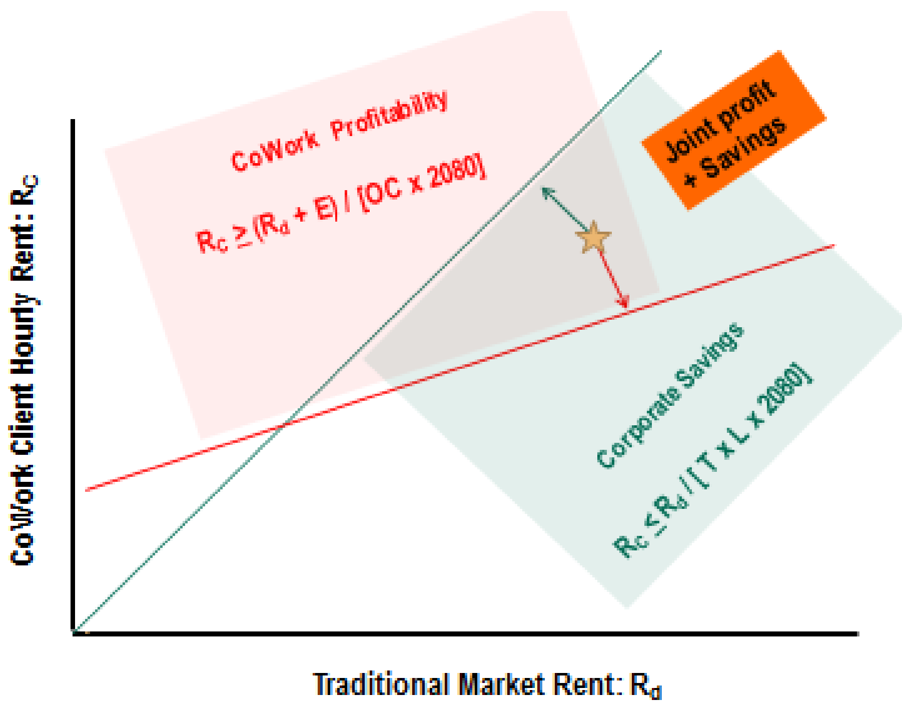
We can now ask what maximum hourly rent (R_c) will firms be willing to pay for the space that they actually need (in expression (3) so that their total space occupancy costs are no greater than the full time leasing of N x S dedicated space at yearly rate R_d. This is:

$$R_c \leq R_d / (T \times L \times 2080) \tag{4}$$

Applying the same illustration used for (2) to expression (4), if traditional yearly rent is \$50.00 and firm workers need space only 25% of the time, and have collaboration overlap of 2.0, then they save money as long as 2080 $R_c \leq R_d/(.25 \times 2)$ = \$100.00 or hourly rent does not exceed \$.048. Expression (4) is also graphed in Figure 1, with the horizontal axis representing the rent paid for dedicated space by tenants for traditional tenancy, and on the Vertical axis the hourly rent that they pay to CoWorking service providers. The shaded green area represents hourly rent that yields increasing savings (lower overall space costs) to firms relative to paying traditional full time dedicated rent. The solid green line is the break-even rent.

The numerical example we have been using for expression (3) and (4) presents an interesting dilemma for CoWorking. At an hourly rate of \$0.048, client firms with T=.25 and L=2.0 will barely have any savings by occupying CoWorking space. On the other hand, with expenses of \$10.00 and occupancy efficiency of only 50%, CoWorking companies need hourly rents of \$.057 to make money. In this situation CoWorking will not work, at least when traditional rent is \$50.00. Put differently, at that value on the horizontal axis of figure 1, the green line lies below the red line so that there is no overlap in the red and green areas bounded by these lines.

FIGURE 1



V. Equilibrium Viability

It's clear that in equilibrium the economic viability of CoWorking requires that market conditions lie in the overlap of the green and red shaded area. This means that given a traditional dedicated space rent, there is an hourly rent (the "star") that both saves corporate clients on annual occupancy costs and makes money for CoWorking service providers. The Projected distance from the star down onto red line gives the magnitude of CoWork profits. The distance projecting upward to the green line gives the amount of corporate client savings. Hence where within the overlap area the equilibrium (star) lies depends mostly on the relative bargaining power of the two entities. With corporate clients in the driver's seat, the equilibrium will likely lie further to the South East, giving them a larger share of the savings. If CoWorking firms have the upper hand it will lie more to the North West giving a greater share of the surplus to them

The size of the overlap area depends critically on several parameters from the previous sections. From section IV we know that if the market for space has many firms whose employees can work relatively independently and "dock" only occasionally (small values for T and L) then the green line in Figure 1 will be rotated counter-clockwise around the origin. The green shaded area will expand as will the area of potential overlap. This increases the likelihood that an equilibrium which is mutually beneficial actually exists. Similarly, if the additional expenses born by CoWorking (E) are smaller, and CoWorking firms are able to find and acquire clients that need part time space - at different times – then they will be able to "stack" users efficiently and achieve a high occupancy rate (OC). In this case the red line will both rotate clockwise and be lower. This expands the red area again making it more likely that an equilibrium hourly rent can be obtained. This discussion should make it clear that the viability of CoWorking could well vary by market, depending perhaps on the industrial mix of local firms and the occupations of their workers.

One thing we have not yet discussed is the potential for some sharing of the surplus (generated between CoWorking firms and their clients) with property owners or landlords.

VI. Can CoWorking generate higher property income and pricing?

There are several arguments for why landlords might charge Coworking service firms long term rents that were higher that the R_d values they charge traditional dedicated space tenants. First, Coworking tenants to date have generally required that exceptionally high amounts be spent on improving their rental spaces, with more modern open floor plates. Another factor is the observation that Coworking income could be highly volatile as it is mostly made up of short term rental agreements, while their contract with the landlord is (like traditional space contracts) usually on a longer term basis. From the landlord's perspective this creates risk to the rental income stream of Coworking tenants, which needs to be compensated for. Traditionally, tenant credit quality is always a consideration in landlord leasing. Both of these considerations can be modeled by assuming that the rent Coworking firms must pay is some additional amount over traditional tenancy. Graphically, this would look just like an increase in E, which would then shift the red schedule in Figure 1 upwards in a linear manner. In turn this shrinks the area of potential overlap and makes the existence of equilibrium less likely

Alternatively, we might imagine that the area of overlap is intrinsically quite large with considerable surplus to both Coworking clients and Coworking service providers. In this case, to speed the transfer of office properties over to the Coworking paradigm, rents might be expected to rise above R_d for some time. In anticipation of these changes, investors could conceivable be willing to pay higher prices – and lower cap rates – for properties deemed suitable for conversion.

Hence it seems to be an open empirical question as to whether properties recently converted or partially converted to Coworking tenants have a).higher income per sqft (perhaps reflecting higher rents paid by Coworking tenants), and b).lower cap rates (reflecting higher expected future property income by owner-investors).

VII. Empirical Results

We first obtained data on 30 office properties selling in 2016-2018, in 14 MSA that had some amount of space rented by a CoWorking firm in addition to regular tenants. From RCA, all 30 of these "subject" property transactions also had information about net income with which to calculate a cap rate. From a CBRE survey we also obtained the share of the property that was occupied by CoWorking firms. These data are labeled in Table 1 below as: CWprice, CWincome, CWcap, CWshare. Notice that there is great variation in property income and price per square ft among these properties due in large measure to market, location and building differences. Cap rates, however, are seen to be much more tightly clustered around 5%.

Then we obtained between 2 and 4 "peer" properties for each "subject" that sold during the same years; that had no CoWorking tenants and were matched as closely as possible in terms of MSA, neighborhood, building attributes. This yielded 77 transactions from RCA that had information on both net income and price. This data is labeled in Table 1 as: Pprice, Pincome, Pcap. Like the subject properties there was a huge variation in property income and price per square ft, but with cap rates again tightly clustered around 5%.

With the two data sets we formed 77 comparisons, each between one of the 30 property transactions in which CoWorking is a tenant and one of the 2-4 matched property transactions in which there was no CoWorking tenant. The linear difference between the Peer and the Subject values for each variable is labelled in Table 1 as: DIFprice, DIFincome, DIFcap. The matching process should help control and neutralize for any impact that property heterogeneity between the 2 samples might have on differences in value and pricing. To further control for property heterogeneity, we also measured the difference in square feet and year built between peer and subject. These are labelled in Table 1 as: DIFsqft and DIFyear. Of the 77 pairs, four had a difference in year and square feet that was deemed unrealistic and was dropped. This left us with a final sample of 73 paired transactions.

Table 1: Sample statistics

Series	Obs	Mean	Std Error	Minimum	Maximum
Pincome	73	25.5029	10.4149	8.2400	58.5302
Pprice	73	512.8652	257.2051	103.0000	1470.0000
Pcap	73	0.0530	0.0110	0.0250	0.0800
CWincome	30	26.8652	9.4386	7.0091	42.1321
CWprice	30	528.7380	198.7190	152.3723	1063.9556
CWCAP	30	0.0514	0.0086	0.0310	0.0666
CWshare	30	0.3608	0.2751	0.0300	1.0000
DIFincome	73	-1.3623	11.0668	-23.2159	26.2459
DIFprice	73	-15.8728	204.7985	-433.4141	490.8773
DIFcap	73	0.0016	0.0111	-0.0230	0.0270
DIFsqft	73	5303.45	273672.64	-804231.00	1227488.00
DIFyear	73	-8.4932	35.8752	-109.0000	79.0000

In equations (3)-(10) we report a series of regression results, where robust standard errors are shown in parenthesis under each coefficient. Starting with regressions (3) and (4) we examine the simple average difference in property income/sqft, peer-minus-subject, and then how the income difference is impacted when differences in property characteristics and CoWorking tenancy share are controlled for.

$$\underset{(-1.05)}{DIFincome = -1.36} \qquad R^2 = .015, \quad N=73 \tag{3}$$

$$DIFincome = \underset{(0.65)}{1.16} - \underset{(-1.17)}{5.05}\ CWshare - \underset{(-1.24)}{.000004}\ DIFsqft + \underset{(2.51)}{.08}\ DIFyear \quad R^2 = .139 \quad N=73 \tag{4}$$

The simple average difference in matched property income/sqft (in equation 3) is not significant statistically. In equation (4) it also is seen to be quite difficult to explain the differences in income, peer-subject across our 73 pairs. Comparing properties with identical physical characteristics (sqft and year built), equation (4) implies that as a property gains CoWorking tenancy, its income goes from being \$1.16 lower to being \$3.89 greater. This pattern, however, is not significant statistically.

Turning to sales price/sqft, there again is no simple average difference in prices (equation 5), nor is there much difference when property controls included in equation (6). As with property income the only control that matters is differences in property age; properties built in a more recent year sell for more. Again comparing peer-minus-subject prices for properties that are physically the same, as a property gains CoWorking tenancy its sales price goes from being

$11.2 greater to being $5.7 lower (equation 6). Once again, though, this effect is not significant statistically.

This general lack of statistical significance changes dramatically if we include differences in income in place of differences in peer-minus-subject physical characteristics (equation 7). Once we control for property income, which naturally is the primary determinant of pricing, the equation R2 values jump dramatically, and then CoWorking tenancy has a major impact. As a property switches over from traditional tenancy to CoWorking, property prices go from being $30.3 higher to being $70.3 less. This is a significant impact statistically.

$$DIFprice = -15.8 \qquad R^2 = .006, \quad N=73 \tag{5}$$
$$(0.66)$$

$$DIFprice = -11.2 + 16.9\ CWshare - .000064\ DIFsqft + 1.23\ DIFyear \quad R^2 = .061, N=73$$
$$(0.36) \quad (-1.07) \quad (-1.07) \quad (2.51) \tag{6}$$

$$DIFprice = -30.3 + 100.6\ CWshare + 16.1\ DIFincome \qquad R^2 = .73, \quad N=73 \tag{7}$$
$$(-1.82) \quad (2.36) \quad (15.5)$$

The comparison of sales prices – given income – should be very similar to directly comparing cap rates. This we do in equations (8) and (9). We first find that there is no significant simple difference in peer-minus-subject cap rates. If we control for differences in property physical attributes, however, the results become significant. In equation (9) as a property moves its tenancy over from traditional to CoWorking, its cap rate goes from being 63 bps lower to being 63 bps higher. As with the sales price equation, this is a significant impact statistically. Unlike the equation for sales price, we cannot include differences in income as an independent variable since it is related to a property's cap rate by construction.

$$DIFcap = 0.0016 \qquad R^2 = .022, \quad N=73 \tag{8}$$
$$(1.32)$$

$$DIFcap = 0.0063 - 0.0126\ CWshare - 2.7e\text{-}9\ DIFsqft + .000018\ DIFyear$$
$$(3.2) \quad (-2.61) \quad (1.18) \quad (.45)$$
$$R^2 = .138, \quad N=73 \tag{9}$$

IV. Conclusions

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. It seems clear in this data that properties with a small CoWorking tenant share are little different in price from those with none. Alternatively, as a building takes on some initial CoWorking tenants, there should be little initial impact on prices. However, as the CoWorking share of tenancy increases and the property fully converts, prices fall and cap rates rise.

These empirical results seem to support the concerns discussed in section VI about whether CoWorking Tenancy is viewed equivalently to traditional tenancy by landlords and investors. Our data suggests that at least in 2016-2018 investors were skeptical about whether CoWorking would provide as high and as reliable income as traditional tenancy. If this persists, it will be an important impediment to the conversion of properties over into the CoWorking office business model.

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