PERCENTAGE RENT IN RETAIL LEASING: THE ALIGNMENT OF LANDLORD-TENANT INTERESTS

By

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ABSTRACT

Only retail tenants pay their landlord a percentage of revenue in addition to the traditional fixed rent. The latter has often been shown to vary widely across stores - inverse to the sales externalities generated by the store. This paper demonstrates that revenue percentages vary widely as well, and positively with fixed rent (sales externalities). It is then argued that existing theoretical explanations for percentage rent (involving generic risk sharing and tenant effort issues) are not specific to the retail sector and apply to all tenant-landlord relationships. Instead, a model is proposed where percentage rent gives the correct incentive to landlords - rather than the reverse. In this model, percentage rent insures that with sales externalities, landlords do not act opportunistically and always have the interest of existing tenants in mind when expanding, altering or reletting space in a shopping center.

I. INTRODUCTION

In real estate, most leases provide for a fixed rental payment between landlord and tenant independent of either's business fortune. In this sense, most property owners bear little if any of their tenant's business risk. The exception to this rule occurs almost universally in shopping centers, where retail tenants pay a percentage of their gross income as rent - usually in addition to a minimum fixed "base" rent. This unique feature of retail leasing raises the questions of what such leases accomplish and why they occur only in the retail sector of real estate.

Recent research has widely recognized that stores within shopping centers (and more loosely defined business districts) generate sales or business traffic externalities amongst themselves. Patrons visiting one store have a sunk cost in the trip which can makes patronage at adjacent stores far more likely [Stahl (1984)]. In the retail business, these inter-store externalities generate what are referred to as either "comparison" or "complimentary" shopping patterns [Eaton and Lipsey (1979), Wolinsky (1983)]. In this environment, Brueckner(1993) shows that rational shopping center owners will discriminate in the flat leasing rates they charge stores in order to obtain a mix of stores that works best together. Stores, whose reputation, size or products tend to draw customers will pay less, while smaller, less known retailers, who depend on passing-by traffic will pay more.

Empirical research has widely documented the existence of such rental "discrimination" in the "base" rent that stores pay [Benjamin, Boyle, Sirmans (1992)]. However, the question of why percentage rent exists remains largely unanswered. Some have hypothesized that percentage rent simply represents an alternative to "base" rent and that the two should vary inversely across leases to yield the same total occupancy cost [Benjamin, Boyle, Sirmans (1990)]. Others have suggested that percentage rent represents a risk sharing arrangement [Micheli and Sirmans (1995)]. Brueckner (1993) models percentage rent as a way that landlords can incentivize their tenants to work in the interest of the center as a whole. This, however, leads to a negative relationship between rent and sales as "successful" tenants are "rewarded".

This paper disagrees with these views and argues that percentage rental payments in fact help tenants give the proper incentive to landlords. In a situation where tenants make specific sunk investments (for example in finishing their space) or where there are imperfect contracts, rent based on a percentage of sales helps to insure that landlords do not act opportunistically or against the interests of existing tenants when reletting space.

To make this point empirically, the paper first examines several sources of data on retail leases to demonstrate that, contrary to other studies, percentage rent and base rent vary positively across leases or types of retailers. Tenants paying less base rent (such as anchors and tenants with "brand" drawing power) also tend also to pay a lower percentages of their sales. The explanation

offered is that being generators of sales traffic, the business of such stores depends less on the mix of other stores at the center. Thus these stores are less exposed to opportunistic behavior by landlords and need not provide as strong an incentive. Conversely, smaller retailers without their own drawing power not only pay higher base rent, but also are far more dependent on the other leasing decisions made by the landlord. By paying a higher percentage of their sales in rent, they make the landlord's income more dependent on their own business success, and in turn insure that the landlord's leasing decisions are made with their interests in mind.

After the empirics, the paper then develops a simple 2-period theoretical model to illustrate this landlord-tenant incentive problem. There are two types of stores and a 2x2 sales payoff matrix for each period. It is assumed that because of some initial tenant-specific fixed costs there cannot be a continuous spot rental market, despite the optimality of this practice. Thus, space is contracted for in the first period for the entire horizon. Random events cause some tenants to fail at the end of the first period, and this space is then relet in the second. It is shown that even with informed, forward looking landlords and tenants, a negotiated fixed rent for first period's tenants can lead the landlord to act opportunistically and select a tenant mix in the second period that is not optimal (although obviously being more profitable). When first period tenants negotiate to pay a fixed percentage of sales instead, opportunism is proven not to occur and the optimal 2-period mix of stores is always obtained.

While the model clearly demonstrates the advantages of percentage rent, it does not fit all the empirical facts - in particular the mix of flat and percentage rents, and the wide variation in percentage rates that are seen in actual leases. The paper concludes with some suggestions about further empirical work to better pin down these questions.

II. RETAIL LEASES.

In order to study retail leases more carefully, this paper investigated three quite different sources of data. These were:

- Interviews with more than a dozen retail leasing agents, who represent a wide range of both national tenants and shopping center owners.
- The summary of retail leases that is widely reported from the national survey of shopping centers conducted by the Urban Land Institute.
- A micro sample of actual leases obtained from a major east coast owner of more than 20 regional malls.

All three of these sources paint a similar picture of how retail leases are structured, and provide consistent evidence about their rationale.

Base -vs- Percentage Rent.

Retail leasing agents report that a common structure has characterized shopping center leases for many decades. The lease structure has two types of rental payments: a "base" amount per square foot of leased space, and a percentage of gross sales. The percentage of gross sales has a minimum threshold that must be achieved in order for the percentage to take effect. In the business, this is referred to as a "breakpoint". In most retail leases the "breakpoint" is calculated as the ratio of "base" rent -to- percentage. This is called a "natural breakpoint". For example, typical base rent might be negotiated at $20 per square foot per year, with 5% of sales, yielding a "natural breakpoint" for sales of $400 per square foot. Retail leases thus have the general form:

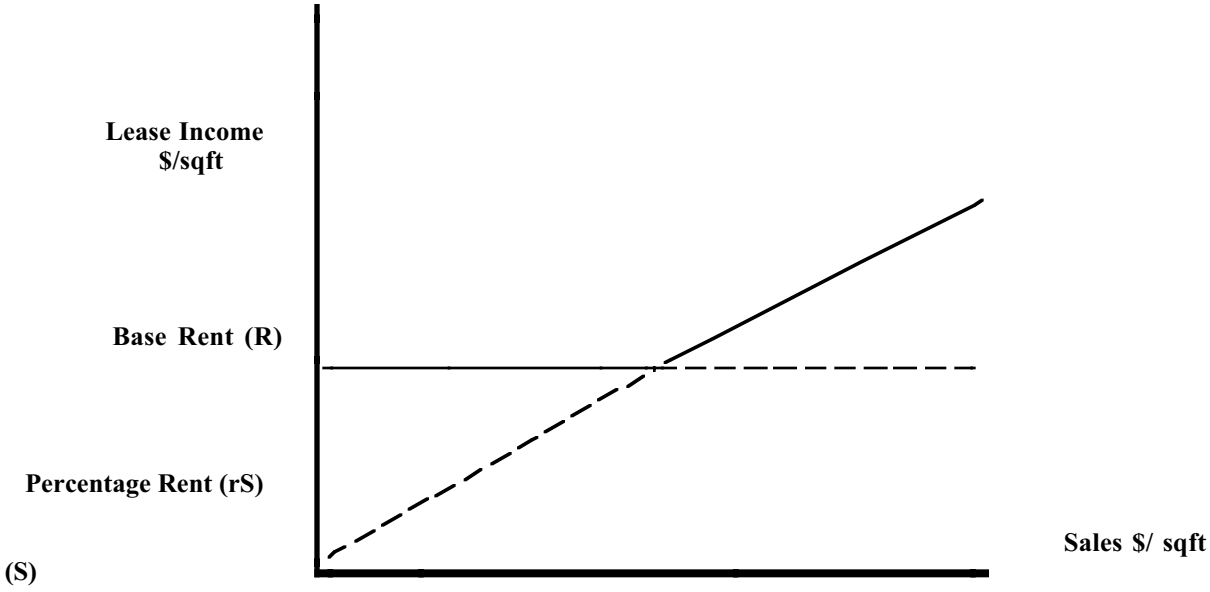
Rental Payments = $R + \max[0, r(S-B)]$,

where: R: flat rent per square foot
r: percentage of sales to be made as a rental payment
S: sales per square foot
B: threshold sales per square foot, or "breakpoint"

With the "natural breakpoint" feature, this reduces to the following expression, which graphically is shown in Figure 1.

Rental Payments = $\max[R, rS]$

Figure 1: retail lease income as a function of store sales



Variation in Base and Percentage Rent

For more than two decades now, the Urban Land Institute (ULI) has conducted a yearly survey of shopping center owners.[1] Since the information is held in confidence, the ULI does not publish data for individual leases or shopping centers - only summary data about average lease terms by both store category and type of retail center. In most years, the ULI receives information from the owners of about 2000 shopping centers. Table 1 displays the 1994 summary characteristics of leases at these centers, by more than 20 types of stores. As reported by other authors, base rent varies from an average of $2.00 (for anchor department stores) to more than $40.00 per square foot for small tenants. The percentages of sales range from 1% to close to 9% of gross income. Also included is average store size and sales, again by type of store.

To compliment this widely published data, the current study obtained the full contractual terms for a sample of 2000 individual retail leases. These leases involve space in roughly 20 regional malls owned by a single operator on the East Coast. After cleaning the data, complete information was obtained for about half of these leases (1035) and this is reported in Table 1, under the columns headed SMPL. While full lease terms were obtained, the sales of each tenant were not. This latter information is kept very confidential by most shopping center operators. The two sources of data are quite consistent. Across the types of stores, the simple correlations between the two comparable columns in Table 1 are: .98 for average store size, .88 for percentage rent, and .93 for base rent.

In both samples, base rent and sales percentages vary across stores in a common pattern. For example, with the ULI averages, base rent varies positively with the average sales level of store type and negatively with store type size. Small, high yielding stores pay the most, suggesting (according to Brueckner's model) that the sales of such stores are highly dependent on that of others. Conversely, large low-sales yielding stores seem to generate these externalities and hence pay the least. A similar pattern exists in the percentage rates that stores pay. The following regressions (using the data in Table 1) illustrate this:

Base Rent = .664 + .083Sales/sqft - .00012Sqft/store
(.17) (5.9) (-2.4)
R^2 = .77, N = 22 (ULI)

Sales Pct = .061 + .0000031Sales/sqft - .00000054Sqft/store
(5.8) (1.2) (-3.9)
R^2 = .51, N = 22 (ULI)

Thus it is not surprising to find that a regression between base rent and percentage is both positive and highly significant. The two vary positively together and not negatively as some other authors have suggested.

Table 1: Average lease terms by type of store.

Store category	ULI area[1]	Sample area	ULI %[2]	Sample %	ULI Rent[3]	Sample rent	ULI Sales[4]
1	102.9	126.4	1.01	.47	2.18	2.36	148.1
2	.8	.7	7.9	8.3	33.5	72.1	278.4
3	2.7	5.5	6.0	5.8	20.3	36.8	261.2
4	2.1	3.3	5.0	5.4	21.0	35.5	268.9
5	2.6	3.7	5.1	5.9	20.1	36.9	235.4
6	3.9	5.9	5.0	5.3	15.0	28.9	175.6
7	2.3	2.5	6.0	6.0	16.2	36.2	203.9
8	2.2	2.4	6.0	6.2	18.8	37.3	232.5
9	1.1	1.3	6.0	6.6	40.5	82.1	525.4
10	1.8	2.3	5.6	5.7	18.7	42.8	231.1
11	42.6	29.7	2.5	2.4	3.5	13.2	129.3
12	8.0	6.4	3.7	3.2	8.6	19.3	210.8
13	2.9	2.9	6.0	7.4	17.3	40.4	207.2
14	1.3	2.3	4.7	6.1	19.1	39.7	237.8
15	1.8	3.0	6.2	6.3	24.2	36.1	266.1
17	3.9	4.1	5.5	6.0	13.8	31.0	191.2
18	2.4	2.5	4.7	5.8	19.6	42.3	290.3
20	8.9	5.6	8.9	17.1	13.7	40.9	93.4
21	5.6	4.1	5.0	6.5	12.8	40.5	225.4
22	.9	.9	7.9	8.7	32.2	74.2	305.1
23	.8	.7	7.8	8.9	39.5	112.3	336.2

1. Gross leased area per store, 1000s of square feet. 2. Percentage of gross sales paid as rent.
3. Base rent paid, dollars per square foot 4. Dollar sales per square foot.

Store Categories: 1=Anchor	8= Shoes	15=Home Furnishing
2=Apparel/accessory	9= Jewelry	17=Hobby, Special Interest
3=Apparel/Unisex	10=Misc.	18=Audio-Visual
4=Apparel/Child	11=Disc. Department Store	20=Amusement and Theatre
5=Apparel/Woman/Spec.	12=Drug and Variety	21=Restaurant
6=Woman's Apparel	13=Books,Gifts	22=Specialty Food
7=Men's Apparel	14=Services	23=Fast Food

ULI information: *Dollars and Cents of Shopping Centers,* Washington, D.C., 1994.

Base Rent = -2.1 + 390.0Sales Pct
(-.4) (4.4)
R^2 = .48, N = 22 (ULI)

When the micro sample of actual leases is examined the same results holds. Base rent and sales percentages move positively together:

Base Rent = -7.7 + 866.0Sales Pct
(-.2.3) (18.3)
R^2 = .26, N = 1035 (SMPL)

The positive association between base and sales percentages continues to hold even across leases *within store categories.* When store-type structural effects are added to the regression using individual leases with the SMPL data, the result is:

Base Rent = .29 + Σ Store Dummies + 396.0Sales Pct
(.94) (8.9)
R^2 = .69, N = 1035 (SMPL)

Thus in both samples of data, there is clear evidence that base rent and the contract percentage of sales move positively together across types of stores. Stores that have low {high}base rent because they generate (receive) sales externalities also pay a low (high) percentage of sales. This clearly suggests that percentage rent has something to do with the nature and magnitude of the externality that the store generates. There have been some attempts to theorize about this relationship.

III. ALTERNATIVE EXPLANATIONS FOR PERCENTAGE RENT.

A number of arguments have been advanced recently in the literature to try and explain the existence of percentage rents in retail leasing contracts. Each of these need to be reviewed before advancing the thesis of this paper.

Tenant externalities with tenant effort incentives.

In Brueckner's [1993] original model there is no need for percentage rent, the optimum allocation of center space can be achieved with discriminatory flat rents. To try and explain percentages, a second model is presented in which each tenant undertakes unobservable effort to expand sales, and which the landlord wishes to encourage because it benefits other stores through shopping externalities. The landlord still needs to discriminate among tenants in order to attract the optimal mix, as in the original model, but now also must provide some incentive to encourage the spillover effect from tenant "effort". The rent maximizing allocation of space now requires not only a rent that is lower for those stores generating externalities, but also a rent that is *lower* when the sales of any one store are higher. In effect, the landlord indirectly rewards tenant "effort" with more favorable rental terms when sales are higher. This type of contract is exactly the opposite of that observed in practice.

Risk Sharing and Tenant Effort

Miceli and Sirmans [1995] argue that a rent which varies positively with store sales might be explained through a simple risk sharing argument. With this line of reasoning, when (uncertain) income is generated from the joint work of two parties (tenant-landlord), efficient contracts to split the proceeds can be of several varieties depending on the relative risk aversion of each party. If tenants are risk neutral, while landlords are risk averse, it is efficient for tenants to "insure" landlords by paying fixed rent. Alternatively, if both parties are risk averse then the optimal contract calls for a sharing of the proceeds (as occurs with percentage rent). The authors go on to suggest that the lower percentages paid by large anchor tenants might be explained if such stores have only slight aversions to risk, while smaller stores are more risk averse (relative to their landlord).

Lee [1995] argues that a lease contract with both base rent and a percentage of sales is the outcome if risk-sharing is combined with unobservable tenant effort (moral hazard). Paying a fixed rent tends to leverage the tenant's net return as a function of sales and thereby provides an extra incentive to exert "effort". If at the same time, only the tenant is risk adverse, this scheme acts perversely as a form of insurance. A constrained 2nd best contract can emerge that contains both features.

While interesting, these arguments do not address the central question of why it is only *retail* tenants and retail space where percentage rents exist. There is nothing unique in the arguments to the retail sector. Why should it be that all landlords are risk averse, retail tenants likewise, while those types of firms occupying office or industrial building are always risk neutral. In fact, since both tenants and owners are most often public corporations, each is likely to be risk neutral and risk sharing models should have little to say.

Risk Sharing with tenant externalities.

In Brueckner's paper [1993], a third model is offered in which the sales of each store are stochastic in addition to depending on the allocation of space within the shopping center. If both tenants and the landlord are risk averse (and have constant relative risk aversion) then there is a an allocation of both space and sales proceeds that maximizes the combined utility of all parties. To achieve this allocation requires first a base (fixed) rent that is again lower for stores generating externalities. In addition, it is optimal for each store to contribute a common share of their sales to the landlord, as a way of distributing risk. Thus, optimal rental contracts would call for a discriminatory base rent but a common percentage of sales from all stores - as insurance. It is important to note that this model suffers from the same failure as the simple risk sharing model - the argument applies to any type of property and is not unique to retail. Office or industrial tenants need not pay differential base rent, but why don't they still share their business risk with the landlord?.

Risk Sharing with Tenant effort (and Tenant externalities).

The final argument in Brueckner's [1993] paper involves not a full model, but an intriguing conjecture. It begins with tenants who undertake unobservable effort to expand sales, which also have a stochastic element. With shopping externalities this effort will benefit all stores and hence the landlord wishes to encourage it with a rent that varies negatively with sales. At the same time, however, Brueckner suggests that if both parties are risk averse, there will have to be a positive splitting of sales proceeds. In this situation, Bruckner hypothesizes that a contract of the type shown in Figure 1 might emerge in which not only base rent varies with the type of store, but a positive percentage rent could as well.

Landlord as opposed to tenant incentives.

While the arguments just discussed are all intriguing, they really fail to explain the most important stylized fact about leasing - that it is only retail tenants who pay a rent that is positively related to their sales. Risk sharing can apply to any landlord-tenant relationship, and while Brueckner's externality-effort model is certainly unique to retail properties, it predicts the wrong sign between rent and sales. Rather that speculate further about whether retail percentage rent can be explained by some existing economic theory, this research will build off of some evidence gathered through the interviewing of retail leasing agents.

The retail agents interviewed provided an explanation for percentage rents that involved many of the same elements as the existing economic arguments, but with some important twists. First, store externalities mean that a tenant's business success depends keenly on the mix of other stores - an arrangement under the control of the landlord (as in Brueckner's model). Second, unlike the static models described, the actual mix of stores is a dynamic process, that changes as

stores fail and trends in retailing shift. This evolving mix is a major source of tenant business uncertainty. Finally, since the landlord controls the mix, it is his (in this case quite observable) "effort" that need to be in tune with tenant interests - not the reverse. It is argued next that percentage rent provides an incentive for the landlord to act in the interest of his existing tenants rather than the reverse.

Of course the use of percentage rent might not be necessary if more complex flat-rate leasing contracts could be written. Consider the following possibilities. First, if all rents were simply renegotiated continuously, landlords would always act in the interest of their tenants since not doing so would lead existing tenants to adjust their rents. The outfitting of shopping centers, however, involves considerable sunk costs - that most often are tenant specific. This requires the commitment of tenants and hence longer term contracts are needed. Given the necessity of such contracts, one might imagine that a complicated set of contingencies could be incorporated into leases so as to have a fixed rent that varies exactly with the mix of other stores in the center. In most sectors of the economy, however, such complicated contingent contracts are frequently missing, possibly because of contracting costs. In what follows, it is argued that at least within a simple model, percentage rent seems to perfectly align the interests of landlord and tenant - while fully informed, forward looking fixed rental contracts do not - if they must be written for several periods.

IV. RETAIL RENTAL CONTRACTS WITH SALES EXTERNALITIES: A 2-PERIOD MODEL.

Consider a shopping center which is bought or built and then operated for two periods. The initial tenants contract to make payments for the full two periods, and the model considers two alternative forms of making rental payments: one where this rent is a fixed amount (base rent), the other where a fixed percentage of sales is agreed to (percentage rent). While the amount of rent paid will vary by tenant, the necessity to outfit space for each tenant and the inability of tenants to make contingent contracts limits the type of contract to just these two.

At the end of the first period, there is some probability that a tenant's business fails and that the landlord is left with vacant, leasable space. To keep the model simple, two assumptions are made about this likelihood of failure. First, store failure is assumed to be exogenous and independent of the initial mix of stores. Allowing it to vary with store mix might be more realistic but it expands the number of parameters by 4-fold. Since the purpose of the model is primarily illustrative, the probability of failure is made uniform. *Secondly, it is assumed that within one period only one of the tenants can fail and not both.* This avoids a series of tedious calculations that arise when the landlord can start all over again. This pattern of risk is recognized by all parties and considered when negotiating first period rental contracts. At the beginning of the second period, landlords

relet the vacated space, but with only 1 period left either fixed or percentage rent yields the same payment - as will be discussed below.

Tenants are of two types, and there are sales externalities. Thus there exists a sales matrix, S_{ij}, which gives the payoff to tenant i when the other store is type j. There is not symmetry, so $S_{12} \neq S_{21}$. This matrix is the same in both periods. *Under these assumptions the optimal tenant mix in each period is simply that which maximizes aggregate sales.*

All parties are rational, risk neutral, and select strategies that maximize the expected present value of revenues. For simplicity, and at no loss of generality, a zero discount rate is assumed. Tenants anticipate how landlords will relet vacant space, and then calculate either fixed or percentage rents that, following bargaining theory, give up _ of the value of occupying the center. Based on these rents, landlords develop a releasing strategy, and then select the first period tenancy incorporating these 2nd period plans. Summarizing, the following definitions will apply in the model.

λ : probability that one tenant (but not the other) fails at the end of period 1. (both cannot simultaneously fail, hence 1-2_ is the probability neither fails).

P_i :probability that the landlord relets available space in period 2 with tenant type i when the remaining tenant is also of type i. (i=1,2).

S_{ij}:net sales in any period of tenant type i when the other tenant is of type j (i,j=1,2).

R_{ij}: base (fixed) rent, contracted for in period 1 and carrying through to period 2 by tenant i when the other tenant is j (i,j=1,2).

r_{ij} : rental percentage of sales contracted for in period 1 and carrying through to period 2 by tenant i when the other tenant is j (i,j=1,2).

E--$_{ij}$: the 2-period expected value (with zero discounting) of either sales (by tenants) or rental revenue (by landlords) under the initial leasing arrangement ij.

Initial (1st period) tenants calculate the expected sales that they will experience under each of the first period occupancy patterns. For example, a type 1 tenant that starts initially with the same type of neighbor, earns S_{11} with certainty in the first period and the same with a $(1-2\lambda)$ probability in the second (if neither tenant fails). If the other tenant does fail (with probability λ) the store has the expected income $P_1S_{11} + (1-P_1) S_{12}$. A tenant of type 1 who starts initially

with a type 2 neighbor receives S_{12} in period 1 and the same in period 2 if neither tenant fails (probability 1-2λ). The expected period two income if the type 2 neighbor does fail is $P_1S_{11} + (1-P_1) S_{12}$. The equations in (1) summarize these expected sales values.

$$ES_{ii} = (2-2\lambda)S_{ii} + \lambda [P_iS_{ii} + (1-P_i) S_{ij}] ; \quad i=1,2, \ I \neq j \qquad (1)$$

$$ES_{ij} = (2-2\lambda)S_{ij} + \lambda [P_i S_{ii} + (1-P_i)S_{ij}] ; \quad i=1,2 , \ j=1,2, \ i \neq j$$

1st period Base and Percentage Rent.

The net value to tenants of entering into a relationship with the landlord is the expected value of sales minus the rental payments made for two periods. In bilateral bargaining theory it is a common assumption that the two parties split the gains from entering into an agreement.[2] For simplicity, its assumed that the tenant's alternative site yields zero expected sales. Thus after making rental payments, the tenant and landlord must each be left with _ of the expected sales from this contract. When base rent is paid, tenants are willing to pay a fixed amount for two periods that is:

$$ES_{ij} - 2R_{ij} = ES_{ij} /2 , \text{ or } , \ R_{ij} = ES_{ij} /4 \qquad (2)$$

In the case where a percentage of sales serves as the rental contract, this yields

$$ES_{ij}(1- r_{ij}) = ES_{ij} /2 , \text{ or } , \ r_{ij} = 1/2 \qquad (3)$$

2nd Period Reletting Rent.

When space that has become vacant is relet in the second period, the rent with either flat or percentage contracts is simply 1/2 of the tenant's sales. Since the new tenant knows the center mix with certainty (no other store can fail by assumption) expected sales equal actual and there are no fixed costs (the new tenant assumes the existing built out space). The assumption that bargaining splits the gains from occupancy yields the 1/2 of sales result.

Thus so far, the model defines how rents negotiated in the first period depend on the tenant mix (in both periods) and hence the anticipated reletting behavior of landlords. The model also fits some of the empirics in sections II and III. For example, the base rents that tenants pay are positively related to expected store sales, as the analysis of leases determined. Bargaining theory, however, dictates a common sales percentage across stores. The leasing decisions of landlord depend keenly on which form of lease contract is used.

V. LEASING DECISIONS WITH BASE (fixed) RENT.

Given how second period rents are determined, the landlord's reletting decisions are simply based on the sales payoffs. When base rents by remaining 1st period tenants are fixed, the landlord reletting probabilities are determined in (4).

$P_1 = 1$ if $1/2S_{11} > 1/2S_{21}$, $= 0$ if reverse (4)

$P_2 = 1$ if $1/2S_{22} > 1/2S_{12}$, $= 0$ if reverse

The landlord's combined 2-period total revenue, for each of the three possible initial tenant combinations and given the reletting probabilities (at the end of the first period), are then defined in (5).

$$ER_{ii} = 2R_{ii}(2-2\lambda) + 2\lambda [R_{ii} + P_i S_{ii}/2 + (1-P_i)S_{ji}/2] \quad i = 1,2 , \quad j \neq i \tag{5}$$

$$ER_{12} = (R_{12}+R_{21})(2-2\lambda) + \lambda [R_{12} + P_1 S_{11}/2 + (1-P_1)S_{21}/2] + \lambda [R_{21} + P_2 S_{22}/2 + (1-P_2)S_{12}/2]$$

In equation (5), the first term on the LHS is the (2-period) revenue that the landlord receives from the initial tenants, conditioned on neither failing. The second term is the revenue the landlord receives in the second period, from the remaining tenant plus new tenant, in the case where each initial tenant fails, again conditioned by the failure probability.

The system of equations in (5), (4), (2) and (1) completely determines all expected revenues, rents and reletting probabilities - given the sales matrix (S_{ij}) and failure probability (λ). Tenants anticipate landlord reletting behavior and build this into rents, while landlords take these rents and determine their initial leasing decision and their reletting choices. There is no hidden or asymmetric information, and all parties are forward looking.

The solution to (5), (4), (2) and (1) depends completely on the payoff matrix. In general the choice of initial tenants as well as the tenant mix that results in the second period after reletting will *not* be that which maximizes aggregate sales. Two types of problems commonly occur, and many examples of each easily can be constructed.

Example 1: 2nd Period Opportunism

The first type of failure might be termed second period opportunism. This happens when the landlord can get the greatest rental income from reletting to a tenant that actually harms the existing tenants. Since the landlord does not pay any rental penalty for this opportunism (with fixed rent), she engages in it anyway. Tenants know that the landlord will do this (if space becomes vacant) and consider this in calculating their 1st period rental contracts, but there is still no mechanism to punish the landlord in the second period. Of course, were contingent contracts or a spot market possible, this would not be a problem.

As an example of this consider the case where the payoffs are: [$S_{11} = 2$, $S_{12} = 6$, $S_{21} = 1$. $S_{22} = 3$, $\lambda = .25$]. This yields the solution:

$$P_1 = 1 , \quad P_2 = 0$$

$$ER_{11} = 3.52, \ ER_{12} = 5.96, \ ER_{21} = 5.96, \ \ ER_{22} = 5.63$$

In this example, the optimal tenancy combination for both periods is a store of each type (a mixed arrangement). The landlord does initially lease the space in this way. In the second period, however, if the type 2 tenant fails, the landlord relets to a tenant type 1 store rather than continuing the optimal mix with a new tenant of type 2. Even knowing this, first period tenant rents still lead the landlord to select the optimal (mixed) tenant configuration. The problem is that this mix is not maintained.

Example 2: 2nd Period Opportunism with 1st period misallocation

Using the same payoffs, [$S_{11} = 2$, $S_{12} = 6$, $S_{21} = 1$. $S_{22} = 3$], as the probability of store failure increases then the expected cost of the landlord's opportunism does as well. As this happens, 1st period tenants increasingly begin to discount the (base) rent they are willing to pay. The net result is that the landlord winds up initially leasing the center in a suboptimal way with two type 2 tenants. What happens then in the second period largely depends on the payoffs. In this example, the landlord relets space to a type 1 tenant, which happens to create the optimal (mixed) configuration after a first period occupancy pattern that is solely of type 2 tenants. When [$\lambda = .45$] then:

$$P_1 = 1 , \quad P_2 = 0$$

$$ER_{11} = 3.26, \ ER_{12} = 5.21, \ ER_{21} = 5.21, \ \ ER_{22} = 5.73$$

These two examples illustrate the major types of failures that occur with flat leases in this model. While it may be the case that landlord decisions are sometimes optimal, it is quite easy to

construct many such counter examples where they are not.

VI. LEASING DECISIONS WITH PERCENTAGE (variable) RENT.

When first period tenants negotiate to pay a fixed percentage of sales as rent, even though this percentage is fixed across periods, the optimal tenant configuration is *always* obtained in this model. With percentage rent, the landlord's reletting decision is now quite different. Opportunistic behavior in the second period by the landlord will now have consequences for the income the landlord receives from the remaining first period tenants - if their sales are adversely affected. With percentage rents, the landlord's reletting probabilities are determined by the broader set of payoff combinations in (6).

$P_1 = 1$ if $1/2S_{11} + 1/2S_{11} > 1/2S_{21} + 1/2S_{12}$, $= 0$ if reverse (6)

$P_2 = 1$ if $1/2S_{22} + 1/2S_{22} > 1/2S_{12} + 1/2S_{21}$, $= 0$ if reverse

The landlord's expected 2-period income under each of the three initial leasing patterns is:

$$Er_{ii} = S_{ii}(2-2\lambda) + 2\lambda [P_i S_{ii} + (1-P_i)(S_{12}+S_{21})/2] \quad i = 1,2 \tag{7}$$

$$Er_{12} = 1/2(S_{12}+S_{21})(2-2\lambda) + \lambda [P_1 S_{11} + (1-P_1)(S_{21}+S_{12})/2] + \lambda [P_2 S_{22} + (1-P_2)(S_{12}+S_{21})/2]$$

In equation (7), the first term on the LHS is the (2-period) revenue that the landlord receives from the initial tenants, conditioned on neither failing. The second term is the revenue the landlord receives in the second period, from the remaining tenant plus the new tenant, in the case where each initial tenant fails, again conditioned by the failure probability. To show that (6) and (7) when combined with (3) always yield the optimal tenancy mix, each of three possible payoff matrix configurations has to be considered.

1). If it is optimal to have a mix of tenants, then $S_{21}+S_{12} > 2S_{11}$, $S_{21}+S_{12} > 2S_{22}$ and from (6) this yields $P_1=P_2= 0$. Thus a landlord will always relet to achieve the (optimal) mixed tenant configuration in period 2. Incorporating these probabilities (7) reduces to:

$Er_{ii} = 2S_{ii} + \lambda [S_{12}+S_{21} - 2S_{ii}]$, which varies from $2S_{ii} \rightarrow S_{12}+S_{21}$ as λ: $0 \rightarrow 1$, $i = 1,2$ (8)

$Er_{12} = S_{12}+S_{21}$

Given the assumed sales payoff values, it is clear that $Er_{12} > Er_{ii}$ for both $i = 1,2$. The landlord will lease to a mix of stores to begin with and (because both reletting probabilities are zero) will maintain the mix if either tenant fails.

2). If two tenants of type 1 are optimal (yield the greatest combined sales), then $2S_{11} > S_{21} + S_{12}$, $S_{11} > S_{22}$ and from (6) $P_1 = 1$ while P_2 can be either 0 or 1. The landlord will relet to achieve only type 1 tenants if the remaining tenant is type 1. As for the situation where the remaining tenant is of type 2, consider each possibility.

If $P_2 = 0$ then (7) reduces to (9).

$$Er_{11} = 2S_{11} \ , \quad Er_{22} = 2S_{22}\,(1-\lambda) + \lambda\,[\,S_{12} + S_{21}\,] \qquad (9)$$

$Er_{12} = S_{12} + S_{21} + \lambda\,[\,S_{11} - (S_{12} + S_{21})/2\,]$,
which varies from $S_{12} + S_{21} \rightarrow S_{11} + (S_{12} + S_{21})/2$ as $\lambda: 0 \rightarrow 1$.

Hence under the assumptions about the sales payoffs: $Er_{11} > Er_{22}$ and $Er_{11} > Er_{12}$. [3]

If $P_2 = 1$ then (7) reduces to (9').

$$Er_{11} = 2S_{11} \ , \quad Er_{22} = 2S_{22} \qquad (9')$$

$Er_{12} = (2-2\lambda)(S_{12} + S_{21})/2 + \lambda S_{11} + \lambda S_{22}$

Again under the assumptions about sales payoffs: $Er_{11} > Er_{22}$, $Er_{11} > Er_{12}$. [4]

3). The case where two tenants of type 2 are optimal is identical to that with two type 1 tenants. QED.

Hence under all possible payoff matrices, basing rent on a fixed percentage of tenant sales insures that the tenant configuration which is initially chosen and then maintained by the landlord is the same as the one which maximizes aggregate sales.

VII. CONCLUSIONS

Retailing is a complex business when there exist interdependencies between stores because of common transport costs, complimentary shopping and comparison product searching. With these inter-store externalities, Brueckner has shown that common center ownership with rental discrimination is necessary to achieve an optimal mix of stores - one that maximizes aggregate sales. In a purely static model the common ownership that shopping centers provide would seem to be sufficient to insure that retailing configurations are optimal. Undoubtedly this helps explain why shopping centers have so populated the country in recent decades while older business districts (that do not have common ownership) have struggled.

Retailing, however, is also a dynamic business that changes over time with tastes, trends and competition. Stores frequently fail, and shopping centers often "adjust" their mix of tenants. Once the Brueckner model is expanded to incorporate multiple time periods, specific sunk costs, uncertainty and limited contracting, common ownership is not sufficient to insure that center rent maximization is equivalent to sales maximization. In the simple two period model developed here, having tenants pay a fixed percentage of sales instead of a fixed dollar rental value insures this equivalence.

While a useful pedagogical tool, the model developed here does not provide an explicit derivation of why sales percentages would vary across stores. While base rent is tied to store expected sales (and hence is different), common bargaining assumptions led to a uniform percentage of sales being used across stores. In the real world the positive movement of the two lease terms might be explained as follows. Externality recipients (stores that "feed" off of the traffic generated by brand value stores) have sales that are keenly sensitive to the exact mix of other stores in the shopping center. To incentivize center operators, these stores are willing to pay a high percentage of sales, so that their rental payments vary more sharply with sales. Conversely, externality generators (anchor stores or those with brand value) draw their own traffic and have sales that are less dependent on the mix of other stores. Thus they need not pay as great a percentage of sales in order to align the landlord's interests with theirs.

While the model in this paper has shown the superiority of percentage over fixed rent, its simplicity leaves another important question unanswered. The actual leases observed in retailing always represent a mix of the two prototypes used in the model. The leasing agents interviewed suggested that this might represent some tradeoff for the sake of financing. With fixed rent, landlords expose their income to little risk and in the process thereby obtain maximum financing flexibility in debt markets. The downside of this form of rent is that it can adversely affect the efficiency with which the center will be run. At the other extreme, pure percentage rent allows for a full alignment of interests and hence better center performance in the longer run. Its downside is the risk that it creates for the landlord's income and the limits that result from this on access to debt financing. The real world is always a compromise between theoretical extremes, and studying this tradeoff in more detail can clearly form the basis of additional research.

Finally, this research suggests some intriguing avenues for additional empirical research. The argument advanced here, particularly in relation to others, generates a number of testable derivative hypothesis.

- In centers with greater turnover, and hence business risk, do leases tend to have higher percentage rent?
- Ceteris Paribus, do tenants that sign longer term leases, and hence make greater commitment to a center, pay higher percentages?
- When stores (in cities for example) lease space in a small single building, owned by someone not owning adjacent properties, is percentage rent still observed? Without externalities, the theory here says percentage rent should not occur.

The type of opportunistic behavior by landlords described in this paper depends on having all of several ingredients: inter-store externalities, uncertainty in tenant mix, and sunk costs with imperfect long term contracts. Without these, percentage rent should not exist - if it is the alignment of landlord behavior and not tenant "effort" that explains the practice.

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NOTES

1.The survey was conducted every 2 or 3 years in the 1960s and 1970s and has become annual only more recently. ULI, *Dollars and Cents of Shopping Centers,* Washington, D.C.

2.The results do not depend on the split - only on the assumption that the split is independent of the sales payoffs or failure probability. See: Mortensen[1982], Diamond [1982].

3. By construction: $Er_{11} = 2S_{11}(1-\_) + \_2S_{11} > 2S_{22}(1-\_) + \_(S_{12}+S_{21}) = Er_{22}$. Since $Er_{11} > Er_{12}$ at both $\_=0$ and $\_=1$, it does so everywhere in between.

4. By inspection: $Er_{11} > Er_{22}$. By construction: $Er_{11} = (2-2\_)S_{11} + \_2S_{11} > (2-2\_)(S_{12}+S_{21})/2 + \_(S_{11}+S_{22}) = Er_{12}$.