Bundling and splitting: Workspace tenure in two vectors

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ABSTRACT

The relationship between levels of energy efficiency and differing forms of commercial office workspace tenure is theoretically affected by the economic principal-agent problems of moral hazard and adverse selection. Tenure involving contracts gross with energy utilities is subject to the moral hazard of overconsumption of energy which results in lower measures of energy efficiency. Tenure involving contracts net of energy utilities is subject to underinvestment in energy efficiency leading to the adverse selection of buildings put to market. Both these problems are theoretically mitigated by information sharing, that is by "disclosure" between principal and agent.

Past empirical research has measured the relationship between energy efficiency and differing contract types. A gap in this research is the inclusion of information-age workspace tenure subject to not just one, but multiple contracts, multiple associated principal agent problems, and the effect to which total energy efficiency has been affected by the presence, or absence of disclosure. To fill this gap a conceptual framework for future empirical research is presented.

Tenure is described in two vectors: bundling and splitting. Using a measure of tenure energy efficiency based upon that of the mandatory National Australian Built Environment Rating System, this framework is then used to derive hypotheses concerning the empirical measurement of the relationship between levels of energy efficiency in commercial office workspace tenure, involving either owner occupancy, and gross or net contracts or some combination of the two.

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PRINCIPAL AGENT PROBLEMS AND DISCLOSURE

A contract for the use of a commercial office workspace involves a principal and an agent. Economic principal agent theory describes how differing incentives, and differing access to information, can give rise the problems of adverse selection and moral hazard. When the principal is a lessee of commercial office workspace, and the agent is the lessor offering that workspace, these problems are of consequence for the energy efficiency of commercial office workspace and the buildings that contain them.

Principal-agent theory also describes how these problems can be mitigated by the sharing of information, henceforth "disclosure," between principal and agent. Such disclosure can be mandated by government policy or undertaken voluntarily through programs administered by government or non-profit organisations.

While mandatory disclosure policy is relatively easy for governments to administer, as Hsu (2014) noted, it places a considerable burden upon those who must comply. Disclosure policy needs, therefore, to be supported by empirical research into its intended, and unintended effect of mitigating principal agent problems.

Adverse selection

Adverse selection is a principal-agent problem of precontractual opportunism (Molho,1997). If prior to a workspace lease contract being agreed upon, a prospective lessee, suffers information asymmetry relative to prospective lessor, she may be unable to discern whether that workspace is an energy efficient building, from an energy inefficient one. And if that contract is net of energy utilities, the lessee reaps the benefits of an energy efficiency investment, while it is the lessor who pays for such an investment. This "landlord-tenant" problem leads to underinvestment that has been measured empirically, including by Gillingham et al. (2012) who found that home owners invest more in energy efficiency measures than do renters.

If other lessors, also underinvest in commercial office energy efficiency, then fewer above-average energy-efficient offerings enter the market. In a process similar to that described by Akerlof (1970), the market deteriorates into one of energy inefficient lemons. Such, adverse selection of energy efficient buildings is a form of energy efficiency investment market failure, the theoretical remedy for which is information (Allcott and Greenstone, 2012)

Ex-ante disclosure mitigating adverse selection

Commercial office building energy-efficiency investment market-failure has become a matter for government policy. In Australia, it is mandatory to disclosure the energy efficiency of a commercial office building prior to the sale, lease or sublease of a workspace over 1000 square meters of net lettable area (NLA). Such ex-ante disclosure is through the National Australian Built Environment Rating System under the sub-category of Energy for Offices.

Energy efficiency is defined as *"using less energy to provide the same service"* (Lawrence Berkeley 2017). Its calculation, therefore, involves measures of energy consumption controlling for variables that describe the level of service provided. NABERS Energy efficiency rating, measures energy consumption controlling for the tenancy workspace's net lettable area (NLA), full-time equivalent occupancy (FTE), hours of operation, and location controlling for climate. A NABERS rating of between 0.5 and 6.5 stars is awarded.

There are three types of NABERS ratings: base-building, whole building and tenancy:

The mandatory base-building NABERS, measures the energy consumed by base-building services and is based upon the NLA of all the tenancies in the buildings. Base-building disclosure is suited to commercial office buildings under net leases, the most common form of tenure in Australia (PCA 2015). These leases are net of both base-building and tenancy energy. Base-building services encompass those in the central building plant heating, ventilation and air-conditioning, centralized security, common area lighting, vertical transportation, water etc. Net lessees pay the lessor for their portion of base-building energy utilities, pro-rated according to NLA, "passed-through" with each rent invoice. Lessees, therefore, neither control nor invest in these base-building services, the energy efficiency of which is to their benefit. Tenancy services include tenancy lighting, tenancy package air-conditioning units, and plug loads etc. The net lessee both invests in, has control over, tenancy energy the cost of which they pay direct to the energy utilities company. Disclosure of base-building energy efficiency theoretically mitigates the underinvestment in base-building energy efficiency.

The mandatory whole building NABERS rating is suited to owner-occupied or single tenant buildings in which tenancy energy is not separately metered. Whole building NABERS rating measures the sum of energy consumed in both base-building and "tenancies,"and is based upon the NLA of all the tenancies in the building. Disclosure of whole building energy efficiency theoretically mitigates underinvestment in whole building energy efficiency.[1]

The voluntary Tenancy NABERS rating measures energy after the tenancy sub-meter. Tenancy NABERS is based upon the NLA of the single tenancy workspace. It is not mandatory but like Base-building or Whole-building NABERS can be estimated using the calculator on the NABERS website (NABERS 2017).

Empirical research into ex-ante disclosure's effects

There is a large and growing body of work that measures the effects of ex-ante disclosure. It shares a common research method. Controlling hedonically for building attributes, multiple regression analysis is used in search of a relationship between a building's eco-certification or energy efficiency (including or similar to NABERS) rating and sales and rental premia. Sales and rental premia are the extra amount paid by the purchasers of a building, (sales), or lessors of a workspace (rental) over and above that paid for an unrated building or workspace. The normative goal is for a finding of sales and rental premia to incentivize energy efficiency investment up to pareto optimal levels.

Premia were found by Miller et al. (2008), Eichholtz et al. (2010), Fuerst and McAllister (2011), Kok and Jennen, 2011, Chegut et al., 2013, Szumilo and Fuerst (2013), Kahn and Kok (2014) Deng and Wu (2014) and others. Rental premia were generally found to be lower than sales premia and Gabe and Rehm (2014) and Papineau (2013) find no rental premia above the full capitalised value

[1] While it is the effects of disclosure across lease contracts that is the subject of this paper, Whole building NABERS, like Base-building NABERS also, theoretically, mitigates adverse selection across sales contracts.

of energy costs savings. This raises the question of much of these premia can be attributed to the capitalized value of expected energy cost savings, and how can be attributed to other tangible or intangible factors, (Fuerst et al. 2018) including what Das and Wiley (2013) describe as the "expected marketing benefits".

While for Oyedokun (2017), some of this research, suffers from a statistically inadequate sample size, of relevance here is that ex-ante disclosure has an effect, and that it creates value for the purchasers of buildings, that either does not exist, or is not of any, or not of so much value, to the renters of rated buildings. There is a need, therefore, for an exploration of what these unknown factors might be, and for a method of measuring the efficacy of ex-ante disclosure in mitigating principal agent problems other than through the measurement of financial returns.

Moral hazard

Stemming from post-contractural opportunism (Mohlo,1997), moral hazard presents the reverse of a situation of adverse selection. It occurs when it is the agent who suffers information asymmetry with respect to the principal. Such a situation precludes the pareto optimal sharing of risk (Stiglitz, 1975; Holmstrom, 1979).

Under a modified gross lease, it is the agent, the lessor, who pays for some combination of base-building and tenancy energy, taxes, maintenance, and insurance. The principal, the gross lessee, is therefore incentivized to overconsume because it is the gross lessor who pays the cost of energy. Such moral hazard has been found empirically by comparing levels of energy consumption under gross contracts subject to moral hazard, with that under net contracts, both in the residential sector (Levinson and Niemann, 2004; Gillingham et al., 2012) and in the commercial sector (Jessoe et.al 2017). Overconsumption occurs when the additional energy used provides no additional service. Overconsumption lowers energy efficiency.

Ex-post disclosure mitigating moral hazard

Stiglitz's (1975) theoretical solution to moral hazard is to for the agent to screen the behaviour of the principal, prior to the contract being agreed upon. Although it may soon be possible via the internet of things, currently it is not practical for a prospective commercial office workspace lessor to pre-screen a prospective commercial office workspace lessee's energy using habits. Holmstrom (1979), however, provides a contract-based solution. Clauses can be written into the contract, that alter risk sharing between principal and agent based upon an observed behaviour. Information garnered, and disclosed between the principal and agent, ex-post, informs the terms of the renegotiation of contracts. Fudenberg and Tirole (1990) go further to advocate a contract which gives a menu of options depending upon the observed actions.

Whitson's (2011) Model Green Lease provides an example of this remedy applied to the commercial office workspace. The Model Green Lease is essentially a gross contract, where the lessor pays for energy, but only up until consumption reaches a level previously set in the contract, an expense stop, after which the lease reverts from gross to net and the lessee starts to pay.

Hart (1995) observes that there are incentives for both parties to agree to ex-post observation and monitoring, so that neither party carries too much risk. The practicalities of such risk and cost sharing between lessor and lessee is, however, complicated. There is the matter of setting the "goldilocks" level at which an expense stops triggers the reverting from gross to net. If the expense stop is set too high, then the contract is predominantly a gross lease and so subject to morally hazardous overconsumption. If the expense stop is set too low, the gross lease becomes mainly a net lease and so is subject to underinvestment resulting in adverse selection. While such an optimisation problem presents an interesting topic for future research, its case-specific complexity explains,

perhaps, why unlike ex-ante disclosure, ex-post disclosure of energy consumption is not, in Australia and elsewhere, mandatory.

Information age changes to workspace tenure

One source of information-age change is that the marginal cost of an information good differs from that of a material good. At scale, the marginal cost of producing a material good reduces and then levels off. The marginal cost of producing an information good, by contrast, continues to decline to approach zero (Thompson, 1982 in Godfrey, 2016). This both lowers the cost of managing offerings put to market, and the cost of managing those offerings in increments of space and time. It also affects the commercial office workspace tenure.

The word tenure is derived from the French verb "tenir" which means to hold. It is defined as *"the act, right, manner, or term of holding something, such as a landed property or a position."*. (Mirriam Webster, 2017). Specific to real property, tenure refers to the legal regime under which land is held. It encompasses not just the title, but also the holding, proprietorship, occupancy and residency (Sackville et al., 2008).

In Australia and other commonwealth countries and former colonies, most land is under Crown Title, that originated in feudal England. Under Crown Title, tenants had to, in addition to paying rent, fight along-side, or instead of the lord, and be required to make one-off incidental payments at life events such as the marriage of their child. While such onerous terms no long apply, two key aspects of Crown Title endure. Firstly, landowners are allowed to hold a portion of the Crown land freehold. Secondly, land, or an apportioned part of it, can be described and subdivided in terms of space, and then be "alienated," to lessees, and sub-lessees through a process of "subinfeudeation" (Sackville et al., 2008).

Tenure, therefore, refers to both what is on offer, and its subinfeudeation from freehold title, in a chain of lessors and lessees. These two dimensions of tenure can be more simply described as the vectors of "bundling" and "splitting." Bundling refers to the real property and what has been added to it. Splitting[2] refers to the subdivision of the real property in increments of time and space and time, in a series of contracts down the chain of subinfeudeation. In the information age, as the marginal cost of an information good approaches zero, there has been an increase along both these vectors.

Bundling and moral hazard

As the marginal cost of an information good approaches zero, the cost of "bundling" commercial office workspace with a combination of material goods, information goods, and human services, approaches the cost of offering the workspace alone. In Godfrey (2016), I describe these bundles containing commercial office workspace as "work-architectures." Work-architectures triangulate the product-service continuum with information to enable the work of an organisation. A work-architecture, enables, rather than supports the work of an organization. It may, act as infrastructure, which by definition, can only support or underpin, or form part of a firm's core business offering. Relevant to this paper, is that the reduced cost bundling extends to energy utilities. And with each gross contract there is the potential for moral hazard and overconsumption.

[2] Rather than "splitting" the division and sub-division of the freehold title offering, could instead be described by the gentler, kinder term "sharing" as in the "sharing economy." Here "splitting" is considered more apt, because with each additional split, there is another principal and another agent, and the potential for split incentives.

Splitting and adverse selection

As the marginal cost of an information good approaches zero, so too does the cost of managing multiple transactions across the boundary of a firm for short and variable periods of time, approach the cost of undertaking activities within the firm for long, fixed, periods of time. This shifts the efficient locus of transaction costs, that for Coase (1937), and this legate, defines the boundary of the firm itself. The cost of outsourcing approaches the cost of insourcing and new firms intermediate, and disintermediate, the chain of subinfeudation between freehold title owner and workspace user.

With each intermediation comes a split between principal and agent. When that additional split involves a commercial office workspace net contract, it is subject to underinvestment in energy efficiency leading adverse selection. When that additional split involves a gross contract, there is the potential for morally hazardous overconsumption, and lower energy efficiency.

Coworking

One information age workspace tenure-type has become known as coworking space. Coworking, is a bundled work-architecture of material and information goods and human services such as concierge, offered for flexible periods of times as short as months, weeks, days, hours or even minutes (Godfrey 2016).

In Australia the coworking offering is bundled gross with both base-building and tenancy services. And while the coworking lessor may have ownership and control over fixed cost tenancy energy consumption, involving overhead lighting, package air-conditioning etc, she has no control over the coworking space lessee's variable-cost consumption of plug-loads, kitchen equipment information and communications equipment, etc. Coworking lessees come to both "plug and play" resulting in overconsumption that the coworking lessor must factor into the price of the bundled offering. Unless there are other factors that affecting the elasticity for investment in tenancy energy efficiency relative to the consumption, moral hazard will lower tenancy energy efficiency.

If the coworking lessor is the building owner, then the morally hazardous overconsumption of tenancy energy utilities might be the only principal agent problem he need worry about. But in a large commercial office building with many tenants that is unlikely. In Australia, a coworking lessor is both a gross lessor and also a net lessee or sublessee, sitting at the end of the chain of subinfeudeation with one or more splits between investor in energy efficiency and beneficiary of that investment, the net lessee. Absent ex-post disclosure, this coworking space lessor is not just subject to moral hazard, but also to adverse selection and the extent to which that has been mitigated by mandatory ex-ante disclosure.

Past empirical research into principal agent problems has compared levels of energy efficiency between owned and leased, or gross or net contracts, one contract at time. In the information age, there is an increasing likelihood that tenure might involve offerings bundled with or without energy and with none, one, two or more, possibly differing contracts, each with their associated principal agent problems, and the extent to which each problem has been mitigated by disclosure - ex-ante disclosure being mandatory, and ex-post disclosure being voluntary. To extend this past research to include these emergent forms of tenure, requires a new conceptual framework.

The bundling and splitting matrix.

A workspace's tenure type can be described in terms of where it sits on a matrix of bundling and splitting vectors.

The bundling vector describes what is on offer, that is the real property alone, and what is added to it in a bundled offering. Bundling can be with any material or information good or human services, but for our purposes the bundling vector refers to energy, that is base building energy, or

base-building plus tenancy energy. A tenure type involved in one or more contracts bundled gross with energy then that contract is assumed to be subject to moral hazard.

The splitting vector refers to the division and subdivision of the freehold title into increments of space and time. Splitting can refer to any subdivision of freehold title, including a time-share or a sold or rented subdivision, however for our purposes it refers to whether the workspace is owner-occupied, as is the case when the building accommodates a single workspace, leased or subleased. If a tenure type involves a contract net of utilities, splitting investor in energy efficiency from beneficiary, then that contract is assumed to be subject to adverse selection.

Each form of workspace tenure occupies a cell on the matrix. Its relationship to the other cells may involve one or more contracts subject to moral hazard and or adverse selection. For example, the coworking space lessor, subject to moral hazard, might also be a net lessee subject to adverse selection.

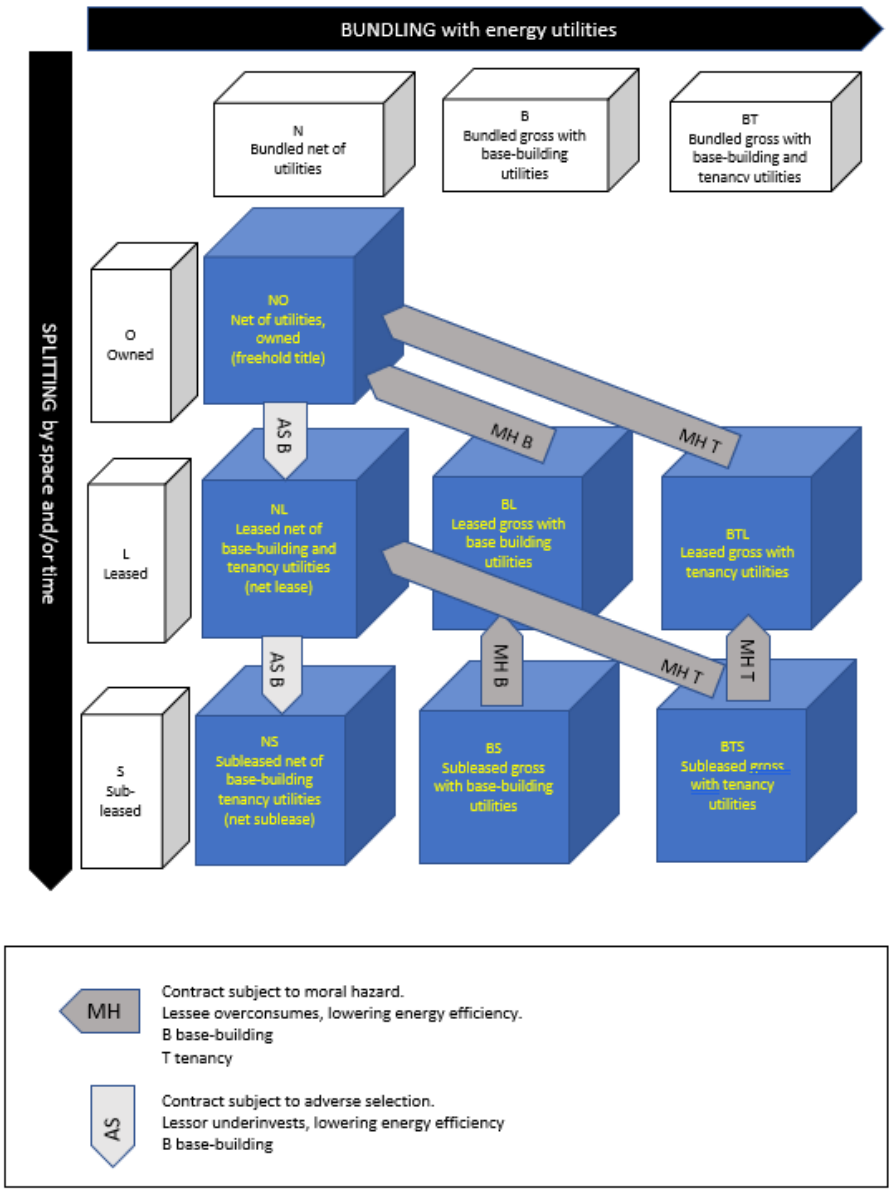

Fig 1. Bundling and splitting matrix with common tenure types.

USING THE BUNDLING AND SPLITTING MATRIX TO GENERATE HYPOTHESES

The bundling and splitting matrix can be used to derive research hypotheses regarding the relationship between energy efficiency and tenure type, in the presence or absence of disclosure, within the population of Australian commercial office buildings. Each cell of the matrix is populated with a measurement of the sample mean NABERS rating of the energy efficiency of that tenure type as defined in terms of its splitting and bundling.

Each NABERS rating is calculated using the algorithm at https://www.nabers.gov.au/ratings/estimate-your-rating (NABERS 2017). Input to the calculator is energy consumption and control data: climatic region, NLA, occupancy rates and hours. It is assumed that the control data is adequate to assess the level of service the building or tenancy provides. Such an assumption is possible given that commercial office buildings in Australia, like their international counterparts follow a, remarkably standard form.

The NABERS website calculator is used because while the assessment of either whole building or base-building data is mandatory, assement of tenancy NABERS is not, and it is the tenancy workspace that is the unit of inquiry. Use of the calculator NABERS ratings requires accepting Hsu's (2014) observation that a "benchmarked" building energy efficiency rating [such as this calculator provides]is as accurate at anticipating energy consumption in the following year, as is a fully assessed energy rating. The algorithm behind the calculator is not in the public domain and not made available to researchers.

While each of the three different NABERS ratings: whole building, base-building and tenancy, has a different purpose, comparison across all forms of tenure, that is across any or all of the cells in the bundling and splitting matrix, requires a common unit of measure. Without a common unit of measure, it is not possible, for example to compare a building with a Whole-building NABERS rating of 4 stars with a different building with a Base-building NABERS rating of 4 stars. This is because the building with the whole building rating of 4 stars might have a base-building rating of 6 stars if high energy consuming tenancies are taken out.

"Tenure NABERS" (not part of the governments NABERS program and contrived for this research, is this new metric. Tenure NABERS is based upon the sum of tenancy consumption and the pro-rated base-building energy consumption for each workspace.

Data

Four different NABERS rating of each tenure type is input in to the matrix: Base-building NABERS, Whole-building NABERS, Tenancy and Tenure NABERS. Calculation of each requires the following data.

Common to all four are control data variables.

z - The post code of the building to control for climatic region
f - The hours of occupancy
h -The number of computers in operation at any one time, that is assumed to be equivalent to the number of occupants.

Each NABERS rating additionally requires the following data:

W- Whole building NABERS:

$\sum tNLA$ - The sum of the NLA of all the tenancies in building that accommodates the workspace under study.

we – Whole building energy consumption: the sum of all energy consumed within the base building plus all the tenancies in the building. Data is sourced from the one whole building meter.

B – Base-building NABERS:

$\sum tNLA$ - The sum of the net lettable area of all the tenancies in the building that accommodates the workspace under study.
be - base-building energy consumption: the sum of the electrical, gas, diesel etc consumed within all tenancies in the base building. Data is sourced from the base-building meter.

T – Tenancy NABERS:

$\sum tNLA$ - The NLA of all the tenancy workspace under study.
te - energy consumption: the sum of the electrical, gas, diesel etc. consumed within the tenancy workspace. Data is sourced from the tenancy meter.

TN – Tenure NABERS:

$tne = (tNLA/\sum tNLA)(be) + te$ - Tenure energy consumption: The sum of the pro-rated proportion of base-building energy consumed, plus the tenancy energy consumed. Data is sourced from both the base-building and the tenancy meter.

Under owner-occupancy tenure, or when the tenancy is not separately metered, $(tNLA/\sum tNLA)(be) = we$.

Assumptions

1. The problems of moral hazard and adverse selection exist and can be measured empirically.
2. There are no factors that influence the level of service a workspace or building provides other than controlled for in the NABERS calculator.
3. There has been ex-ante mandatory disclosure of Base-building and Whole building NABERS.
4. There has been no voluntary ex-post disclosure.
5. The sum of all tenancy energy in any one building, plus the base-building energy equals the whole building energy consumption. $\sum tne + be = we$.

HYPOTHESES

Hypothesis 1.

H1. Null μ**W NO =** μ**TN NL or TN SL**

The population mean of Whole-building NABERS under owner-occupancy tenure is equal to that of Tenure NABERS under net lease or net-sublease tenure.

If true, this is consistent with ex-ante disclosure fully mitigating adverse selection.

H1. Alternative μ**W NO >** μ**TN NL or TN SL**

The population mean of Whole-building NABERS under owner-occupancy tenure is higher than that of Tenure NABERS under net lease or net-sublease tenure.

If true, this is consistent with ex-ante disclosure not having fully mitigated adverse selection.

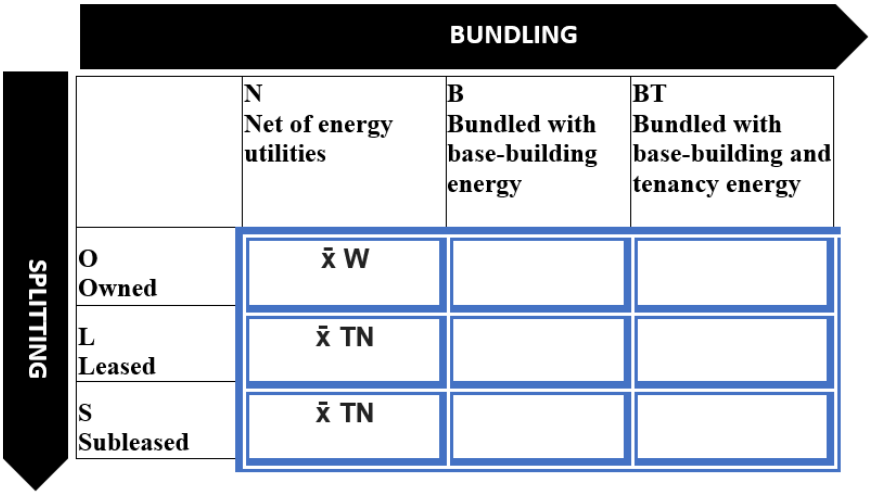

Fig 2. Bundling and Splitting Matrix with Hypothesis 1. Data.

Hypothesis 2.

H2. Null μT NL = μ T BTS

The population mean of Tenancy NABERS ratings under net leased tenure is the same, as that under gross subleased tenure.

If true, this is consistent with the increase in energy consumption from moral hazard being offset perfectly by an increase in energy efficiency. The variable-cost tenancy energy efficiency investment is perfectly elastic to the morally hazardous overconsumption of variable-cost tenancy energy.

H2. Alternative μT NL > μ T BTS

The population mean tenancy NABERS rating under net leased tenure is the same, or higher, than under subleased gross tenure.

If true, then this is consistent with moral hazard remaining.

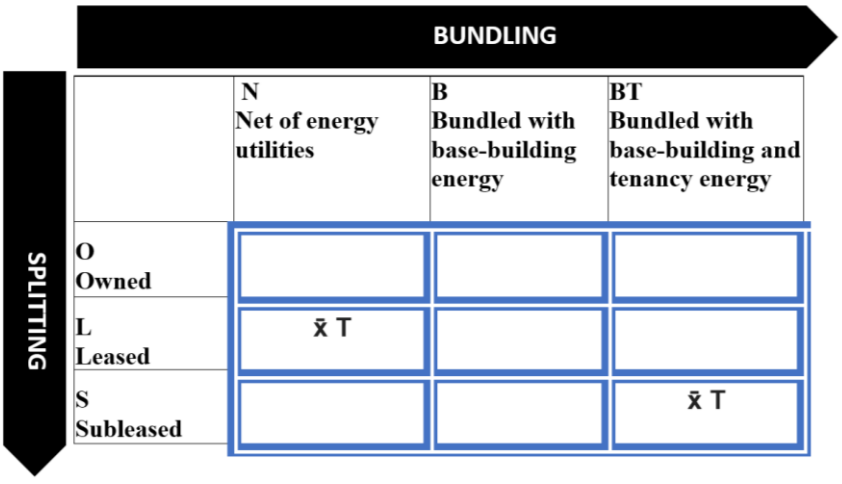

Fig 3. Bundling and Splitting Matrix with Hypothesis 2. Data.

Hypothesis 3.

H3. Null

If H1 and H2 are false

AND

μTN ON = μ(TN NL + TN BL + TN BTL) =μTN BTS

Tenure NABERS is equivalent across all tenure types.

If true, this is consistent with ex-ante disclosure fully mitigating adverse selection, and tenancy energy efficiency investment being perfectly elastic to morally hazardous overconsumption.

H3. Alternative

If H1. and H2. are true

AND

μ TN ON >μ(TN NL + TN BL + TN BTL)

AND/OR

μ(TN NL + TN BL + TN BTL)> μTN BTS

Tenure NABERS decreases with splitting and bundling.

If true, this is consistent with ex-ante disclosure not fully mitigating adverse selection, moral hazard remaining, and that these problems have additive effects.

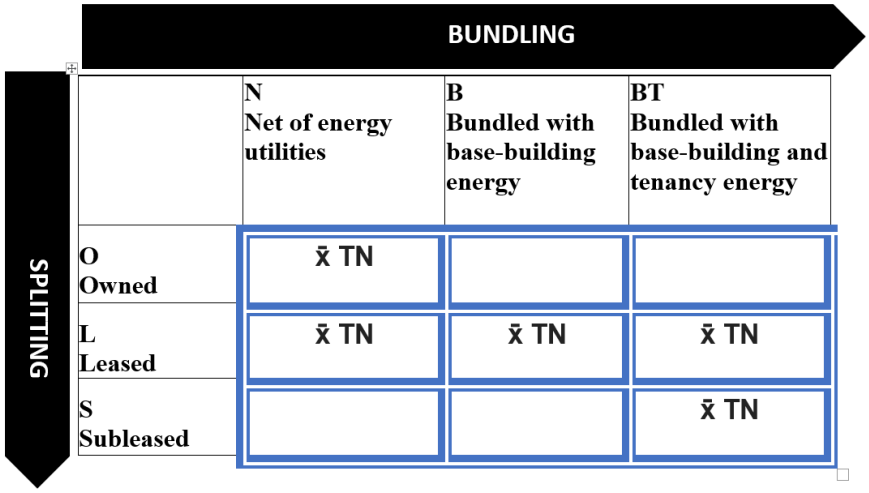

Fig 4. Bundling and Splitting Matrix with Hypothesis 3. Data.

1.1.1 Conclusion and Research Significance

If Hypothesis 1. can be shown to be true, then that finding is consistent with ex-ante disclosure failing to fully mitigate adverse selection under net contracts. Such a finding does not negate the purpose or usefulness of ex-ante disclosure, so much as indicate its limitations. It suggests that there is a need for further research into mechanisms other than ex-ante disclosure, to mitigate

base-building energy efficiency market failure. These might focus directly upon changing incentives rather than reducing of information asymmetry between principal and agent.

If Hypothesis 2. can be shown to be true, then that finding is consistent with the gross-sublease lessor being lacking incentive to invest in energy efficiency to mitigate moral hazard because they can pass through the cost of morally hazardous overconsumption to the gross sublease lessee. Such a finding indicates the need for government policy to mitigate moral hazard.

Principal-agent theoretically, ex-post disclosure mitigates moral hazard. In practice, however the mandating of ex-post disclosure policy is not as simple as the mandating of ex-ante disclosure through mechanisms like NABERS despite the internet of things greatly facilitating the real time metering and monitoring of tenancy energy consumption.

For ex-post disclosure to inform the clauses in Whitson's (2011) Model Green Lease, it is necessary to decide upon the level at which to set the expense of stops beyond which a gross contract reverts to net. These expense stops must be set at a level that optimizes risk sharing between gross lessor and gross lessee. And that requires not only a solution to the optimization problem, but that this solution be readily available to all those who must mandatorily ex-post disclose, in a format as public as the NABERS online calculator. A simpler, information-age solution, might be pay-as you-go with plug-load energy consumption triggering micropayments.

If Hypothesis 3. can be shown to be true, then that finding is consistent with those tenure types suffering from multiple principal agent problems having lower energy efficiency than, either those susceptible to single principal agent problems, or to those under owner occupancy when principal and agent are one and the same party. Lower energy inefficiency under coworking tenure becomes of increasing concern as it, and other emergent information-age forms of workspace tenure becomes more commonplace. More broadly, if Hypothesis 3. can be found to be true, it highlights that in the information age, splitting is not all happy sharing. Any intermediation of a supply chain, brings with it additional principal agent problems.

Any the mitigation of principal agent problems at the workspace level firstly requires a metric for it measurement. An argument can be made for the addition of "Tenancy NABERS" to the current Australian ex-ante disclosure program.

Finally, the usefulness of this conceptual framework in generating these and other hypotheses depends upon the assumptions made. The first assumption, that past research is conclusive that moral hazard and adverse selection can be identified and tested for empirically, has been substantiated by previous literature. The second assumption, made in this paper, that there are no factors that influence the level of service a workspace or building provides, other than controlled for in the NABERS calculator, remains much less certain. An exploration of what those additional factors might be forms the subsequent part of this research.

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