MINDING THE GAP(S) IN SPECTRUM LAW: AN AUSTRALIAN STUDY AND A CASE FOR REFORMS

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Abstract
Achieving efficient spectrum management in the pursuit of the public interest is a key aspect of legal reforms introduced in spectrum liberalising countries. However, spectrum law is unclear about the precise nature of the efficiencies to achieve and choices between different efficiency objectives are often dictated by the nature of the services, bands and market considered. This article argues that what the public interest needs most is governance efficiency, i.e. the flexibility to select appropriate efficiency objectives and design the corresponding licenses to achieve them. Australia has experimented with flexible governance arrangements since the 1992 legislative reforms. Hybrid licenses have flourished within the apparatus and class licensing regimes, albeit less so within the property rights approach where the regulatory discretion to craft dynamically efficient sub-regimes is mostly transferred to the licensee. Hence, despite successes in moving towards governance efficiency, some legal rules still feed a pool of ‘licensing gaps’ that detract from the public interest they are meant to serve. The article discusses remedies to these gaps.

Keywords
Radiocommunications law, licensing, spectrum, Australia

Paper Category
Research Paper, law and economics

Introduction
How efficiently we allocate and license the radio spectrum is of vital importance not only for the media and communications industry but also for the whole information society. Achieving efficient spectrum management in the pursuit of the public interest was therefore a major aspect of legal reforms introduced in various spectrum liberalising countries about a decade and a half ago.

However, spectrum law is unclear about the precise nature of the efficiencies to achieve. Should new licensing regimes be allocative efficient, productive efficient or dynamically efficient? An efficient licensing regime would ideally combine these three objectives but in practice they are
often of mutually exclusive nature. Furthermore, choices between different efficiency objectives are often dictated by the nature of the services, bands and market considered.

This article argues that what the public interest needs is ‘governance efficiency’, i.e. the flexibility to select appropriate efficiency objectives and design the corresponding licenses to achieve them. Australia has experimented with flexible governance arrangements since the 1992 and later reforms. Hybrid licenses have flourished within the administrative and open access approaches, albeit less so within the property rights approach where the regulatory discretion to craft dynamically efficient sub-regimes is transferred to the licensee.

Hence, some of the legal rules embedded in the trichotomic licensing structure of the 1992 reforms have helped deploy a wider array of governance instruments to fine-tune the needs of users and better respond to the opportunities of new technologies. But at the same time, other legal rules stemming from the same set of legal reforms feed a pool of ‘licensing gaps’ that detract from the public interest they are meant to serve. Although the reforms have undoubtedly led to better spectrum governance, there are still untapped sources of improvements in governance efficiency and Australia could do better.

The article first discusses why standard economic efficiency principles can be confusing to guide spectrum policy, and why we need a concept of governance efficiency. We then analyse and discuss Australia’s progress towards governance efficiency by examining the types of hybrid regimes developed under the current set of radiocommunications licenses (the successes). Finally, we concentrate on the type of potentially efficient regimes, which the current set of rules does not allow to unfold in Australia (the gaps) and sketch broad recommendations to amend current spectrum management legislation.

From efficient allocation (and use) to efficient governance

The importance of efficient spectrum licensing is well recognised in Australia and principles of efficient management have now long been enshrined in the Radiocommunications Act 1992 (the Act). For instance the Act stipulates that its first (among eight) objective is to:

maximise, by ensuring the efficient allocation and use of the spectrum, the overall public benefit derived from using the radiofrequency spectrum (Part 1.2, Section 3, my emphasis).

However, the Act does not stipulate which of ‘allocative efficiency’ and ‘usage efficiency’ should prime in situations where these two objectives are mutually exclusive. Neither does the Act suggest how these objectives should be interpreted and how they could be pursued.

This is problematic in many ways because new licensing regimes such as Australia’s spectrum licenses (a form of property rights regime) that are generally presumed to be efficient are often only so in an allocative sense, not in a productive (usage) sense, because some users make scant use of their private spectrum. Furthermore, the process of pursuing allocative efficiency through spectrum auctions has seen further controversies as there have been many instances where spectrum auctions did not deliver public interest outcomes. The claim that regulatory authorities achieve allocative efficiency through auctions rests on very strong assumptions that are too often violated.1

Conversely, licensing arrangements that make intensive (productive) use of a specific frequency band may not be allocative efficient if the deployed service or the adopted technology are prescribed with no regard for market forces (as with most types of administrative licensing).

Yet, it would be mistaken to assume that these orthogonal choices result from a failure of the Act to provide a clear sense of direction. Much of the legislation in this area is influenced (to a degree) by regulatory authorities and if the legal texts have remained imprecise over the desired type of

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1 I am grateful to Martin Peitz for raising and illustrating this point at a recent presentation. See also a review of these issues in (Gans et al. 2005).
'efficiency', it indicates that policy makers wished it that way. There is no silver bullet to these trade-offs between different efficiency objectives, and the task of designing efficiency-enhancing radiocommunications licenses depends largely on the judgements and experienced decision-making processes amongst regulatory agencies. A band designated by ITU (or other) regulations for mid-range power, narrow channel services used by a high number of users will require a different interpretation of ‘spectrum efficiency’ than one characterised by a few large operators, transmitting at very high power, with nation-wide coverage and important infrastructure investments to protect. Hence, the degree of discretion granted regulatory bodies in recognising the adequate nature of efficiency objectives and in designing appropriately matching licensing regimes is paramount to the pursuit of the public interest (or at least the efficiency component of it). One would then hope that these decisions are relatively unfettered by political interference, legislative vetoes and other institutional restraints. If a regulatory authority recognises the need to adopt an allocative efficiency approach for a highly valued service requiring considerable capital expenditure, the public interest is better served if decision makers can freely design a license based on market instruments and a high degree of legal protection for the investments required, rather than be constrained to prescriptive or open access approaches. This suggests that ‘the public interest’ may need another concept of spectrum efficiency, which we might call instrumental efficiency: having the right legal instrument available to cater for the specific requirements of all possible services, technologies and markets, or at least having the discretion to develop one. To some extent, this is the path that the Australian Communications and Media Authority (ACMA) has sought to pave in Australia, with mixed success. Under the Act, Australia assigns and regulates the radio frequency spectrum using three licensing systems; apparatus, spectrum and class licences, which are broadly representative of regulatory, property rights and open access approaches respectively. However, there are many more ways to manage spectrum allocation and coordinate interference control than under the three licensing regimes authorised under the Act, and several informal hybrid regimes have seen some degree of deployment in Australia. Australia’s ‘trichotomic’ licensing structure does not reflect the actual mix of practical approaches developed on the ground. These practical experiments with hybrid spectrum management regimes are only authorised under the Act through legal provisions allowing the ACMA a significant degree of discretion in designing apparatus licenses, and to a lesser extent in crafting class and spectrum licenses. This degree of regulatory discretion is a positive step towards developing instrumental efficiency in Australia. On the other hand, this discretion to craft management regimes through licensing remains sub-optimally circumscribed by the Act. There are various gaps between theory and practice. Some potentially efficient regimes are not unfolding in Australia (or elsewhere for that matter). In this article I will argue that the most important policy gaps lie with spectrum licensing. Some of these gaps arise from prescriptive provisions in the Act, whilst other gaps stem from an incentive problem amongst licensees. The paper discusses these limitations and isolates their underlying legal rules. In a context characterised by ever increasing demand and band congestion these limitations may soon warrant significant legislative reforms. Thorny policy issues such as the roll-out of the National Broadband Network and the allocation of the digital dividend may make these reforms more pressing still. Australia needs to start thinking about these issues now, and about what set of legal reforms are needed to address them. **Mapping licenses to governance regimes** Australia’s current set of three radiocommunication licenses dates back largely to the 1992 reforms. A few subsequent amendments in 1995 and 1997 modernised apparatus licenses, authorising license transfer and third party operations, along with spectrum reallocation processes and other policy
novelties. The three licensing regimes enabled by the Act have seen little change ever since. The last significant alteration was a multi-year consolidation process among class licenses started in 2000 and completed in 2008.

There is, conceptually, a much wider array of spectrum management approaches available to policy makers (Freyens 2007, 2009b). There have been earlier attempts by ACMA to suggest legal reforms towards a single licensing regime under the Act, which would allow the regulatory agency to tailor its licences to the needs of users as new services and technologies emerge. In practice there are at least about 20 different ways to manage spectrum allocation and interferences (and potentially many more), and as discussed above, a wider array of approaches contributes to the efficiency and public interest objectives of the Act. In particular, such a discretionary approach (occasionally referred to in the paper as ‘the bespoke approach’) would allow ACMA to fine tune the flexibility-certainty dilemma present in its current licensing regimes.  

The bespoke approach was never seriously considered beyond ACMA’s policy branches, but Australia’s practical approaches on the ground reveal that some of these conceptual approaches have been used in Australia for some time. However Australia’s ‘trichotomic’ licensing structure does not reflect these developments on the ground. Australia’s practical experiments with hybrid spectrum management regimes are only authorised under the Act through legal provisions allowing ACMA a significant degree of discretion in designing apparatus licences.  

There is a small subset of apparatus licences, which is fully specified in the Act, such as licences for national broadcast, temporary community broadcasters, and datacasting, but for most apparatus licences ACMA is virtually unconstrained in its approaches. Apparatus licences are generally construed to be the archetype of control and command (C&C) management and most of them are device-specific and entail very prescriptive technical arrangements. However some apparatus licences are actually quite flexible.

Exhibit 1 below summarises the rather lengthy mapping work undertaken under previous research (Freyens 2007, 2009). Again, interested readers are referred to the aforementioned articles for further conceptual details about these regimes. The practical approaches presented in Exhibit 1 suggest that decentralised C&C approaches have seen a fair bit of activity in Australia. Not all apparatus licences fit the stereotype of an arch-rigid management regime ruled by government-fiat. There is no shortage of demand for regimes providing both rights certainty and some degree of service or technological flexibility in Australia and although spectrum licences are one way to meet this need, some versions of the apparatus licensing regime have provided alternatives in some areas.

Some flexible apparatus licences, such as the PTS licences issued in the 900 MHz band, could have realistically been converted to spectrum licences long ago, given their high-value use (cellular markets) and underlying technology (GSM and WCDMA). The fact that they were not converted illustrates just how few differences PTS licensees must have perceived in practice between spectrum licensing and flexible apparatus licensing, in terms of running their core operations.

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2 For a fuller discussion of earlier attempts to develop a bespoke licensing approach see (Freyens 2009a).
3 ‘Trichotomy’ refers to the division into three parts, classes, categories, etc.
4 In practice, ACMA also has some degree of discretion in designing class and spectrum licenses, but for various reasons, it has been much less used to define and authorise new spectrum management regimes.
Exhibit 1. Mapping Australia’s governance regimes to its radiocommunications licenses

<table>
<thead>
<tr>
<th>Conceptual regime</th>
<th>Australian examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Standard C&amp;C</td>
<td>Most apparatus licences (e.g. fixed links, land mobile, broadcasting)</td>
</tr>
<tr>
<td>2. Pure property right</td>
<td>Spectrum licences, (e.g. 3G licences in 2GHz band, Fixed WAS in 3.4GHz, etc.)</td>
</tr>
<tr>
<td>3. Privately-run commons</td>
<td>— Authorised under spectrum licences — but no or little take-up so far</td>
</tr>
<tr>
<td>4. Private Parks</td>
<td>— Not authorised yet but under consideration in Australia</td>
</tr>
<tr>
<td>5. Monitored easement</td>
<td>Rarely allowed under s.105 and s.153P of the Act (e.g. MOST radio telescope on 843 MHz)</td>
</tr>
<tr>
<td>7. Public Parks</td>
<td>LIPD class licences (Wi-Fi, etc) on 900 MHz and 2.4GHz ISM bands.</td>
</tr>
<tr>
<td>8. Device-specific parks</td>
<td>Cordless Telecommunications Devices class licence for DECT on 1880–1900 MHz</td>
</tr>
<tr>
<td>9. Quasi property rights</td>
<td>— Not authorised in Australia (e.g. the easement)</td>
</tr>
<tr>
<td>10. Market-run easement</td>
<td>— Authorised under spectrum licences (but little take-up)</td>
</tr>
<tr>
<td>11. Managed commons</td>
<td>2-way aircraft communications apparatus licences; CB and Overseas Amateur class licences</td>
</tr>
<tr>
<td>12. Open access</td>
<td>— Eli Noam’s 1995 model — remains a utopia at this stage</td>
</tr>
<tr>
<td>13. Collective C&amp;C</td>
<td>Non-assigned apparatus licences (e.g. shipping radios)</td>
</tr>
<tr>
<td>14. Open access C&amp;C</td>
<td>Space objects class licence (satellites), cellular mobile class licence (hand-held to PTS)</td>
</tr>
<tr>
<td>15. Controlled easement</td>
<td>Some quasi-broadcasting licences (e.g. auctioned LPON apparatus licences)</td>
</tr>
<tr>
<td>16. Eased C&amp;C</td>
<td>Many apparatus licences (e.g. scientific apparatus licences used on ISM bands)</td>
</tr>
<tr>
<td>17. Flexible C&amp;C</td>
<td>PMTS Class B apparatus licences in 900MHz band (GSM)</td>
</tr>
<tr>
<td>18. Flexi-eased C&amp;C</td>
<td>— Authorised under s.107(1)(g) (initial conditions) and s.111 (variations) of the Act. Not experimented yet.</td>
</tr>
</tbody>
</table>

Mapping licenses to practical management regimes on the ground also reveals gaps between theory and practice. Some of these gaps arise from prescriptive provisions in the Act, whilst other gaps stem from an economic incentive problem. The article discusses each of these gaps and suggest some legislative amendments. The limits of conducting multi-regime policy equipped only with a trichotomic licensing structure constrain ACMA in its quest to allocate spectrum to its highest value while serving the public interest. Spectrum licences are too exclusive and unaffordable for many users, class licences are too restricted to low power services, and apparatus licences are generally too prescriptive and provide little certainty to licensees. These limitations warrant legislative reforms in some areas of licensing policy: the degree of exclusivity in property rights need to be adjusted to increase the dynamic efficiency of spectrum-licensed bands, and the degree of certainty in apparatus licenses needs to be adjusted in some areas to create conditions favourable to long-term investment decisions.

Minding the gaps: Unauthorised and dormant regimes

Are there really gaps between these practical approaches and the conceptual regimes of the bespoke model, and do these gaps matter? Finding significant gaps in one of the most advanced reform countries with a decade and a half of ongoing flexible experimentations to its credit might not be a
trivial exercise. Yet, a quick read of the approaches described in exhibit 1 suggests that several important conceptual licensing regimes are not emerging in Australia under the current set of legal rules, in particular regimes 3, 4, 5, 9, 10 and 17. These ‘gap regimes’ can be separated into two types; those prevented by legal rules, which are concentrated on the spectrum licensing / property rights quadrant, and those enabled by legal rules but inhibited by other factors, which apply both to spectrum licensing and apparatus licensing regimes.

Gaps in the policy continuum arise quite expectedly from the high degree of exclusivity and legal protection granted spectrum spaces. Spectrum licensing is essentially a ‘package’ of rights and obligations over which ACMA has little power to make variations under the Act. RALIs, Administrative band plans and legislative band plans would not normally apply to spectrum licences and various sections of the Act make sure spectrum licences will not become a future laboratory for testing as yet unknown governance regimes. This high degree of protection enables a higher level of certainty in rights and usage. Yet, the matter of experimenting with new types of property rights models has been frequently discussed by academics and policy analysts in the last few years. There are high hopes for some of these regimes, which are briefly discussed below.

(i) Monitored easement

In 2003, economists Gerald Faulhaber and David Farber suggested a ‘fee simple ownership with non-interference easement’ to solve the property right / shared access dilemma that was gripping the policy debate in the US (Faulhaber and Farber 2003). In the easement regime, primary licensees (‘owners’) have clear broadcast rights but secondary users (unlicensed or differently licensed users) may use the band so long as they never purposely interfere with the owner’s transmission and reception rights. Compliance is enforced through identification signals and compensation schemes for owners’ monitoring costs. Wayne Leighton suggested the model could fit high-power band-hopping services referred to as ‘elephants’ and low-power spread spectrum services, referred to as ‘fruit flies’ (Leighton 2004; Freyens 2009b). Faulhaber and Farber, who are strong advocates of the property rights approach, saw much promise in this approach and summarise it in these terms:

… economists have favoured a market-based regime, while engineers have favoured a commons-based regime to promote new technologies. We show that there is a property rights market-based regime that unleash the power of the market and unleash the power of the new technologies to efficiently allocate spectrum that is likely to meet our needs for the near future. (2003: 220)

The idea of allowing non-interfering easements, or at the very least some form of co-existence formula for apparatus licences within spectrum-licensed spaces seems to have been explicitly considered by ACA in its 2001 submission to the 2002 Review of Radiocommunications:

If the distinction between the two licence types [apparatus and spectrum] were retained, there may be a need to consider some incremental changes to the Act. Currently there is a prohibition in the Act (s. 105) against issuing apparatus licences in a spectrum-licensed area, except under ‘special circumstances’. In practice the ACA has found that there can be some advantage in allowing existing apparatus licences to remain in place in a spectrum licence area. This is because of the difficulties of converting apparatus to spectrum licences … There would be merit in considering whether this prohibition needs to remain. (2001: 13)

For reasons discussed earlier in this paper, this suggestion would have met with some degree of resistance among spectrum licence stakeholders. Yet, the conversion of apparatus licences into spectrum licences under s.38 of the Act has raised a number of intricate legal and technical issues such as ‘Swiss cheese’ effects and dealing with the conversion of multiple apparatus licences over multiple geographic areas (discussed at full length in ACA 2001: 25, and Productivity Commission 2002: 133–136). These issues have only been partially remedied by the 1997 amendments to the Act, which introduced spectrum re-allocation mechanisms.
Furthermore, the easement question also directly relates to the matter of allowing non-interfering class licensed services into spectrum spaces. Given that class licences operate rather successfully on non-interfering conditions in apparatus licences bands, why would that option not be available to them in spectrum-licensed spaces as well? The mere issue of whether the Act actually does prevent such secondary usage for class licences is in fact quite open to interpretation. The Productivity Commission notes that:

… there is uncertainty about the ACA’s ability to issue class licences over the same frequency as spectrum licences. Although technically possible, legal considerations may arise if spectrum licences had been marketed as exclusive rights to particular bands. (2002: 98)

As stressed by the Productivity Commission (2002), the Act does not provide clear-cut advice on this matter and consequently opportunities for dynamic and productive band usage are being squandered. In the meantime, and wherever possible, ACMA has shifted the load of allowing high-demand class licensed services to apparatus bands (e.g. numerous UWB services such as imaging or ground-breaking radar under scientific licences). Yet, ACMA will not be able to do this indefinitely. If the portion of the total spectrum occupied by spectrum licences is called to grow, as is frequently commented in Australia, the squeeze on new high tech services will become unbearable. In its 2002 Inquiry, the Productivity commission encouraged the ‘early’ resolution of this issue, in a manner that will facilitate the efficient use of spectrum, and respects the rights and flexibility of spectrum licensees. Little has happened in the meantime.

Albeit they are not specifically authorised under the Act, there are several other efficiency-enhancing licensing options, which would require relatively minor legal amendments to the Act to be operational. In fact, some of them, such as the first two below would probably work with the sole use of new subordinate legislative instruments.

(ii) Privately-run commons

A private commons is a property right regime in which the spectrum owner or owners authorises collective usage of the band by third parties. Users become members of the private commons upon acquitting an owner-set fee and committing to follow general management rules set by the owner, and specific rules set by the collective of users. Once users are authorised into the band they can use the entire spectrum band, and transmission interferences would be governed by sharing and etiquette rules defined among users based on the types of compatibilities in equipments and technologies deployed. Power limits could be regionally specified to allow higher power in low-density regions. Owners manage overcrowding and congestion through club entry and exits. In this way, spectrum remains in private hands but coordination and management follow rules more similar to those of a quasi-commons.

Both spectrum licences and apparatus licences allow the creation of private commons through third party authorisation rules, although exclusive rights under the apparatus regime are not equivalent to private property rights. For this and other reasons, spectrum licensing offers considerably more scope to develop private spectrum commons than apparatus licences.

First, spectrum-licensed spaces typically consist of much larger spectrum bands than most apparatus licences do. Second, spectrum licences offer more fluid conditions and independence to redefine use and technology both spectrally and geographically, and they also permit spectrum subdivision. In addition, spectrum licences are not bound by the constraints imposed by the Spectrum Plan and frequency band plans. ⁵ Arguably then, spectrum licences provide the only obvious environment in which to develop private spectrum parks. Despite an overt regulatory preference for flexible, technology-neutral approaches, the privately-run commons has not been exploited in Australia so

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⁵ However, if the services produce inter-country interferences they must be stopped. The potential for this situation is low given the country’s geographical isolation.
far and there is as yet little to suggest it will arise freely from the unfettered operations of property rights approaches.

(iii) Private Parks

In February 2006, ACMA submitted a specific version of the privately-run commons licensing model for consultation with wireless access services (WAS) stakeholders (ACMA 2006c). The suggestion was to issue ‘private park’ licences specifically designed to accommodate WAS. Dynamic access, technical band efficiency, black spots and competitive delivery had become major issues for these services, and there were clear indications the spectrum licensing regime may not be suitable to address them. Future WAS needs required a service-neutral regime authorising any number and type of interoperable base stations in a licensed space with band coordination undertaken by users — in short a regime combining aspects of spectrum and class licensing.

The private park licence is a membership-based, fee-based approach, which keeps most aspect of the privately-run commons described above, relying on device registration and self-coordination rules by users. However the private park is somewhat closer to class licensing than the privately-run commons regime is. On the one hand, ACMA (not a band owner) directly issues the shared-use licences to users. Furthermore, devices would be expected to use dynamic frequency selection techniques in the manner of class-licensed devices. Finally, there would be no seniority privileges, and no ‘hard’ licence boundaries — although base stations would have to be sited within the geographical area of the licence.

The private park approach also differs from the privately-run commons through user discrimination; prime licences would be issued in short numbers and would cover nation or state-wide services, inclusive of high-density areas. Prime licences would govern high-value (urban) spectrum and would be auctioned. Secondary licences would be sold for a moderate fee, restricted to low density regional and remote areas, and would be issued in much higher numbers (potentially unlimited). Further tiers could be defined as fitting the circumstances addressed by the licence.6

The private park regime resolves the current crowding out of small, regional operators by large carriers operating in spectrum-licensed spaces through a different mechanism than the easement. Here the regime forces users of similar size and background to coordinate and self-manage their services on different geographical spectrum-licensed spaces within the band. Stakeholder feedback was mixed, with many WAS providers generally wary of new licensing techniques (ACMA 2006b, 2006a).

As with spectrum licensing, policy-makers currently have very poor visibility with respect to stakeholders interests and incentives and further behavioural research would be warranted. Anyway, ACMA’s commitment to the private park as a dynamically-efficient response to future WAS needs is firm, and has been reiterated in the 5-year Spectrum Outlook 2009–2013 document (p. 115). It is thus likely that some form of privately-run WAS commons will take place in some not too distant future in Australia, but for this alternative to succeed ACMA may first need to develop a better capacity to understand the motivations and expectations of spectrum users.

6 In its proposal, ACMA suggests a three tiered approach; business class (auctioned), economy class (over the counter for a fee) and discount economy (open access) — see Appendix D, p.51 (ACMA 2006c).
(iv) management rights

Another variant on the private licensing model is the management rights\(^7\) approach. Here, instead of authorising third parties on a technology-compatible park under shared access rules, the owner (the ‘band manager’) uses sections s.68 and s.85 of the Act to carve the spectrum-licensed space into different geographic or frequency rights subdivisions. The band manager then sub-leases or sells these portions of spectrum-licensed space for sub-licensees to use as they please subject to the general conditions governing the spectrum-licensed space. In a way, this regime could be referred to as ‘sub-spectrum licensing’, and it is the mainstream property rights approach adopted in New Zealand.

Although some owners of the 3G spectrum licences in the 2 GHz band (e.g. Telstra) have allowed different services and technologies to be deployed under these conditions within their space, the number of authorised third party usages remains low.\(^8\) Paradoxically, despite the lesser suitability of apparatus licences for this type of spectrum management model, the band management regime may have historically seen more take-up by Government users such as the Department of Defence under section s.114 of the Act, particularly in the land mobile bands (Productivity Commission 2002, Ch.7, pp. 151–2). As with the privately-run commons option, the provisions for its use are present in the Act but it is not widely exploited, which suggests a lack of market incentives.\(^9\)

(v) Market-run easements

For most advocates of a property rights approach to spectrum management, having the government enforce easement rights to secondary users (regime 5 discussed above) and govern interference management through regulation simply violates what property rights and markets are really about. Instead, these arrangements should come out naturally from the freedoms and flexibilities granted spectrum owners. If some segments of private spectrum continuously lie fallow for any reason and there is demand for these segments, owners will realise the value of this idle spectrum by exploiting their rights to subdivide their band and sell the resulting lots to the highest bidder (making an ‘assignment’ under s.85 of the Act).

Alternatively they might allow secondary users to access their active bands for a fee whenever they do not use them (Third party authorisation under section s.68 of the Act). After all, this is what spectrum licensing is all about; letting market forces determine the best usage by setting the private value of spectrum (a revealed preference approach in economics jargon).

However, this immense potential for efficient spectrum allocation through market exchange is not being fulfilled in Australia. In most spectrum-licensed spaces, usage of huge, high-value bands remains confined to a single user and very few services. The reason for this disappointing take-up is not well-known at this stage and the issue begs further research. One possible explanation is that owners of spectrum-licensed spaces are more concerned with their core business than with the further exploitation of their spectrum inputs. Perhaps, this has to do with the complexities of the technical frameworks designed to manage interferences, or restricted visibility about the benefits of spectrum trading.

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\(^7\) The term ‘management right’ refers to New Zealand’s approach to property rights licensing in which a manager acquires rights to a large spectrum space, which can be subdivided and traded without government intervention. In Australia, this regime is enabled through third party authorisations (s.68) and spectrum trading rules (s.85). Terminology can be confusing between Australia and New Zealand; e.g. ‘management rights’ corresponds to spectrum licensing in Australia, and ‘spectrum licensing’ in New Zealand correspond to ‘device registration’ in Australia.

\(^8\) ACMA does not collect information on third party authorisations. Existing evidence relies on community consultations, inquiry submissions, case studies and word of mouth. ACMA has recently issued a discussion paper with an extensive list of possible barriers to trade and third party authorisations (ACMA 2008).

\(^9\) I note here that this incentive problem is not well understood nor seems to have been much investigated, and further research on the failure of spectrum owners to tap this source of income would be warranted.
(vi) Flexi-eased C&C

In the section ‘flexibility of apparatus licences’ of its 2002 Inquiry Report (pp. 94–95), the Productivity Commission notes that legislative amendments enacted upon proposals from the SMA and later ACA had permitted various market mechanisms to be used in the management of apparatus licences, including licence trading, third party use and allocation by price mechanisms. Yet, because apparatus licences are site-based, and cannot be subdivided nor merged in terms of geographic areas or in terms of bandwidth, the 2002 Inquiry concluded that apparatus licences ‘generally remain highly prescriptive and inflexible with respect to changes in spectrum use and new technologies’ (p. 95). Licensees seeking a change of location, bandwidth, technology or service for their licence can only do so through ACMA, which is a further restriction to free flowing allocation mechanisms.

Service prescription is a central feature of most apparatus licences, but there are exceptions. As discussed in one of the case studies, ACMA has since 1992 issued technologically-neutral PTS apparatus licences for GSM services in the 900 MHz band. This regime offers similar practical degrees of flexibility as spectrum licences within the constraints of an apparatus licence. It is classified as Flexi C&C rather than Flexi-eased C&C because ACMA will not in practice authorise an easement for class licences on GSM bands. Yet, since the GSM bands are licensed under an apparatus regime, nothing in the legal rules would prevent non-interfering easements for secondary users if ACMA had to revise its position as circumstances change and favour such an arrangement, which illustrates the type of governance efficiency gained amongst some apparatus licenses.

Recommendations: a new set of reforms?

Amending the Act raises a number of strategic questions. What are the limitations in the Act if ACMA wishes to proceed with a new set of spectrum management regimes and what sort of legislation would be needed? Would it be enough to amend current licensing models, and how? Or should the current regulatory framework be expanded to introduce other licensing categories?

These questions first beg determining which types of Australian licences are currently better conducive to efficient spectrum governance. Taking stock from Australia’s past experience this may surprisingly prove to be apparatus licences. Under the Act, ACMA has used apparatus licensing much more extensively than any other approach to tailor its approaches beyond the apparent set of options presented by the trichotomic licensing structure. As discussed in exhibit 1, this facility has enabled very different practical regimes.

Counter-intuitively, the most promising avenue for apparatus licensing is not necessarily a large scale move away from highly prescriptive regimes towards e.g. a Flexi-C&C model. Completely redesigning apparatus licensing would be a huge task, would be very disruptive for many services (e.g. narrowcasting) and would be entirely inappropriate for others (e.g. fixed links). However, wherever possible, ACMA may want to exercise further its discretionary power to allow a wider variety of more flexible apparatus licensing options to unfold. The licensing arrangements in the 400 MHz band (mainly land mobile) and in the 900 MHz band (mainly GSM) provide an illustration. For instance, the Act could be amended to encourage more allocative efficiency in narrowband applications. Or the Act could be amended to allow the apparatus licensing regime to grant more legal certainty to GSM licensees, which in turn might encourage investment in new technology networks. Such amendments could expand the potential of apparatus licensing well beyond the flexible regimes currently experimented.

10 Those amendments came through various amendments to the Act such as the Communications and the Arts Legislation Amendment Act 1995, Radiocommunications Amendment Act 1997 and the Radiocommunications Legislative Amendment Acts 1997 and 2000.

11 The only known exceptions consist of easements for some point-to-point apparatus licences on off-shore islands.
Although apparatus licences are already conducive to a tailored licensing approach, spectrum licences by contrast are not. Spectrum licences currently constitute a very monolithic regime under the Act. They occupy large portions of spectrum in very exclusive ways. Although spectrum licences were designed as a tool to remove market barriers, the large spectrum-licensed spaces they control are too often dictated by the ‘spectrum-guzzling’ technologies deployed on them. How could licensees be expected to subdivide and trade quantities of spectrum that they need in large amount to guarantee the workability of their technical frameworks? Under these conditions, the main alternative available to increase the yield of spectrum-licensed spaces is to allow non-interfering secondary usage such as by low-power, spread-spectrum or UWB devices.

Reforms should allow secondary usage rights for class licences with low interference potential within spectrum-licensed spaces — in order to improve the productive efficiency of spectrum licences. This will restrict the property rights of spectrum licences and would accordingly be expected to lower the proceeds from spectrum licence auctions. However, these losses should be more than offset by the economic value of enabled technological development and increased band usage in high-value spectrum-licensed spaces. To the extent that proceeds from auction are a transfer from band users to the government whereas improved non-interfering band usage corresponds to a productivity increase, the gains to the public interest are straightforward.

These concessions in the extent of the property rights assigned to spectrum licensees could also be compensated by allowing a presumption of renewal in the public interest — in order to increase the certainty of spectrum licences — thus increasing the potential value of licenses and mitigating the lower licence value incurred through enforced easements to property rights. Longer licence tenure such as 8 or 10 years should be also be considered for some apparatus licenses. Finally, new licensing regimes should be considered under the Act to reflect the growing disparities among apparatus licences, even if the above recommendations were to be acted upon.

Together, the reforms suggested in this paper will allow both spectrum and flexible apparatus licensing regimes to better contribute to economically efficient spectrum usage in technical terms (increased band usage), in dynamic terms (easier band access) and in allocative terms (migration of services towards market demand) through improved spectrum governance.

Conclusions

Through its apparatus licences, Australia has already started using a varied array of approaches in its practical management of radiocommunications. However, these experiments took place within the legal constraints of the trichotomic licensing model, under the Act. This expansion of the traditional control and command approach to encompass models that are more flexible has been successful but is still limited in scope. Although legal reforms have enabled several hybrid regimes to unfold, the current licensing framework still does not reflect the full extent of governance needs in practice, and the mismatch is likely to grow over time.

Governance efficiency would gain from amendments to the current licensing system: apparatus licences are generally too prescriptive and uncertain, spectrum licences are too exclusive and too general, and class licences are too restricted to short-range low-power applications. Australia needs an expanded regime toolkit not only to deal with its complex and diverse set of radiocommunications operations, but also to better address future and complex issues such as the allocation of the digital dividend, the governance of the National Broadband Network, and dealing with emergent technologies.

I suggested here that the potential for regime widening in Australia is largely concentrated in the spectrum licensing quadrant. Although spectrum licensing is the most service neutral regime in

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12 However, there is recent econometric evidence that this needs not always be the case (Hazlett 2008).
Australia, it is also currently the most protected regime under the Act, and therefore the most difficult to tailor to meet the competitive needs of different types of users. This high degree of protection implies that several variants of the spectrum licensing regime are either forbidden by legal rules, or enabled but overlooked, lacking the right incentives for their exploitation by private operators.

Overall, Australia benefits from a much wider array of spectrum governance options than most other reform-oriented countries (let alone countries, which have not yet started reforms to purely centralised management). This versatile set of practical approaches would benefit from two additions: (i) a better mapping of the implicit licensing regimes defined in practice (particularly with regard to some apparatus licences) to the explicit licensing structure under the Act would help ACMA clarify the options to users and settle allocative conflicts, (ii) an expansion of the policy toolkit towards more flexible rights for secondary users in spectrum-licensed spaces would help ACMA extract higher dynamic efficiency from spectrum-licensed spaces.

The large scale expansion of the property rights approach often advocated domestically (Productivity Commission 2002) and in overseas policy circles (AEI 2006; Webb 2008) would be unlikely to meet its avowed objectives in Australia. Any expansion of spectrum licensing would take place by conversion of apparatus licences and would therefore reduce the flexibility of licensing design in Australia, thus weakening governance efficiency. Unless new owners would prove so committed to secondary trading (and that has too seldom been the case in the past), the conversion of apparatus licenses would also reduce the quantum of spectrum currently facilitating easements for secondary users, thus reducing dynamic efficiency. Furthermore, such a move would oppose rather than help deploy new licensing approaches, as advocated in this paper, because these alternative approaches have always developed under apparatus rather than spectrum licenses.

Instead, Australia needs to reform its legal rules to allow greater activity rates and secondary usage in its spectrum-licensed spaces, and simultaneously increase the level of certainty and flexibility for its apparatus licences. This two-pronged approach offers a promising way to maximise both economic and governance efficiency in spectrum policy.

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Albeit for different reasons than in Australia, I suspect this remark would also apply to other reforming countries, e.g. the UK, which following the Cave Review in 2002, has officially vowed to privatise 70 percent of its spectrum in the short-term (Cave 2002; OFCOM 2005). As was argued here, one size fits all approaches to spectrum management are intuitively a risky prospect to achieve governance efficiency.
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