REGULATION FOR THE FUTURE OF AUSTRALIA'S NATURAL RESOURCES SECTOR

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Regulation for the Future of Australia's Natural Resources Sector

Australia's resources sector has made a significant contribution to the recent growth of the economy, and is well positioned to capture the benefits of a prolonged era of rising global demand. This will require a doubling, or more, in export infrastructure capacity, and companies achieving greater scale and competitiveness.

Australian legislation allows for mandated third-party access to private infrastructure. In some industries, when certain conditions are met, there is a clear benefit in enabling access. However, in export-oriented bulk commodity[1] industries access regulation deters future investment, reduces productivity and makes the Australian resources sector less globally competitive. Meanwhile despite any Australian regulation, prices will continue to be set on a global basis with no impact on consumer surplus in Australia. Therefore, the resulting reduction in potential producer surplus and output, and hence a reduction in potential taxes and royalties, will lead to a reduction in social surplus.[2]

An unregulated commercial outcome will not be perfect but will be preferable in this setting, as it will maximise investment, productivity, global competitiveness and it will also lead to more jobs and enhance the economic growth of Australia. Therefore, the Government should not mandate third-party access to export-oriented bulk commodity infrastructure, on the grounds that it is not in the national interest.

This paper outlines the arguments that support this position by drawing from contemporary academic literature and supplements them with case evidence from the resources sector and beyond. In particular four documents below will be extensively referenced throughout the report:

- Hausman, Professor Dr Jerry, 'Economic Analysis of Mandatory Access Provision', 2008.
- Fitzgerald, Vincent, 'Issues Posed by Infrastructure Regulation in Australia's Bulk Commodity Export Sectors', 2008.
- Affidavit of Stephen O'Donnell, Australian Competition Tribunal, File number 5 of 2006, 2007.
- Stephen O'Donnell, 'Goonyella Coal Chain Capacity Review', 2007.

Hereafter these will be referred to respectively as, Professor Hausman, Fitzgerald, O'Donnell(1) and O'Donnell(2).

The paper is divided into three chapters:

1. The importance of timely investment in resources-sector infrastructure
2. The impact of access regulation on export-oriented bulk commodities
3. The impact of a commercial outcome.

1 For example, iron ore, thermal coal and metallurgical coal.
2 Defined as the sum of Producer Surplus, Consumer Surplus and government receipts; arising from an economic activity, otherwise known as social welfare.

Chapter 1—The importance of timely investment in resources-sector infrastructure

1.1 Growth of the natural resources sector is critical for Australia's economic future

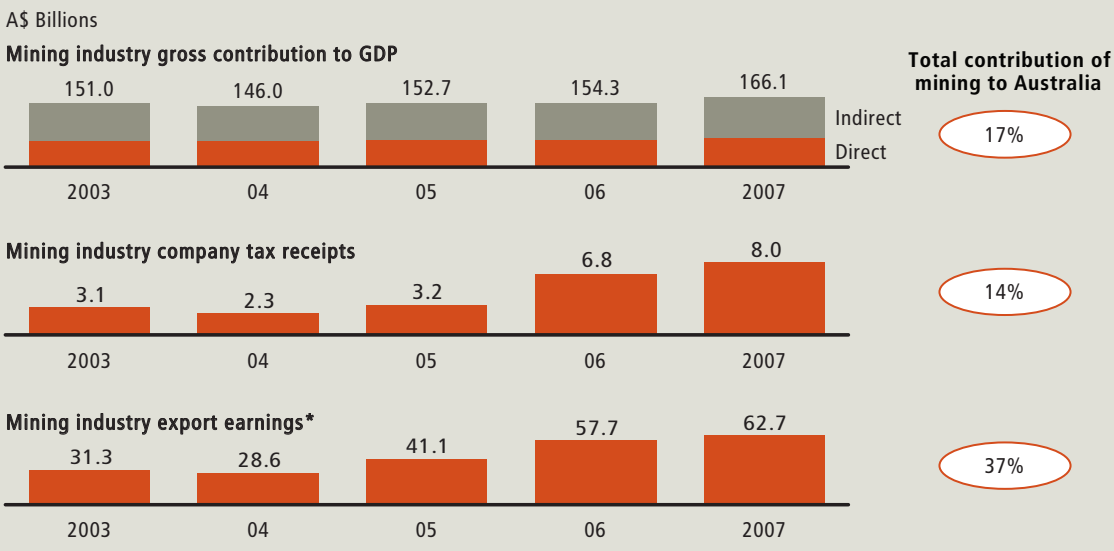
In 2006–07, the mining industry alone directly contributed 7 percent of Australian GDP and delivered 16.1 percent of GDP growth.[3] In 2006–07, directly and indirectly, mining contributed up to 17 percent of Australian GDP and generated A$62.7 billion in export revenues (37 percent of Australia's total export revenues),[4] and A$8.0 billion in company tax (14 percent of total government company tax revenue).[5] Mining also created 57,000 new jobs between 2001 and 2007, and has attracted significant capital investment concentrated in regional, rural and remote Australia.[6] It has been a significant driver of Australia's budget surplus through unanticipated growth in tax receipts (Exhibit 1).

The global resources sector is in an era of unprecedented growth due to demand generated by China and (in the future) India—the largest populations in the world to have industrialised and urbanised. This phenomenon has been dubbed the 'super cycle' or the 'stronger for longer' demand scenario. Annual global demand is expected to increase between 2006–15 by 65 percent for iron ore, 69 percent for nickel, 44 percent for copper and 23 percent for coal, exceeding (except for coal) the historically strong growth of the preceding decade[7] (Exhibit 2). Prices that tend to be higher than long-term historical averages—although with inevitable ups and downs—will accompany this demand growth, stemming from contestability for scarce supply and inducement of new greenfield capacity.

Australia is well placed geographically and geologically to benefit from this boom in demand. Australia ranks in the top five countries for a number of key commodities and has rich, abundant and economic reserves to meet growing demand (Exhibit 3).

If Australia is able to participate in this global growth—and increase its share of world production in some key bulk commodities—the benefits will be substantial. For example, an incremental 5 percent share of global growth in iron ore demand between 2006 and 2015 would be worth nearly 2 percent of Australia's 2006–07 total export revenue or nearly 1 percent of Australia's 2006–07 GDP, including the industry's second-order effects[8] (Exhibit 4). In addition, the Australian mining industry will enhance its ability to lead in innovation and technical solutions, and adhere to the highest environmental standards.

Exhibit 1 The contribution of mining to Australia's economy

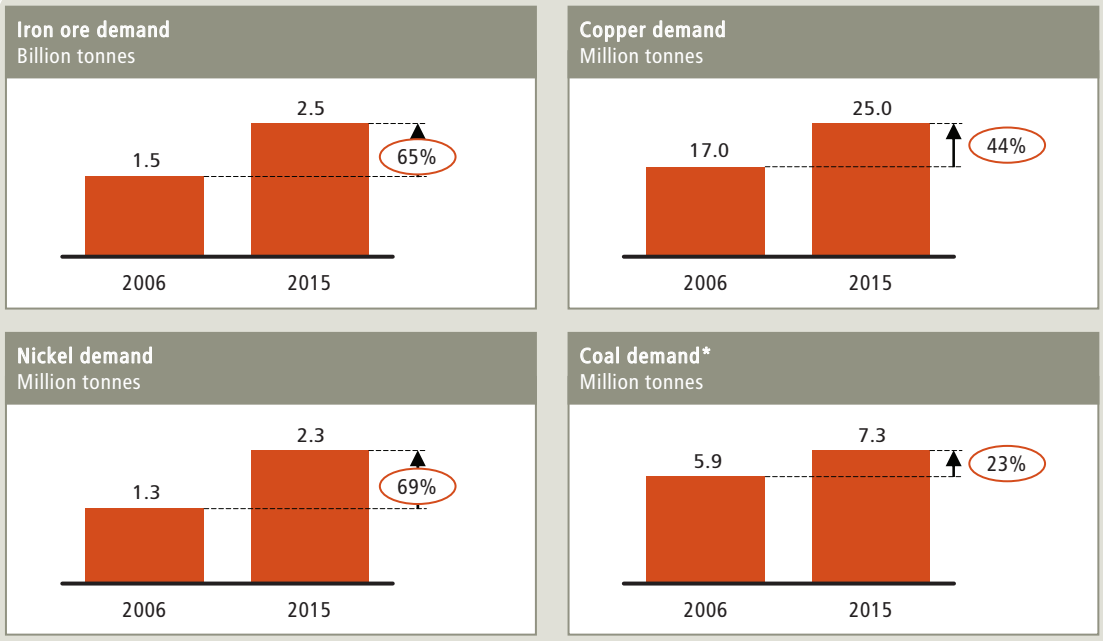


* FOB value

Source: ABS 8417.0 Mining Indicators June 2007; 8229.0 Manufacturing Indicators June 2007; Yearbook 2000; ABS 5204.0—Australian System of National Accounts 2006–07, Table 9—Industry Gross Value Added (chain volume measures); ABS 5209.0—Australian National Accounts Input-Output Tables 1998–99

3 Mining Gross Value Added (GVA) increased A$5.0 billion and total GDP increased A$30.8 billion in 2006–07; ABS 5204.0—Australian System of National Accounts 2006–07.
4 ABS 8417.0—Mining Indicators, June 2007; ABS Yearbook 2007, 2005.
5 ABS 8417.0—Mining Indicators, June 2007.
6 Total mining industry jobs increased from 79,000 to 136,000 whereas total manufacturing industry jobs decreased from 1,104,000 to 1,086,000 over this period; ABS Labour Force 2001–07.
7 Global production growth rate between 1997 and 2006: iron ore 63 percent, nickel 38 percent, copper 34 percent and coal 32 percent; US Geological Survey Minerals Information and Mineral Commodity Summaries; McKinsey Iron Ore Demand Model; RBC Capital Markets; Brook Hunt; AME; INSG.
8 A$1.00 of additional output from the mining industry ultimately induces A$2.38 of total output for the economy as a whole; McKinsey Iron Ore Demand Model; ABS 5209.0—Australian National Accounts Input-Output Tables 1998–99; ABS 5204.0—Australian System of National Accounts 2006–07.

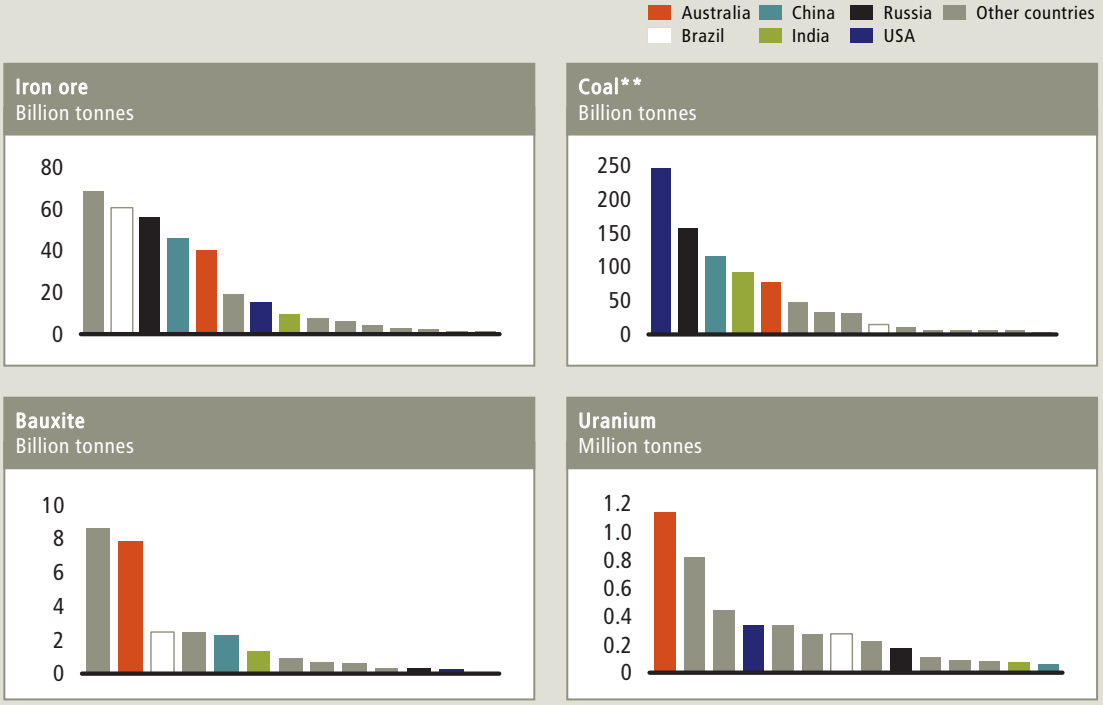
Exhibit 2 Strong growth is expected for key commodities



* Metallurgical and thermal coal

Source: McKinsey Iron Ore Demand Model; RBC Capital Markets; Brook Hunt; AME; INSG; WBMS; IFA coal outlook

Exhibit 3 Australia has the mineralisation* to meet strong global demand

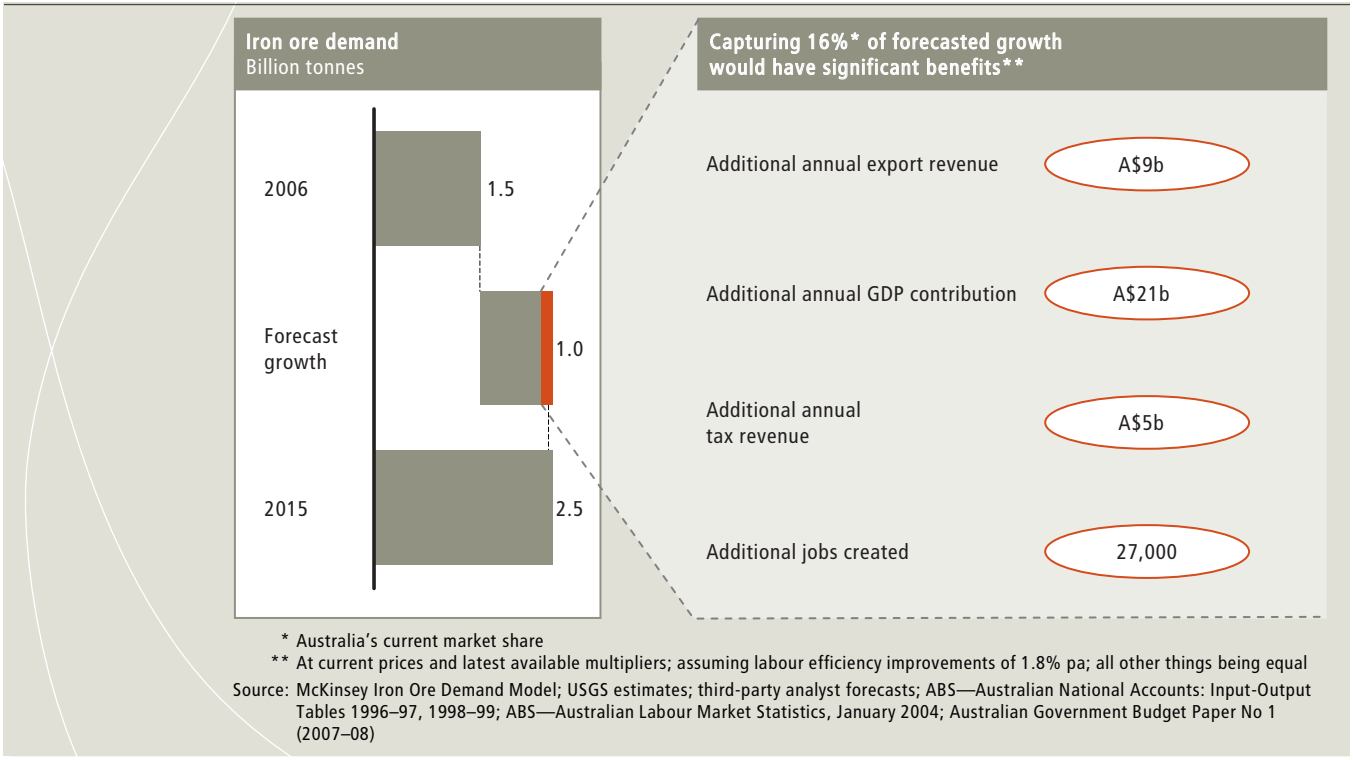


* Reserve base for crude ore and bauxite, recoverable reserve for uranium, and proven reserves for anthracite, bituminous, sub-bituminous and lignite coal types

** Metallurgical and thermal coal

Source: USGS

Exhibit 4 Maintaining current market share provides significant benefits for Australia—example: iron ore



* Australia's current market share
** At current prices and latest available multipliers; assuming labour efficiency improvements of 1.8% pa; all other things being equal

Source: McKinsey Iron Ore Demand Model; USGS estimates; third-party analyst forecasts; ABS—Australian National Accounts: Input-Output Tables 1996–97, 1998–99; ABS—Australian Labour Market Statistics, January 2004; Australian Government Budget Paper No 1 (2007–08)

The impact on social surplus—the sum of producer surplus, consumer surplus and government receipts—will therefore be substantial. Producer surplus stands to be very high as high growth and historically high prices enable significant profits to be derived from Australian resources. Government receipts, based on taxation of profits and royalties on outputs, will be correspondingly high. And this is before the positive flow-through effects to the wider product and labour markets.

Australian consumers will not be directly affected by the historically high prices as the vast majority of consumption happens outside Australia—and in any case prices will be set in global markets. Therefore, the maximisation of producer surplus arising from this historically important period is consistent with the Government's objective to maximise social surplus, within well-accepted constraints such as maintaining strong and cooperative international relations and upholding corporate citizenship.

1.2 Timely investment in infrastructure is needed to ensure Australia captures this growth

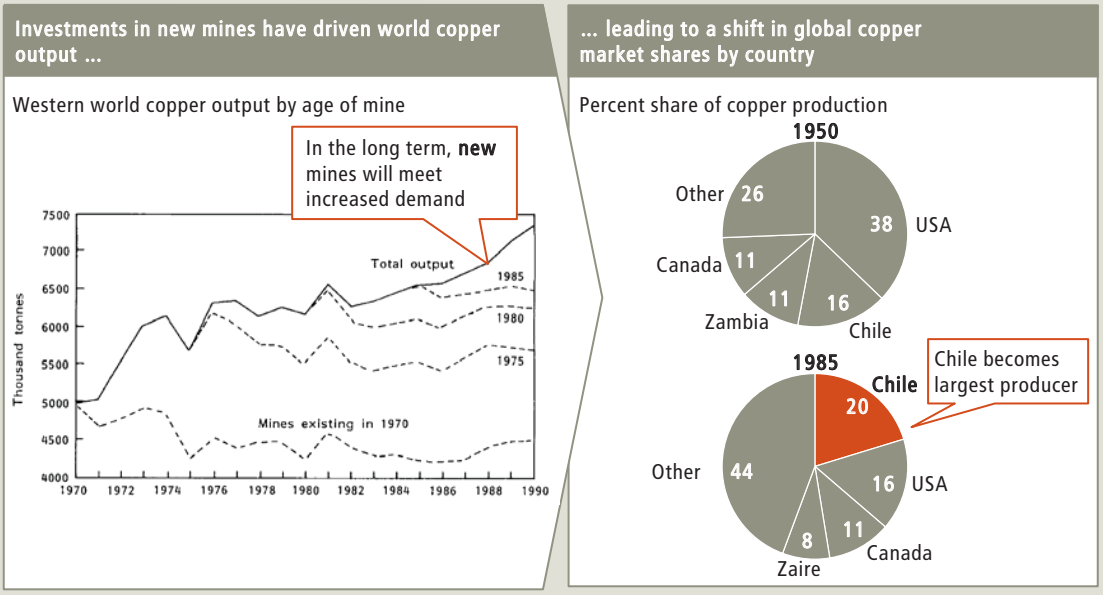
Australia faces real and intensifying competition from other countries that are also endeavouring to capture the benefits of demand growth in key bulk commodities. Even recent statistics show that Australia's share of the global market in key commodities has declined as our rate of production expansion has not kept pace with expansion overseas. Despite absolute gains in production over 2001–06, Australia's volume share of the global iron ore market has declined from 19.3 percent to 18.7 percent, while thermal and coking coal volume share has declined from 6.9 percent to 6.0 percent.[9]

As we observed in the last super cycle, these periods of dramatic growth can lead to a shift in production to new resource basins that can accommodate the surge in demand (Exhibit 5). Australia, as the new resource basin in the 1960s and '70s, benefited from this trend as activity moved away from the US and Europe, but we could be the victim of it in this current era as resources open up in West Africa, Latin America, Asia and Eastern Europe. Though reserves exist in these areas, massive infrastructure projects are needed to unlock them; once this infrastructure is in place and costs are sunk, these regions house new long-term competitors that need only cover cash costs to sustain their operations.

Clearly Australia must expand its mining operations quickly, and most industry participants are seeking to do just that. But it will not be possible without corresponding expansion in infrastructure, which typically comprises 60–70 percent of the invested capital for incumbent bulk commodity producers.

9 Raw Materials Group, Stockholm, 2008.

Exhibit 5 Global copper market shares through last super cycle

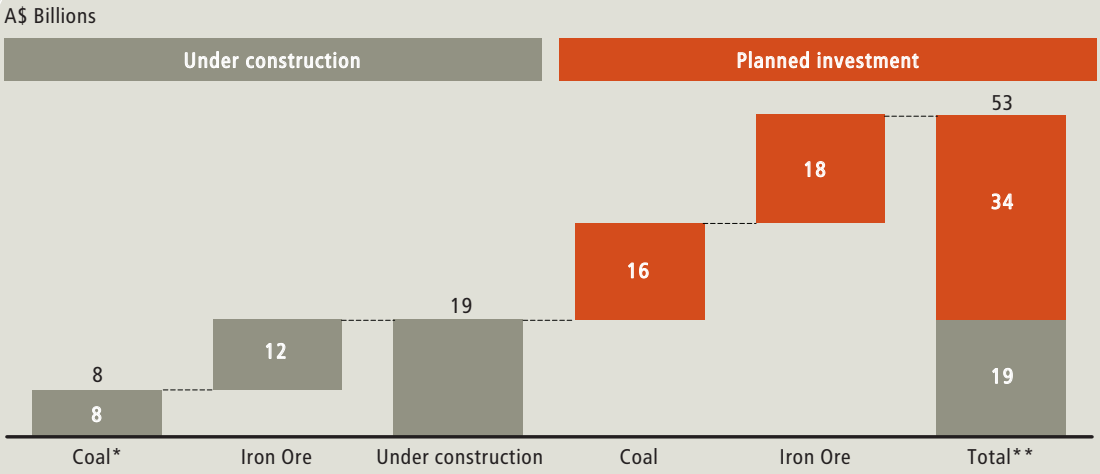


Source: Phillip Crowson; 'Geographical Shifts in the competitive strength of mineral production...'; Resources Policy 12/92, US Bureau of Mines year book successive issues

Infrastructure plays a critical role in the minerals value chain beyond just the movement of product. Infrastructure is critical for the business to meet the high degree of short-term variability in the level of demand for specific products, ensure efficient blending of minerals throughout the supply chain to reduce variability in product specifications, and maximise security of supply to customers. This is particularly important in bulk commodities which are marketed directly to customers who depend on reliable supply, rather than through terminal markets, such as the London Metals Exchange for copper, that can act as a buffer between supply and demand.

Bulk commodities infrastructure is not only critical, but is also currently insufficient and a degree of urgency in the response is required. Within Australia, more than A$19 billion worth of coal and iron ore projects are currently under construction and over the next 10 years a further A$34 billion worth of investment is planned (Exhibit 6). To sustain the capacity growth, Australia will need to invest in the equivalent of at least 8 additional 50 Mt ports and corresponding rail networks by 2015 (Exhibit 7). This increase represents an almost doubling of capacity from today. Given the 4–5-year lead time that construction of infrastructure

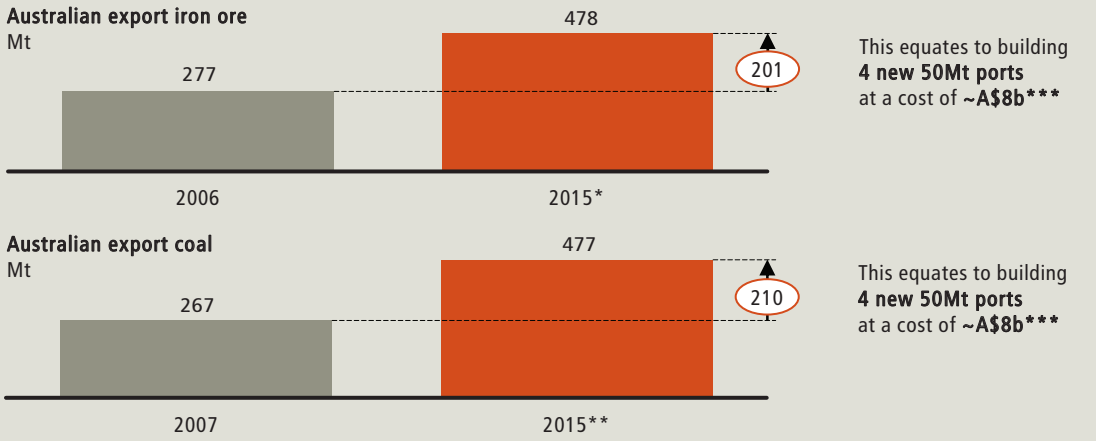
Exhibit 6 Australian iron ore and coal investment



* Metallurgical and thermal coal mines and infrastructure
** Further investment is planned in other minerals as well

Source: ABARE, October 2007

Exhibit 7 Required infrastructure development



* Estimated from total volume required to maintain current 34% market share of seaborne iron ore market
** Assuming all projects in ABARE database are built and coal is exported
*** Estimated from the A$1.1b cost to construct 30 Mt terminal by NCIG at Port Newcastle

Source: UNCTAD, 2007; press search

has,[10] these investments must be committed to within the next 2 years or Australia will see more bottlenecks such as the ones that have cost Queensland coal miners an estimated A$1 billion per year in opportunity costs from delayed expansions.

In summary, without timely and large expansion of infrastructure, Australia will lose global market share and miss the historic opportunity to benefit from the stronger for longer cycle of expected demand growth. If Australia doesn't make the investment, other resource basins will emerge to capture the demand, and once built these resource basins will sustain market share and growth in the long term—that is, others will replicate Australia's success story from the 1960s.

To sustain the capacity growth, Australia will need to invest in the equivalent of at least 8 additional 50 Mt ports and corresponding rail networks by 2015. This increase represents an almost doubling of capacity from today.

10 NCIG Terminal 5 years from announcement to completion, RBCT 'phase 5' expansion project 4 years from announcement to completion, DBCT 5 years for recent expansion, Abbott Point 5 years for recent expansion, Hay Point 3 years for recent expansion.

Chapter 2—The impact of access regulation on export-oriented bulk commodities

Mandated third-party infrastructure access regulation is appropriate in some industries and under certain conditions. But overall, these conditions are not met in export-oriented bulk commodities and therefore mandated access regulation should not be enforced in this sector.
This chapter lays out this argument in four sections:

2.1 Mandating third-party infrastructure access is beneficial only under certain conditions
2.2 These conditions are not met in export-oriented bulk commodities
2.3 The impact of inappropriate regulation is clearly demonstrated in several case studies
2.4 Therefore mandating access in this context will reduce social surplus.

2.1 Mandating third-party infrastructure access is beneficial only under certain conditions

The objective function of regulation is to improve social surplus—the sum of producer and consumer surplus and government receipts. Typically, access regulation is used to overcome the market failure of natural monopoly which can foreclose competition in upstream and downstream markets and lead to the inefficient under-provision of infrastructure. In the 'textbook case', the owner of the natural monopoly exerts market power to restrict output and raise price, creating a deadweight loss of welfare[11] (Exhibits 8 and 9). Access regulation can, under the right conditions, impose more efficient pricing and facilitate competition in upstream and downstream markets, which redresses the deadweight loss. Moreover, this competition typically induces better productivity which, over time, further improves social surplus.

Mandating third-party access to infrastructure results in a favourable outcome for the economy if:

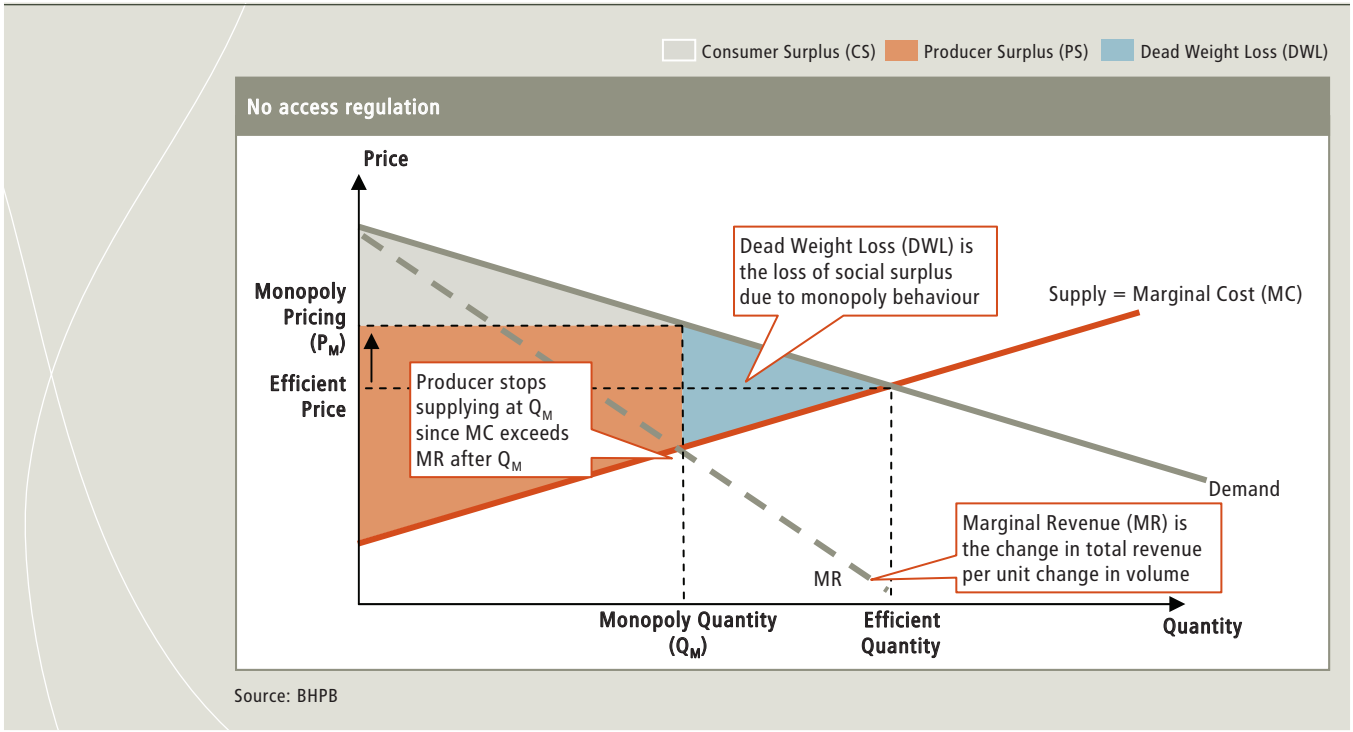
- Sharing access does not introduce material inefficiency for the overall system, net of additional transaction and 'friction' costs
- Capacity is sufficient, or incentives are sufficient for ongoing timely and efficient investment in capacity to meet future needs and
- Facility owners are able to—in the absence of such regulation—exercise market power and foreclose beneficial competition.

This leads to seven conditions that on balance need to be satisfied for access regulation to promote social welfare.

Shared access will not **introduce material inefficiency** into the overall system—net of additional transaction and friction costs—provided the following four conditions are met:

- **Condition 1—The operation must be vertically separable.** The supply chain can be broken up into and operated as separate, stand-alone elements, while maintaining efficiency of the whole vertical system for each participant. That is, the system can be split so that optimising each part yields an outcome similar to globally optimising the entire supply chain
- **Condition 2—Sharing assets does not impede operational efficiency.** This requires that use of the asset by any one participant does not impose additional costs for any other participants. This requires as a minimum that the shared system must be able to continually improve productivity through adopting new technology and work practices in a timely manner

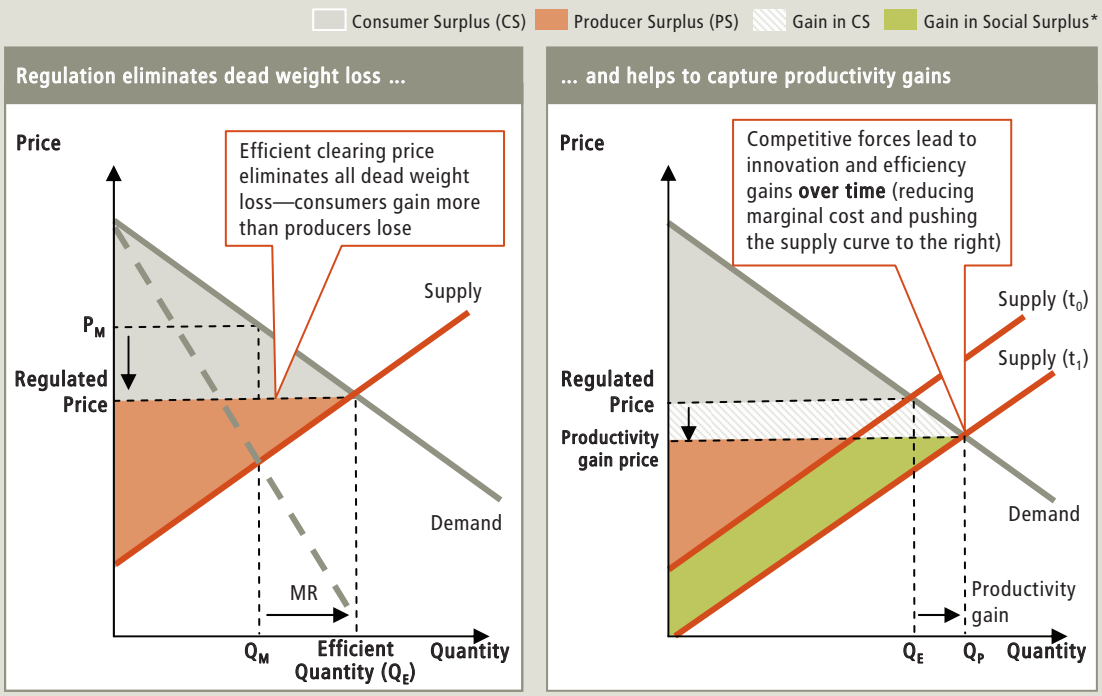
Exhibit 8 The economics of standard monopoly behaviour



Source: BHPB

11 Dead weight loss refers to the total surplus lost relative to an efficient market due to monopoly effects, market imperfections, taxes, or other factors.

Exhibit 9 Economic theory suggests access regulation can remove DWL and improve productivity



* Depending on the extent of the shift of the supply curve it might not result in a net gain of Producer Surplus

Source: BHPB

- **Condition 3—All key operational and commercial terms must be contractable.** For the regulated system of multi-party coordination to work, information must be available to all parties on a timely, efficient and transparent manner, incentives need to be compatible (whether naturally or through simple incentive mechanisms), sufficiently 'complete' contracts must be writable (including payments for consequential loss) and the scope for deviant 'gaming' behaviour needs to be limited. This requires a sufficient degree of predictability, stability, transparency and standardisation in the operation. And even if conditions 1 and 2 are met in theory, failure to meet condition 3 means that operational efficiency will not be achieved in practice
- **Condition 4—The asset must be a natural monopoly.** A natural monopoly exists if market demand can be met at a lower cost by operating one asset rather than two or more assets, usually implying that building a second asset is not feasible or desirable. A facility that genuinely exhibits this characteristic will enable an economic benefit of sharing due to scale economies that provides an offset to any costs associated with conditions 1, 2 and 3. The asset must also be expandable to meet the demand over a long period of time if it is to truly classify as a natural monopoly, and expanding the existing asset has to be more economic than building new greenfield capacity.

For access regulation to effectively promote social surplus, there must be sufficient capacity or sufficient incentives for **ongoing timely and efficient investment in capacity.** Where ongoing investment in capacity expansion is required, conditions five and six must be met, but where all foreseeable investments have been made, they need not apply:[12]

- **Condition 5—Capacity requirements can be forecast with low uncertainty.** Infrastructure is relatively expensive and long-lived, and according to Professor Hausman, is 'largely a sunk and irreversible investment... [with] significant time to build' (3–5 years for rail and ports and the bulk commodity industry). If future demand is highly uncertain, it is very difficult to coordinate and approve the appropriate investments in a timely manner. This is especially challenging in a regulated environment
- **Condition 6—The returns offered to the infrastructure provider must be market-based.** The Regulator has to accurately and relatively quickly determine a fair estimate of all costs incurred by the infrastructure provider in providing access, and the rate of return on sunk costs. This is particularly challenging when system flexibility and uncertainty on the use of the system is significant, both of which can result in substantial real option value. The conventional approach to regulation in Australia uses the 'building block approach' based on Net Present Value (NPV) and the weighted average cost of capital (WACC).

12 However, even when investment is not an issue, there may be some concern about signalling effects across industries; the Regulator must ensure that contagion through precedents set in one industry does not harm another industry.

This approach ignores real option value to the detriment of the infrastructure provider. When the returns offered to the infrastructure investor are too low, third-party access (a 'free rider' effect) is encouraged and investment in new infrastructure is discouraged.

Third, the 'prize' of mandating access—the **promotion of competition** in adjacent upstream or downstream parts of the supply chain—must itself be sufficiently large in terms of social surplus to be able to offset the inevitable costs and frictions of regulation. This rests on meeting condition seven:

- **Condition 7—Beneficial competition must be enabled.** The default argument is that by isolating the natural monopoly component of infrastructure and providing access to it, new entry and competition is enabled in non-regulated parts of the value chain for the benefit of consumers in Australia. For this competition to be beneficial, there must be a large enough deadweight loss from the exercise of excessive market power in the first place. These benefits must outweigh the costs of regulation and the benefits lost from lack of any facility-based competition.

For example, **access regulation of electricity transmission grids** appears to satisfy these conditions in its application in Australia, and has, on the whole, produced good outcomes for Australians—notwithstanding likely valid arguments about how the regulatory framework can be improved.[13] Specifically:

- The energy value chain (from fuel supply to generation over transmission and distribution to trading and retailing) has proven to be separable with clear interfaces between each step of the value chain where key performance indicators and service-level agreements are clearly defined and accepted in the industry—condition 1
- Any one participant using transmission infrastructure within capacity constraints does not impede the efficiency of another participant's use. That is, sharing the asset does not impede operational efficiency—condition 2
- Although not straightforward in the first place, the Australian energy industry (as in most other countries) has found fairly standard agreements at the interfaces of generation, transmission and retail. Vertical market failure has been avoided through the use of transparent market mechanisms such as NEMMCO (National Electricity Market Management Company)—condition 3
- Transmission and distribution grids are natural monopolies, meaning duplication is inefficient. Most capacity growth is (geographically) incremental, and, where needed, it is optimal to expand the existing transmission network—condition 4
- Average yearly peak and base-load electricity demand can be forecasted in most developed countries with a reasonably high degree of certainty. Therefore there is a common basis for long-range capacity planning at a measured pace—condition 5
- The stable risk profile of the infrastructure asset limits the potential problems introduced by a WACC model of risk pricing, as demand and prices are relatively certain, real option value may be relatively low and stranded assets are not a significant issue in the industry—condition 6
- Open access to the transmission grid is a fundamental prerequisite to enabling competition in generation and retailing. South Australia and Victoria have highly competitive electricity markets (as indicated by the highest churn rates in the global retail energy markets—above 20 percent) and new players were formed in generation, benefiting from clearly structured interfaces between the parts of the value chain—condition 7.

In industries, such as electricity transmission and gas pipelines, where access regulation was implemented and conditions were sufficiently satisfied, real prices for consumers have declined and productivity has improved as the reward of competition (Exhibit 10).

2.2 These conditions are not met in export-oriented bulk commodities

Export-oriented bulk commodity industries have special characteristics—in terms of market context and the complexity and specifics of the value chain. It is important to note that in bulk commodities the price is set on a global supply/demand balance. Therefore the demand curve is effectively flat for Australian suppliers and any Australian consumer surplus is invariant to regulation (Exhibit 11). Furthermore, the conditions outlined above are not satisfied.

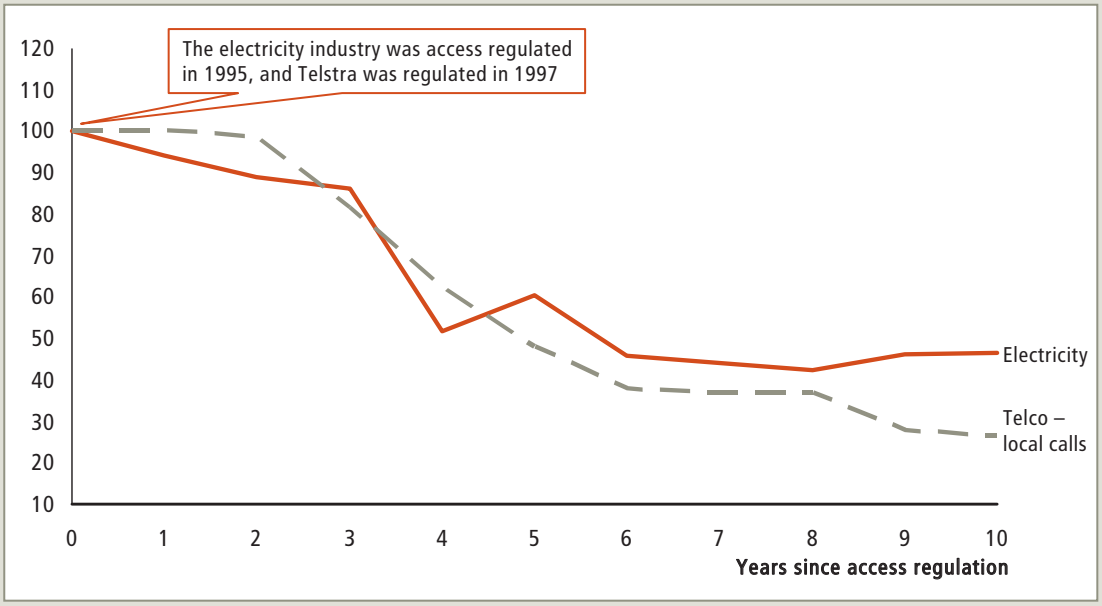
Taking each in turn:

Condition 1—The supply chain is not vertically separable
Regulating a small part of the bulk commodity supply chain causes a suboptimal outcome for the whole system. This is because capturing economies of scale and maximising operational efficiency requires ownership and end-to-end coordination of the whole supply chain in export-oriented bulk commodities—the very reason these value chains were vertically integrated in the first place, and have remained so. These supply chains are complex, interrelated systems, linked by blending, managing variable short-term product demand, operational interdependencies, and continually flowing information through and optimising across the system. Separating the value chain undermines this complex system, and creates additional challenges as there are no standardised interfaces between elements which would allow each element to be separately managed. O'Donnell(1) reports that 'even if each component of the value chain operates efficiently and meets its production or throughput targets 95 percent of the time, the total system may only meet its overall throughput targets 60 to 70 percent of the time'.

13 While we say regulation is feasible in this instance, we do not say it will guarantee good outcomes in all instances, as it requires a high level of regulator effectiveness (eg California versus Texas electricity grids).

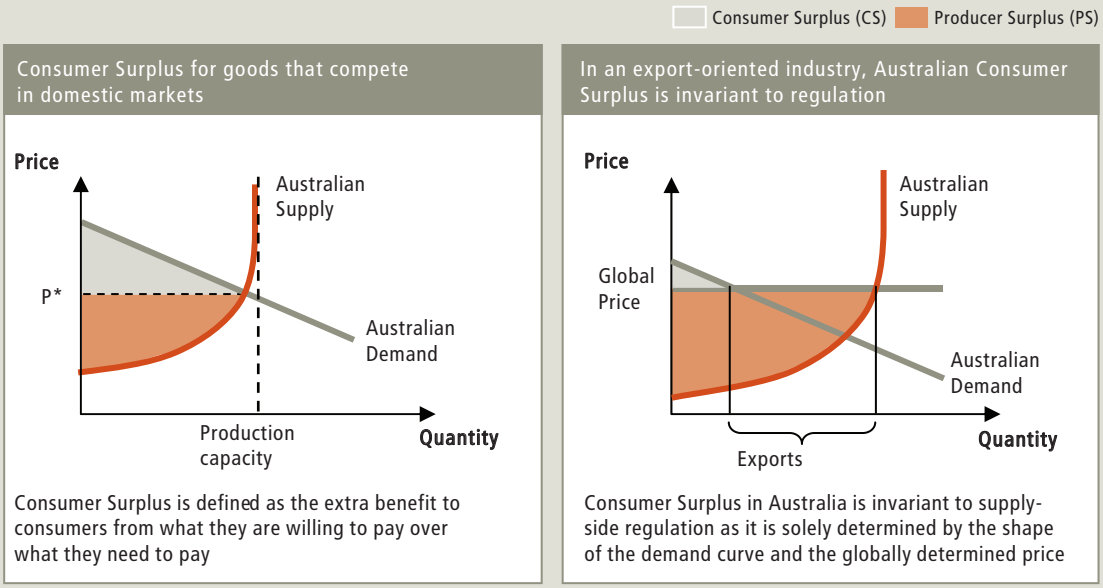
Exhibit 10 Declining real price of local calls and electricity

Indexed real prices, 100 = year of regulation



Source: Australia Bureau of Statistics; NEMMCO; Paul Budde 2006

Exhibit 11 Local consumer surplus in industries with global price setting is invariant to regulation

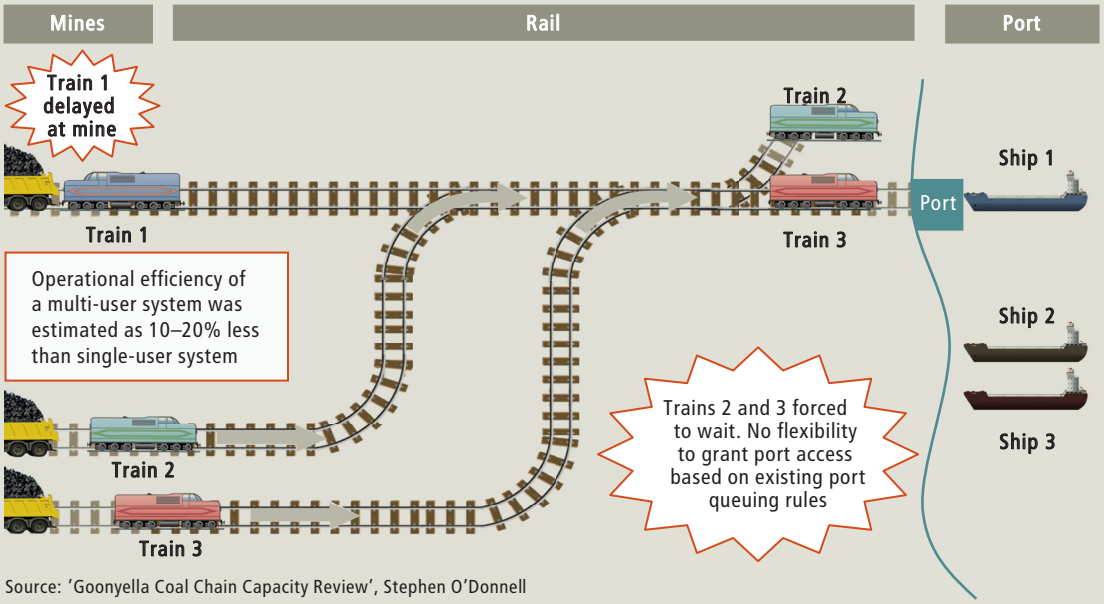


Source: BHPB

Condition 2—Sharing assets impedes operational efficiency

The infrastructure in bulk commodities has massive dimensions and is a very complex system. Actions or mistakes by one user can have large knock-on effects to other users, for example, delays in loading or not meeting agreed parameters can result in delays and reduced capacity of other users. This is different to electricity transmission and gas pipelines which have relatively well defined sub system interfaces that are easily measured and standardised. Attempts to coordinate multiple users, such as timetabling, have been estimated to reduce system capacity by 10–20 percent (O'Donnell(1)). Additionally, continuously improving operations in a multi-user system requires all parties to align, which is difficult to achieve. O'Donnell(1) adds 'the level of continuous improvement described [in the Pilbara] is unlikely to be able to be achieved on a common user system, or on a rail network which is shared by two different train operators' (Exhibit 12).

Exhibit 12 System inefficiencies due to loss of flexibility and coordination



Source: 'Goonyella Coal Chain Capacity Review', Stephen O'Donnell

Condition 3—Not all terms are contractable

Above we argued that for coordination frictions to be reasonably low, a sufficient degree of predictability, stability, transparency and standardisation is required in the operation. Bulk-commodity value chains do not have these properties: short-term demand and supply are hard to predict, the system is complex, in part due to the closed loop nature of many systems, information requirements to optimise the system are detailed, and there is little scope for standardisation as the products are not interchangeable. As a result, attempts to create arms-length contracts result in slow decision making, misaligned incentives, high transaction costs, disagreements and disputes, and gaming behaviour such as 'hold ups' where it is in one parties best interests to delay investment.

Professor Hausman states 'it is not feasible to specify contractually the full range of contingencies (ie complete contracts) and stipulate appropriate responses'. O'Donnell(1) adds 'the commercial and contractual arrangements governing a flexible operational framework in a multi-user system would be extremely complex'. O'Donnell(1), in a report on the Goonyella Coal Chain, cites several shortcomings of multi-user systems, including:

- Lack of flexibility in daily operations, making it difficult to implement changes at short notice to maximise system throughput
- Difficulties in aligning contractual frameworks to deal with commercial relationships between system participants
- Delays associated with implementing changes
- Constraints on operational and technological improvements
- Lack of appropriate governance and accountability mechanisms.

Professor Hausman summarises that 'vertical integration eliminates many of these potential problems because economists (and lawyers) have long realised that it is not feasible to specify contractually the full range of contingencies and stipulate appropriate responses'. The economic impact of a violation of conditions 1–3 is a significant reduction in producer surplus and therefore in social surplus since access regulation prompts the supply curve to shift inwards and increases producers cost and reduces the capacity of the infrastructure system (Exhibit 13).

Condition 4—Infrastructure assets are not a natural monopoly

The natural monopoly test is failed on two counts. First, the scale of growth in demand (and expected high prices) makes building greenfield capacity feasible, as shown by the proposed Fortescue rail investment for their Cloud Break and Chichester deposits. The development of the Pilbara region also shows that having multiple infrastructure owners even in one region can be efficient (and economically viable).

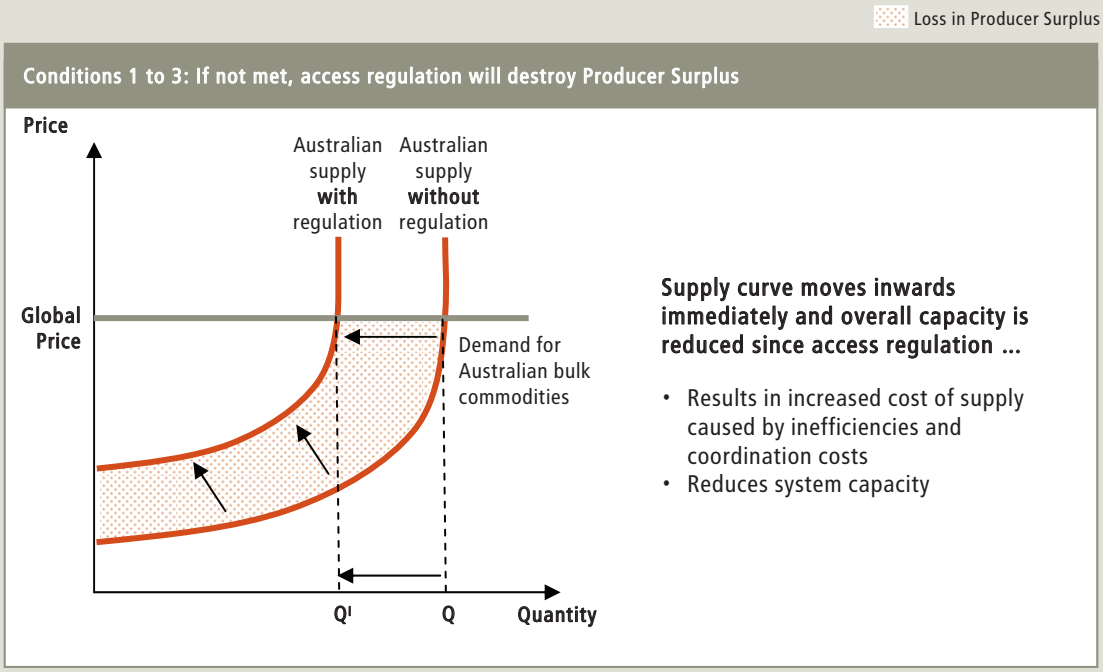
Second, there is no effective excess capacity and existing capacity is not readily expandable at the scale required: planned expansions require current infrastructure assets to double existing capacity.[14] For example, in the Pilbara system alone, rail capacity was 262 Mt in 2004–05 and the mid-point estimate of **additional** required capacity by 2015 is 225 Mt.[15] This step-change in required capacity makes all investment effectively greenfield in nature.

Since infrastructure assets in bulk-commodity are not natural monopolies, access regulation imposes higher system costs through efficiency losses and therefore reduces producer surplus significantly (Exhibit 14).

14 Australian Bureau of Agricultural and Resource Economics, List of major mineral and energy projects, October 2007.

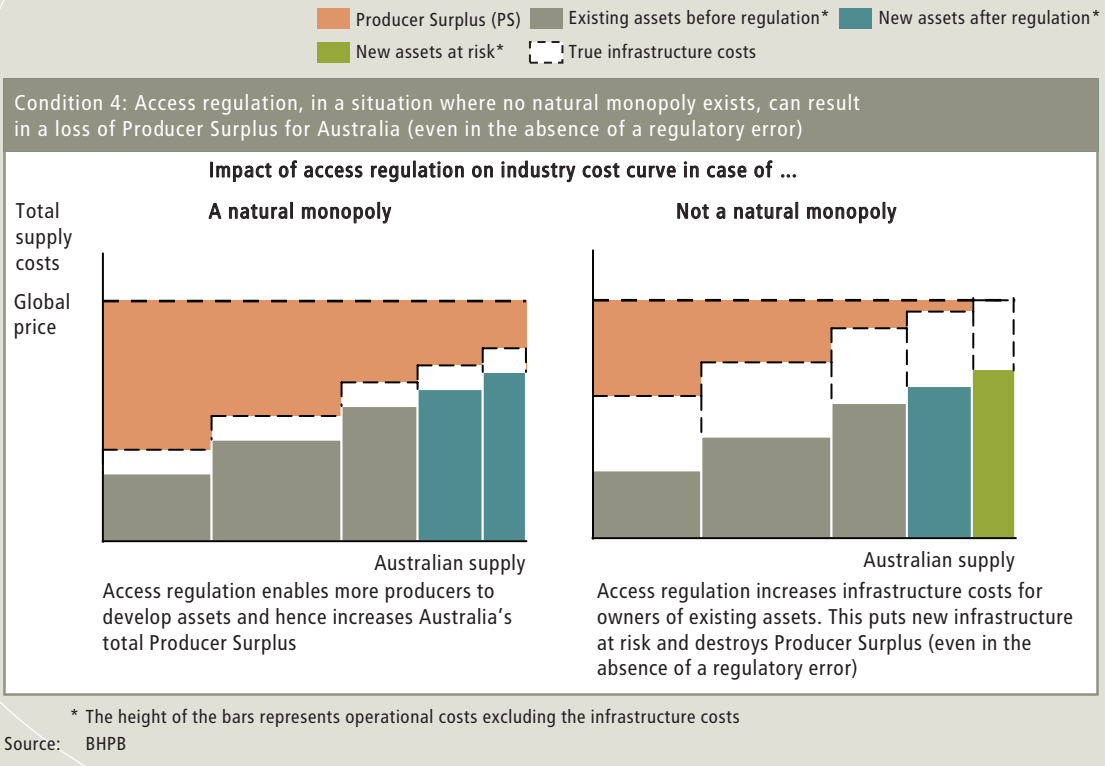
15 Combining Port Headland, Dampier and Cape Lambert; Department for Planning and Infrastructure, Government of Western Australia: 'Port and Related Infrastructure Requirements to Meet the Expected Increases in Iron Ore Exports from the Pilbara', February 2007.

Exhibit 13 Impact of unmet conditions on regulated infrastructure assets—Conditions 1 to 3



Source: BHPB

Exhibit 14 Impact of unmet conditions on regulated infrastructure assets—Condition 4



* The height of the bars represents operational costs excluding the infrastructure costs

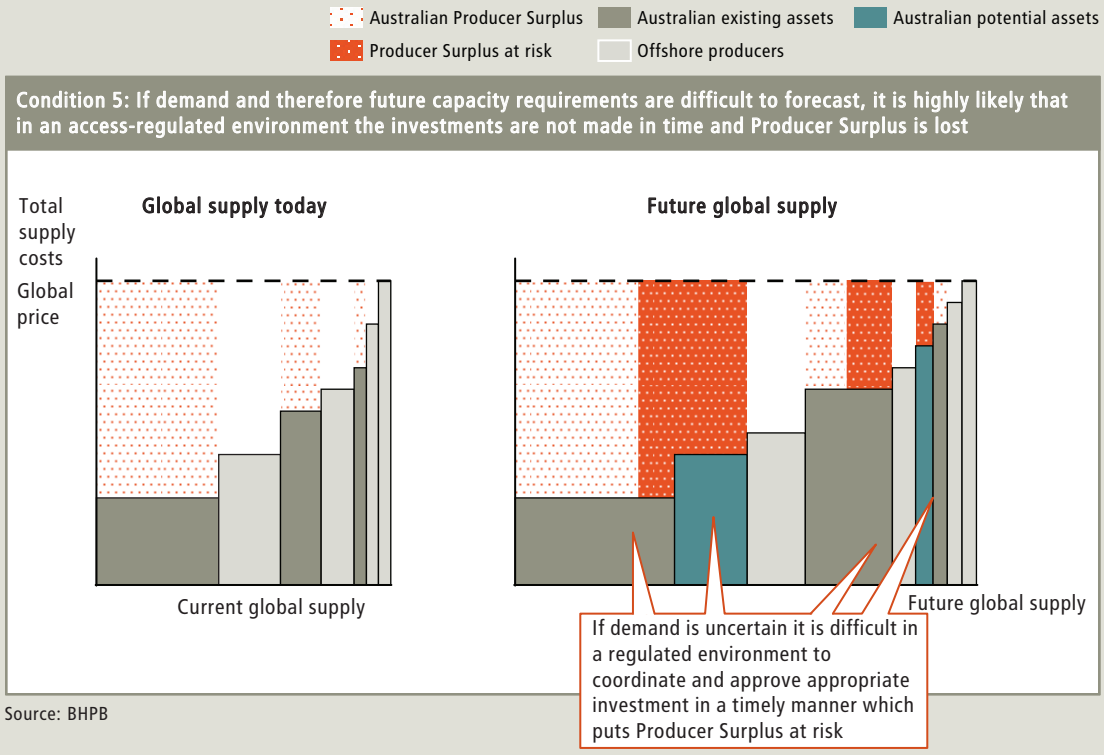
Source: BHPB

Condition 5—Long-term demand for infrastructure usage cannot be forecasted with low uncertainty

In the bulk commodity industries capacity requirements are difficult to forecast, yet timely supply responses are required. Unlike the relatively predictable demand profile for typical domestic utilities (such as electricity and gas), commodity demand is naturally cyclical and highly dependent on uncertain economic growth and intensity of resource utilisation.

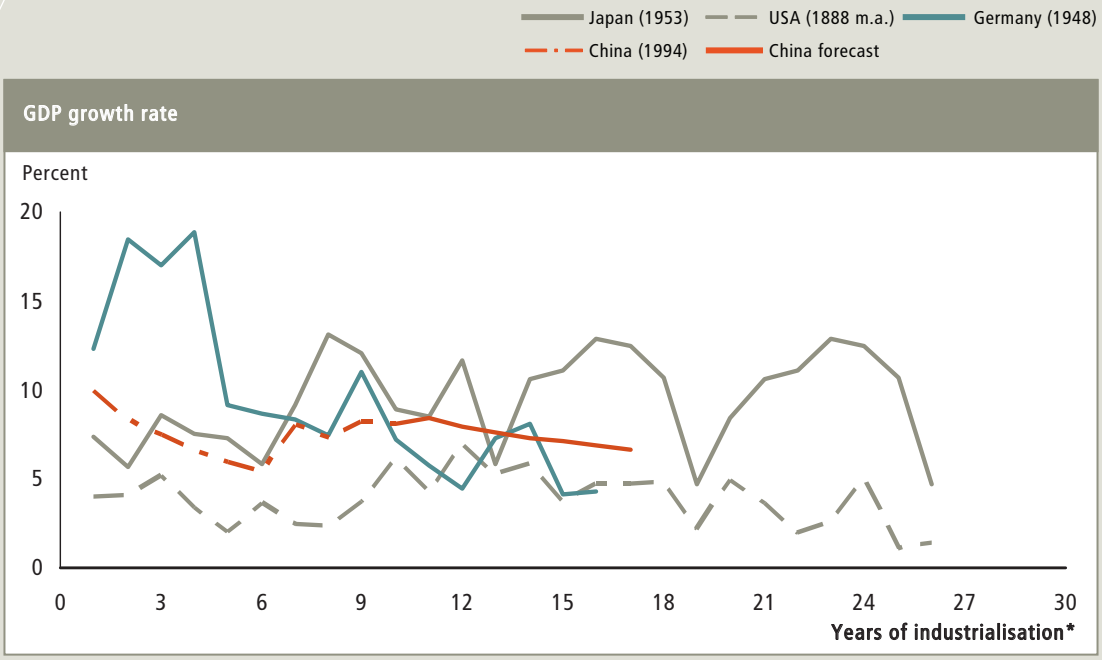
Furthermore, the rational global supply side response for cyclical demand is dependant on the relative position of the resource basin on the global supply cost curve. Most of the Australian assets in bulk commodities enjoy a privileged position on the cost curve and are therefore 'natural candidates' for capturing any short- or long-term demand upswing to increase Australian's social surplus. Access regulation of the infrastructure assets makes the coordination and timely approval of the necessary

Exhibit 15 Impact of unmet conditions on regulated infrastructure assets—Condition 5



Source: BHPB

Exhibit 16 GDP growth rates post industrialisation



* Year 1 of development is determined when GDP/capital reaches ~US$1,500 in 1990 real terms

Source: OECD for historical, Goldman Sachs for China forecasts

investments to capture increasing demand more difficult. This ultimately results in a loss of producer surplus in a regulated environment (Exhibit 15).

History—and current experience—shows demand for commodities does not follow a predictable year-to-year path. For example, Japan's economic growth was highly variable while the country industrialised, as China's has been so far—and this has a substantial effect on demand (Exhibit 16). Moreover, India's development will happen later and perhaps less reliably than China's, compounding uncertainty. The national capacity requirement also depends in complex ways on the plans and intentions of competing sources of supply in other off-shore resource basins.

In this environment, small changes to growth outlook and the aggressiveness of the individual company's growth posture (eg a desire to invest ahead of demand to gain market share, which tends to be 'sticky' once gained) will yield large differences in the appetite for the speed and scale of investment. Furthermore, investment plans need to align across the elements of mine, rail and port, making coordinated and timely investment even harder.

And even if participant expectations and investment appetites do converge this will take valuable time. Required investment is extremely lumpy and complex requiring a high degree of coordination and hence highly vulnerable to delay. Given the 'stickiness' of market share gains and the global contestability of resource provision, such delays impose significant opportunity costs: global market share, once lost, will be very difficult to claw back.

Condition 6—Returns offered to the asset owner are not market-based

Access regulation makes investments less attractive (Hausman):

- Since access to infrastructure is sought only in good times, the upside to the investor is curtailed, while the downside remains the same, creating **asymmetric returns**. This makes holding latent capacity very risky for the owner
- As access contracts are shorter than asset life, the access seeker has an option not to renew access, and so is given a **free option** at the expense of the investor
- As the option to defer investment is valuable in the presence of significant demand uncertainty, projects with relatively small NPVs will not be sanctioned. This is because sanction extinguishes the deferral real option owned by the infrastructure provider, and this project (opportunity) cost needs to be allowed for. Because of this opportunity cost, the prospective internal rate of return (IRR) of an investment will need to significantly exceed the project's WACC and regulated rates of return, which effectively assume zero **real option** value by ignoring the IRR and thereby provide an insufficient return on sunk costs (Exhibit 17).

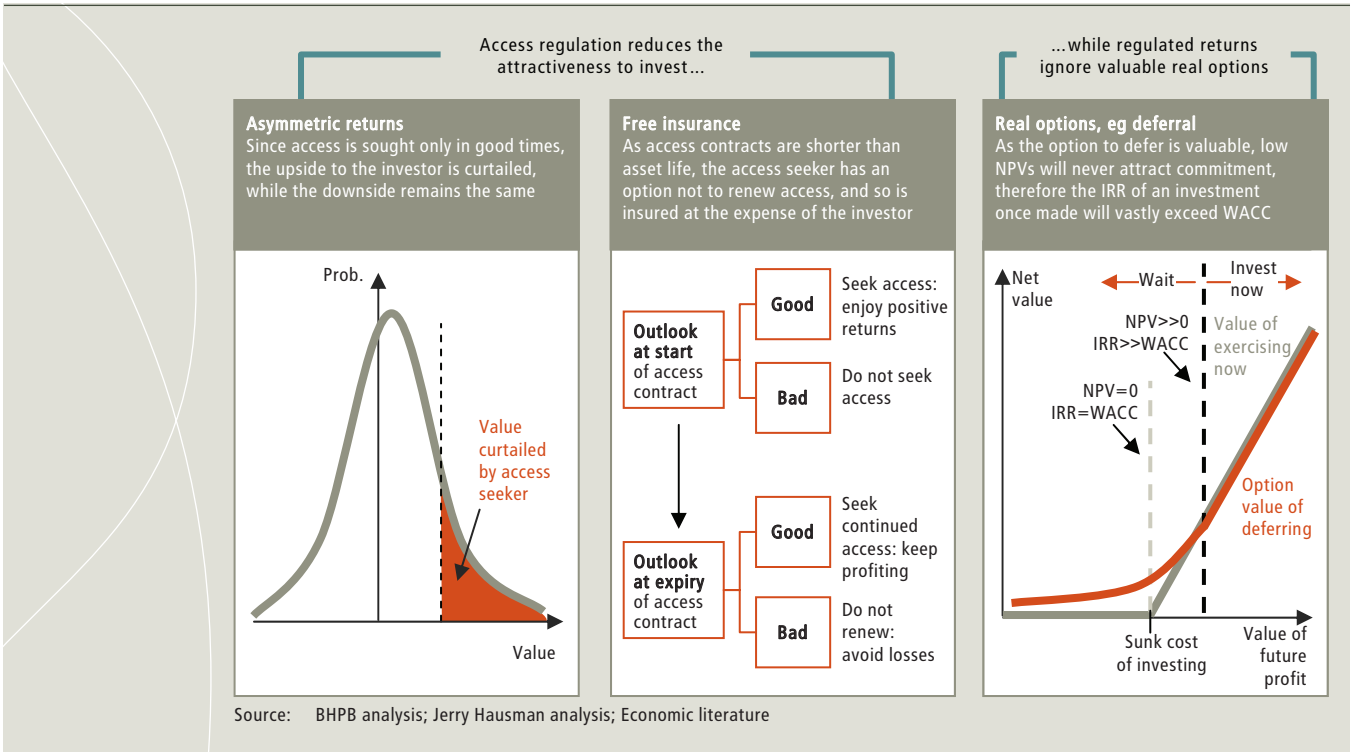
These issues are all the more acute in the context of export-oriented bulk commodity industries. A high-potential range of outcomes makes curtailing upside returns all the more damaging, the long-life and sunk nature of the investment makes the granting of free options all the more expensive, and significant uncertainty and long option life makes real options all the more valuable. As a result, the required market-based returns on sunk costs are considerably higher than WACC.

Access regulation pursued with or without offering the right price for accessing the infrastructure will result in delayed investments or can even make investments in the infrastructure uneconomical. Were those investments to be previously optimal, this would destroy social surplus (Exhibit 18).

Condition 7—Beneficial competition already exists

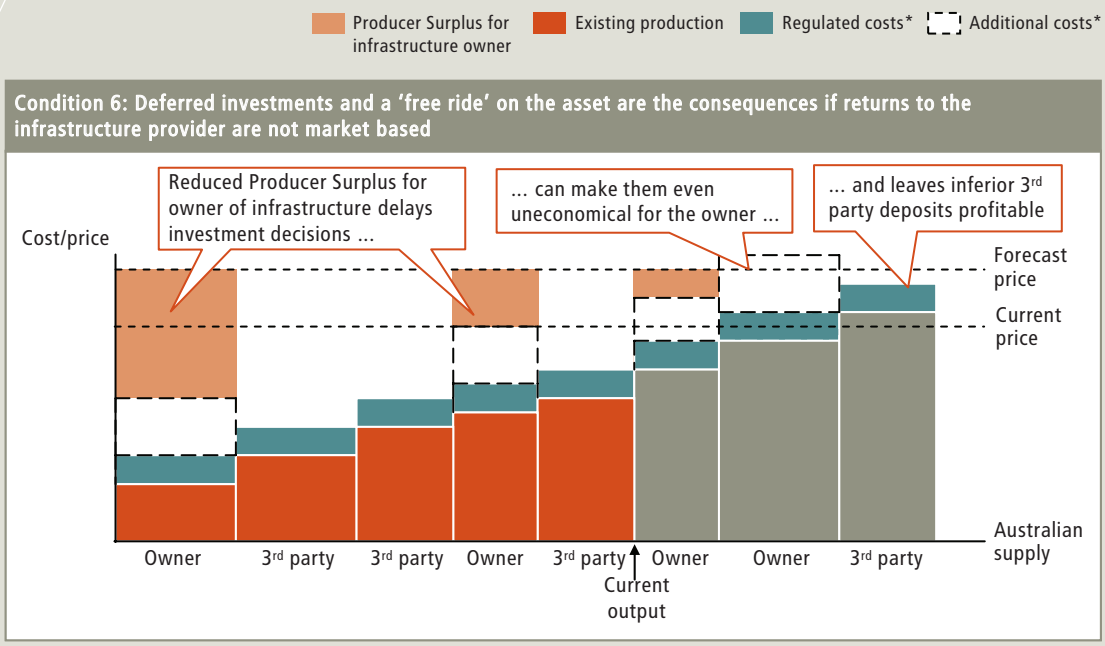
For access regulation to be beneficial there must be abuse of market power causing deadweight loss in the first place. But bulk commodity price is set by global supply and demand, and any one mine is effectively a price taker. Even in commodities with fairly concentrated production like iron ore, shadow competition from Chinese ore, competition from other seaborne destinations and powerful customers backed by government pressure, ensure a competitive price. There is no potential to extract rents from domestic customers, therefore no motive to foreclose others' sales to competitive world markets (Fitzgerald).

Exhibit 17 Access regulation distorts the price of risk



Source: BHPB analysis; Jerry Hausman analysis; Economic literature

Exhibit 18 Impact of unmet conditions on regulated infrastructure assets—Condition 6



* To use infrastructure

Source: BHPB

Moreover, seaborne commodities consumers are outside Australia, and therefore do not impact Australian consumer surplus—the market is competitive, and even if more upstream competition lowered prices, this would not benefit Australian consumers.

Introducing domestic competition will almost certainly not be 'beneficial' in the context of global competitiveness. Fitzgerald argues that 'most access seekers will be those with inefficient scale... hence a risk of displacement of more efficient production and export by less efficient'. Australia will consequently lose its relatively advantaged cost-curve position and investment will flow to resource basins abroad. The irony is that global competition will only be increased by other countries opening up their reserves and gaining market share. Mandated access to Australian infrastructure is handicapping our industry, thereby promoting the development of new resource basins (Exhibit 19).

2.3 The impact of inappropriate regulation is clearly demonstrated in several case studies

We have analysed a number of situations to highlight the real impact of access regulation, linking the extent to which the above conditions are met with the quality of the outcome. These cases cover situations with both high and low intensity of regulation and high and low degrees of market fragmentation, namely: (A) Dalrymple Bay Coal Terminal; (B) Pilbara rail and port network; (C) Newcastle port; (D) California electricity; (E) Richards Bay Coal Terminal; (F) Kumba Iron Ore; and (G) US broadband (Exhibit 20).

A. Dalrymple Bay Coal Terminal (DBCT)

The DBCT was privatised in 2001 and made subject to access and price regulation by the Queensland Competition Authority (QCA). This has been accompanied by significant delays in capacity expansion that BHP Billiton has previously estimated at over A$1 billion in lost future revenues from unmet demand. Further, and in addition, O'Donnell(2) estimated approximately A$1.2 billion per year in foregone revenues and demurrage costs, resulting principally from a mismatch between port and rail system capacities and operational inefficiencies through the coal chain. Relating back to the above conditions:

- **Condition 1—Vertical separation undermined total value chain optimisation.** O'Donnell's review of the Goonyella Coal Chain (O'Donnell(2)) indicated that coordination issues related to having multiple participants in the system resulted in reduced overall capacity. Firstly, modelling indicated that even if every component of the system meets its target capacity 95 percent of the time the system will only meet its capacity between 60 and 70 percent of the time. Secondly, the review showed that optimising for port throughput in isolation to the rest of the chain increased the rail bottleneck and created a worse outcome for the total value chain overall. Despite both rail and port being bottlenecks in the Goonyella Coal Chain, DBCT unrealistically required trains to arrive on time and in an ordered sequence. Trains that arrived early were required to park and wait their turn, resulting in significant follow-on delays to the rail network. As a result only 73 percent of unloading times were met within contractual agreements
- **Condition 2—Sharing assets within a complex system created operational inefficiencies.** Coordinating more than 30 users on a common rail network required timetable operations which was less flexible than 'go when ready' scheduling. O'Donnell(1) reports that the overall rail capacity was estimated to be reduced by 10–20 percent as a result of lost flexibility in the Goonyella Coal Chain. In addition, new technologies were delayed compared to neighbouring ports.

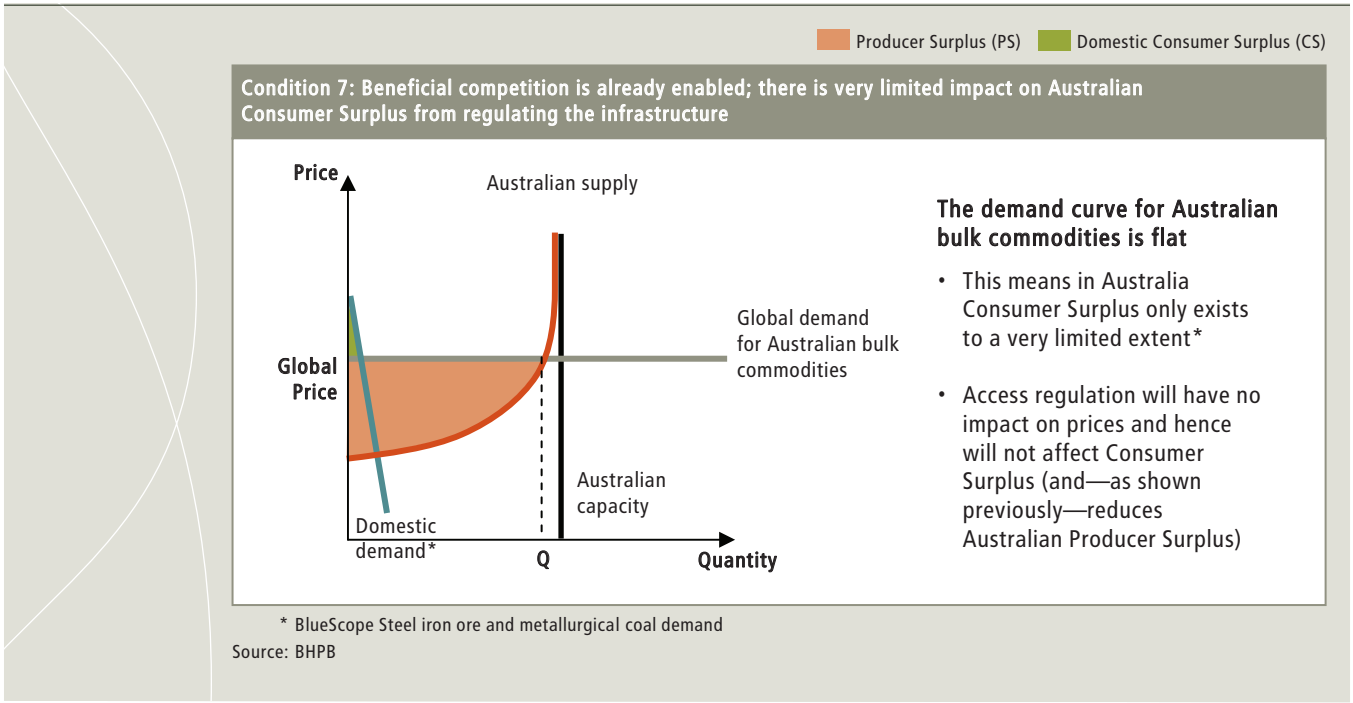
It took DBCT 3 years longer than Hay Point to implement 'wagon vibrators' to address issues with 'sticky' coal. This was primarily a consequence of delays in aligning multiple stakeholders

- **Condition 3—High coordination costs resulted in delayed investments and expansion.** Finalisation of the DBCT regulatory arrangements took 22 months and significantly delayed capacity expansion as investment payoffs were uncertain prior to the determination of allowable charges.[16] While there are undoubtedly a range of factors influencing this, the expansion of approximately 8 Mtpa at DBCT took 5 years from planning to implementation, whereas at the unregulated Gladstone, a 28 Mtpa expansion only took 2½–3 years. Estimated costs to producers as a result of this delay were over A$1 billion per year in foregone revenues.

B. Pilbara rail and port network

BHP Billiton and Rio Tinto individually operate proprietary iron ore rail and port infrastructure in the Pilbara. End-to-end ownership and control has been business-critical in delivering positive operational outcomes:

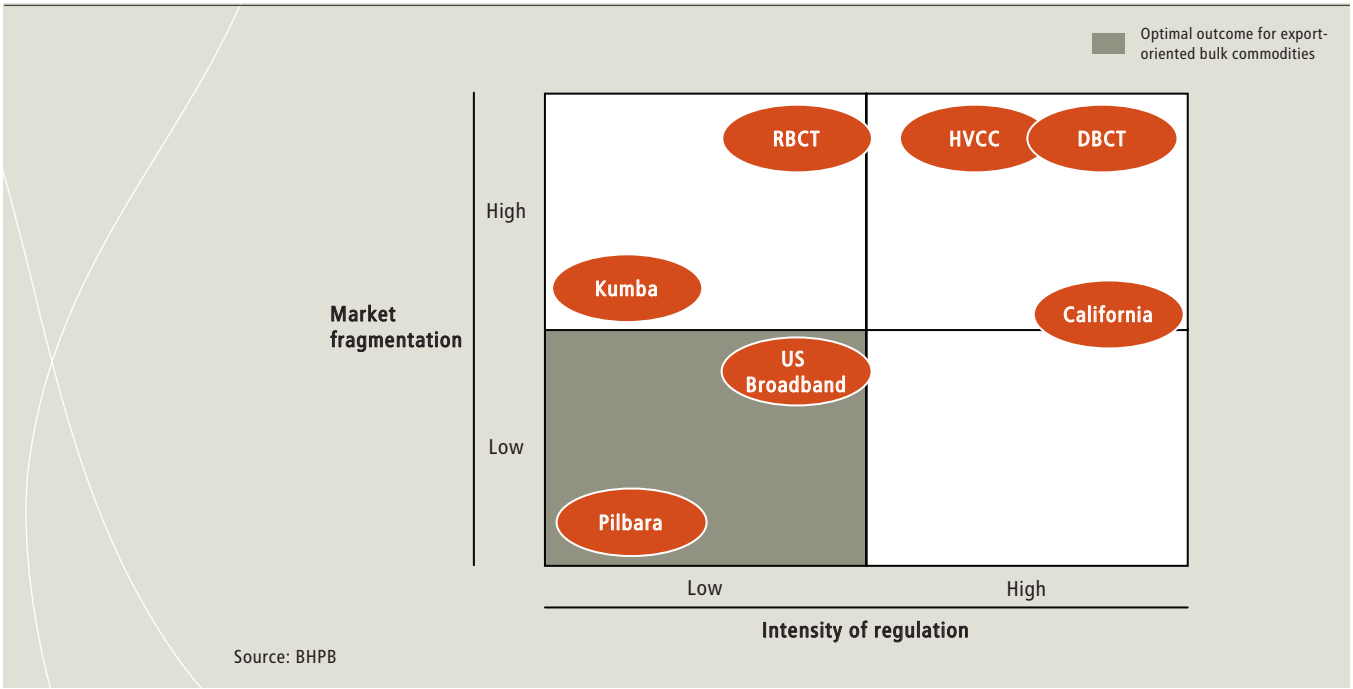
Exhibit 19 Impact of unmet conditions on regulated infrastructure assets— Demand side



* BlueScope Steel iron ore and metallurgical coal demand

Source: BHPB

Exhibit 20 Classification of case examples



Source: BHPB

16 BHP Billiton—Document 5, 'Costs of Delays to Investment in Infrastructure as a Result of Regulatory Intervention', 2006.

- **Condition 1—End-to-end control optimises for the whole supply chain.** Limited demurrage at the Pilbara ports evidences the benefits of end-to-end control of the supply chain. A shortfall in one product or operational difficulties at a mine can be resolved by a short-term reconfiguration of the supply chain, which is only possible due to the unified control available to the participants
- **Condition 2—Single-user system maximises operational efficiency.** BHP Billiton was able to deliver 3–4 percent operational improvement in their proprietary Pilbara rail network over 6 weeks through experimenting with a 'go when ready' operation rather than the traditional 'timetable' approach used in multi-user settings. Further, other innovations such as driverless trains are more feasible without network sharing.

C. Newcastle port

Port Waratah Coal Services (PWCS) requires its Board to approve any expansion. Capacity expansions have been delayed and bottlenecks are occurring. These delays are costing Hunter Valley coal producers over US$100 million per year in demurrage[17] and are resulting in significant lost revenue opportunities (10Mt pa equals US$700 million).[18] These delays have led frustrated coal producers to commit to a greenfield investment in a new terminal nearby, instead of feasible brownfield expansions. Meanwhile PWCS has recently announced its intention to expand further from 2010 up to 140 Mtpa—however, it is not clear if this is possible (Exhibit 21):

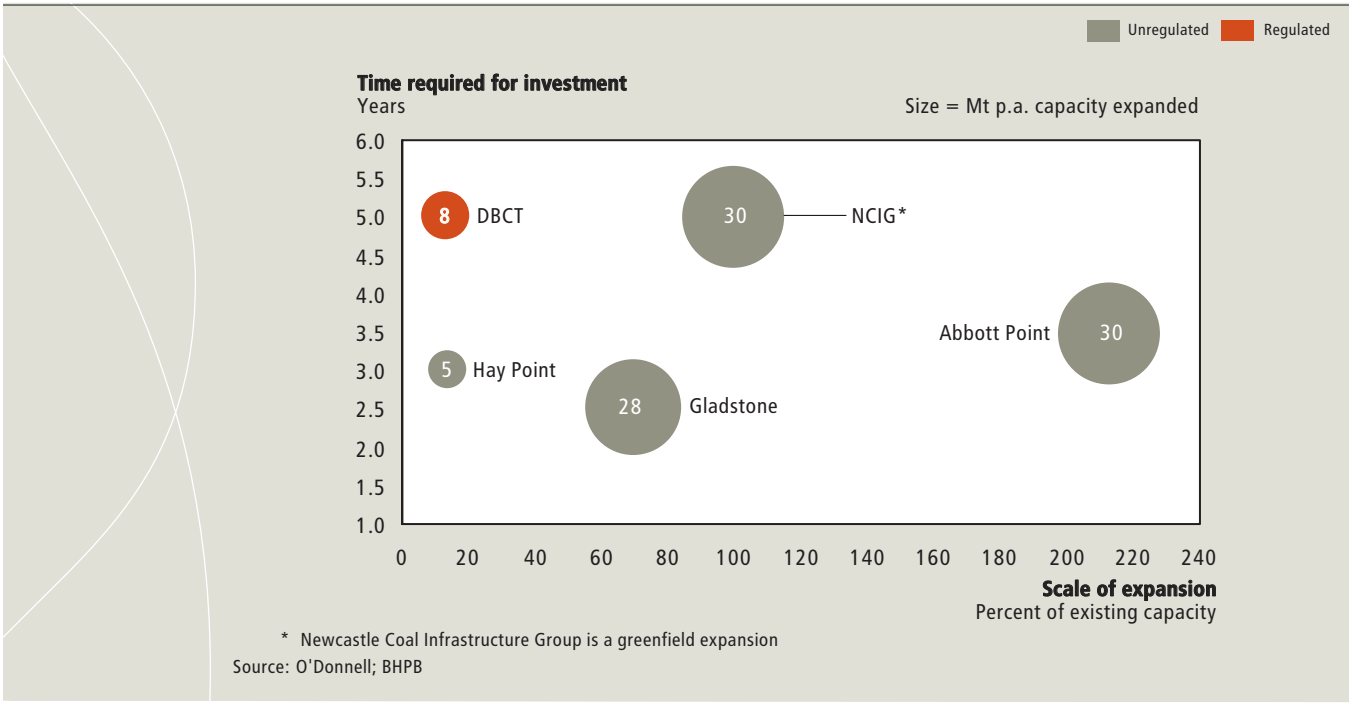
- **Condition 3—High coordination costs from aligning multiple users.** Newcastle coal exports grew just 21 percent between 2002 and 2005[19] compared to 61 percent growth at the comparable vertically integrated chain in Cerrejon, Colombia.[20] While there are different views as to why slower and lesser expansion occurred, it is not unlikely that, among other issues, divergent views on market conditions and growth aspirations led to misalignment between stakeholders on how much and when to expand existing capacity at PWCS. Because of the common user regulation capacity increases require consensus of key stakeholders and this was only achieved after multiple rounds of consultation. The common-user regulation at PWCS means that users do not get capacity in proportion to their shareholding; this situation makes it near impossible for one user to individually drive capacity increases and may have resulted in hold-out behaviour as different growth objectives drove shareholders to pursue different outcomes (Exhibit 22).

D. California electricity

Reviewing a non-minerals example, excessive regulation of the Californian electricity industry resulted in underinvestment in generation capacity and blackouts in 2001. California privatised its electricity industry in 1998 but while doing so vertically split generation and retail and imposed excessive regulations and price caps. Although the regulation of electricity can be made to work, this case illustrates the importance of implementation, and the non-trivial risk that regulation can be ineffective in practice, even if effective in theory.

More than 13 regulatory bodies were put in place to oversee the industry and price caps were imposed on both retail and wholesale parts of the chain. The depressed and uncertain returns that this regulation created resulted in underinvestment in California, as investors chose to invest in other states (Exhibit 23). This resulted in mismatched supply and demand, eventually leading to a series of blackouts in 2001:

Exhibit 21 Expansion of Australian coal terminals

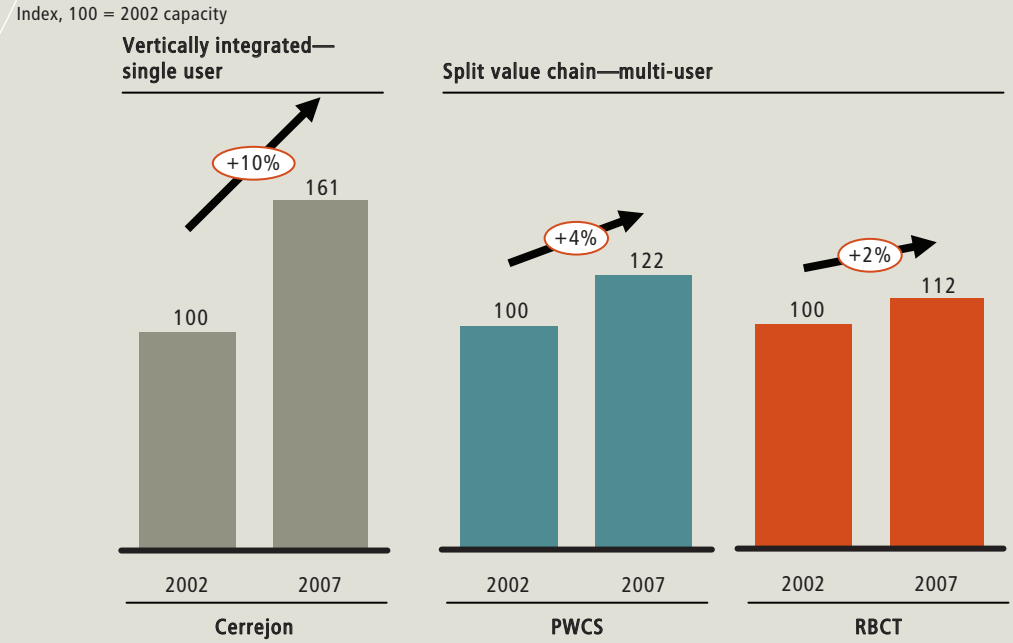


* Newcastle Coal Infrastructure Group is a greenfield expansion

Source: O'Donnell; BHPB

17 *Australian Financial Review*, 2007.
18 Average spot price of US$70/tonne; J F King.
19 Port Waratah Port Services—Financial Community Tour, June 2006.
20 Cerrejon website, http://www.cerrejoncoal.com/, 2008.

Exhibit 22 Expansion rate of major thermal coal chains



Note: Thermal coal spot price is ICR NW Europe CIF coal marker price averaged over year, 2007 is just Jan-Mar
Source: Cerrejon; HVCC logistics team; JF King

- **Condition 3—High coordination costs.** Onerous permitting procedures required Californian generators to navigate 13 regulatory bodies before investment was approved. The average time to approve new generation investment in California was 20 months compared to just 7 months in Texas[21]
- **Condition 6—Non market-based returns to infrastructure providers.** Leading up to privatisation in 1998, price-cap regulation was applied to the retail market, but not to the wholesale market. As a result, generators chose to export excess capacity to neighbouring states through the interconnecting transmission grid. This resulted in a decline in the reserve margin (demand less peak load capacity) from 26.0 percent to 3.5 percent, laying the foundation for blackouts in 2001.[22]

E. Richards Bay Coal Terminal (RBCT)

The RBCT ships the majority of South Africa's export coal mined from the Witbank Highveld Coal Basin. Although unregulated and operated by a consortium of miners, expansions have been hampered by limited complementary expansion of the government operated rail network, Transnet. Delays in adding new capacity are costing miners up to US$1.5 billion in lost revenues per year:[23]

- **Condition 1—Vertical separation created operational inefficiency.** Government regulation opening up terminal capacity to new entrants resulted in RBCT investing in significantly increased capacity without a coordinated increase from Transnet. None of this additional capacity has been utilised given the unchanged rail network bottleneck. From the second half of 2009 it is forecast that RBCT will have up to 19 Mt more capacity than the rail network[24]
- **Condition 3—High contracting costs.** Protracted pricing negotiations between the miners and Transnet have delayed rail capacity expansions. Transnet is seeking a 60 percent increase in rail tariffs in addition to take or pay contracts.

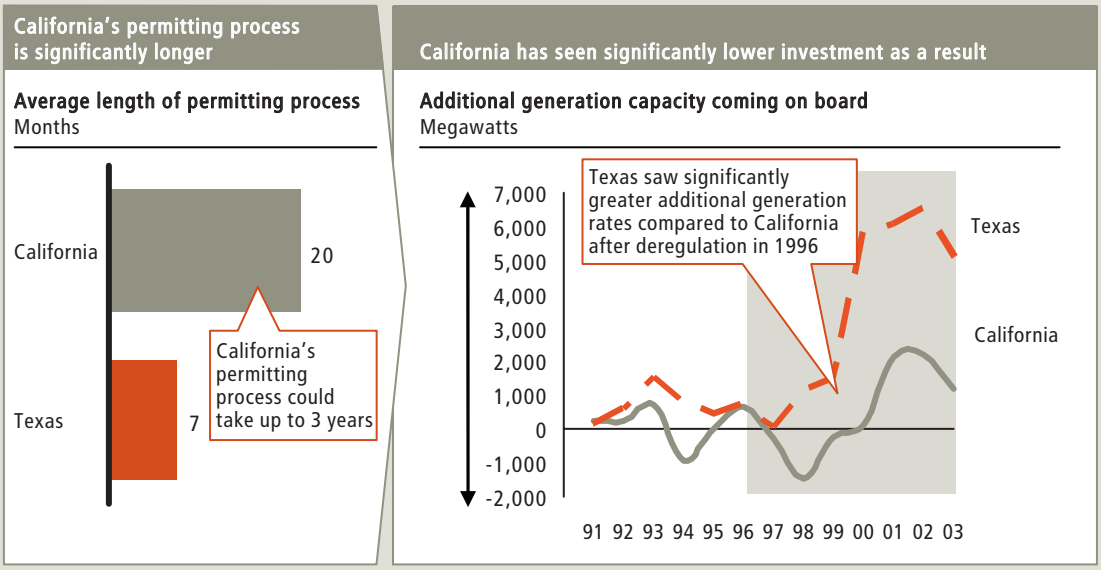
F. Kumba Iron Ore

The Orex rail line between the Sishen iron ore mines and Port Saldanha rails the majority of South Africa's iron ore exports. Similar to RBCT, expansion delays by Transnet has constrained volume growth:

- **Condition 1—Vertical separation undermined total optimisation.** Planned rail expansions were delayed from 2004 to 2006 as a result of Transnet struggling with operational issues and a large capital investment program across its entire network. The delay of the first stage 10 Mt expansion is costing South Africa US$900 million in lost export revenues[25]
- **Condition 2—High contracting costs.** Complex negotiations between Transnet and the two iron ore miners over allocations of capacity, 'take or pay' contracts and rail tariffs resulted in hold-out behaviour. Eventual planned capacity expansions fell short of those demanded by miners due to Transnet's constrained capital and differing risk appetites.

21 The Bay Area Economic Report—A Knowledge Economy Needs Power: Bay Area Economic Forum, April 2001.
22 Ibid.
23 J F King.
24 Richards Bay Coal Terminal Company Limited Presentation, 2006.
25 Deutsche Securities, 'General Mining Kumba Iron Ore Ltd', April 2007.

Exhibit 23 California permitting process



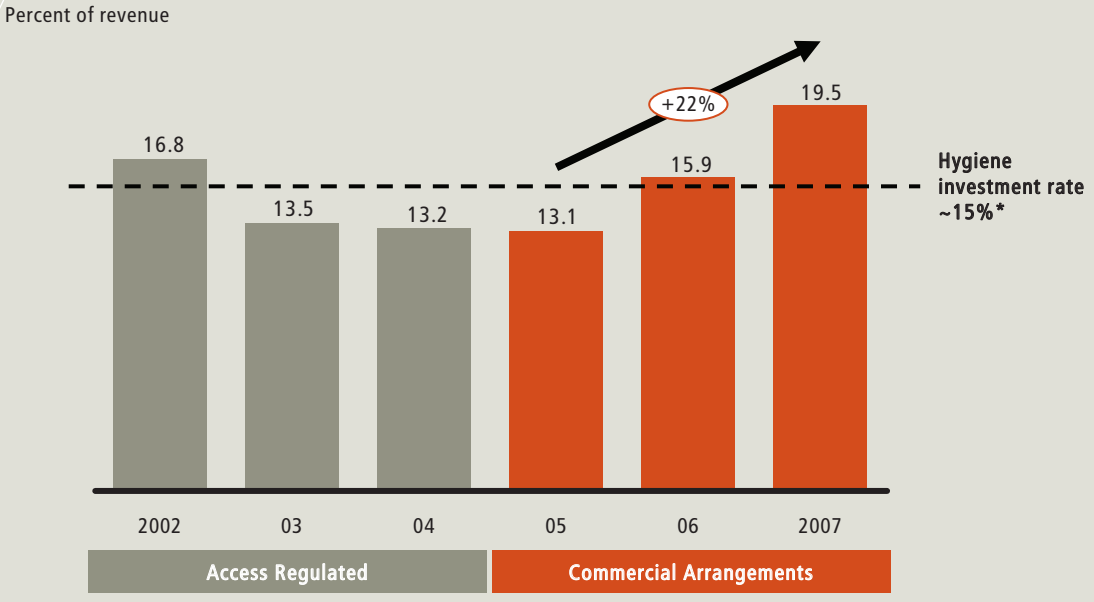
Source:Energy Information Administration; CEC; Texas Natural Resource Conservation Commission; literature search

G. US broadband

Federal legislation was introduced in the USA in 1996 forcing wireline telecom providers to give access at regulated prices to their existing copper networks. This access regulation imposed significant coordination costs and importantly created uncertainty over the regulatory treatment of future investment in networks. This uncertainty caused a lack of investment in next generation broadband infrastructure. Regulation was relaxed in 2005 and fibre networks were given exempt status. Since then investment has increased significantly to 22 percent Compound Annual Growth Rate (CAGR) (Exhibit 24).

Comparatively, in the UK and Europe network owners have been given no assurances regarding the regulation of future investments and correspondingly investment has been very low.[26] LECG research on European telecommunication shows access regulation caused an 18 percent investment decline in competing broadband infrastructure:[27]

Exhibit 24 US wireline capital investment



* Hygiene investment rate is defined as the investment required to maintain existing infrastructure according to Morgan Stanley

Source: ALTS; Buckingham Research Group

26 Ovum, British Telecom.

27 LECG, 'Access Regulation and Infrastructure Investment in the Telecommunications Sector: An Empirical Investigation', 2007.

- **Condition 4—The assets are not a natural monopoly.** Wireline operators in the US face significant competition in providing broadband from cable providers and in the future are likely to face wireless competition. Hence, from an end-user perspective they are not a natural monopoly. The uncertainty over whether access regulation would be imposed upon fibre networks reduced the attractiveness of these assets relative to other forms of providing broadband
- **Condition 5—Returns (demand) have high uncertainty.** Considerable uncertainty exists in telecommunications over technology platforms. This uncertainty, combined with the high cost of fibre networks (for European telcos the cost is estimated as 5 years of total wireline and wireless cashflow[28]), delayed investment
- **Condition 6—Non-market based returns for infrastructure providers.** The regulated rate of return created a situation where returns were far more attractive for infrastructure access seekers than for infrastructure owners.[29] Hence all parties held off investing in network upgrades, thus delaying broadband investment. Capital investment as a percent of revenue was just 13.5 percent in 2003 and exceeds 20 percent after deregulation.[30]

As the above cases demonstrate, inappropriate regulation can introduce inefficiencies into systems as well as induce behaviour from participants that is suboptimal for the overall system. Where systems are inherently complex and unstable, and where rapid expansions are needed, the unregulated situation, as seen in the Pilbara case, is the most efficient.

Where systems are inherently complex and unstable, and where rapid expansions are needed, the unregulated situation, as seen in the Pilbara case, is the most efficient.

2.4 Therefore mandating access in this context will reduce social surplus

Given the conditions for effective regulation are not in place, mandated third-party access in export-oriented bulk commodity industries will reduce social surplus for Australia. Australian consumer surplus, as we have shown, will be unaffected. However, producer surplus, and accordingly government receipts, will be significantly at risk as other countries with less intrusive regulatory regimes develop their reserves to meet growing global demand.

In this section, we outline the adverse consequences that will result from mandated third-party access: (A) lower productivity; (B) reduced and delayed investment; (C) declining global competitiveness; while (D) Australian consumer surplus will not be affected.

A. Lower productivity

Losing vertical integration benefits will result in lower throughput and higher unit costs and therefore lower productivity of the whole supply chain. Imposing an artificial separation of components of the value chain (eg mines versus rail versus port) will result in optimising each part that when put together is worse than optimising the whole chain. Sharing infrastructure with high operational variability and complex system dynamics leads to loss of efficiency, that is, a second player using the asset can impose significant externalities on the first, and vice versa. Additionally, very high coordination and contracting costs are imposed on the whole system. This is due to operational complexity, lack of clear standards, information asymmetry between parties and 'gaming of the system' given the acknowledged inability to write contracts that are complete and align incentives.

B. Reduced and delayed investment

Incumbents' or new entrants' incentive to invest is significantly dampened, right at the time when a stronger for longer scenario should make investment more attractive. For incumbents, the threat of access regulation being granted to an access seeker at below-market rates of return will be exacerbated by the potential for reduced productivity as outlined above.

Meanwhile, new entrants have less incentive to pursue their own greenfield infrastructure investment given the option of seeking access, even if it was originally optimal for them to invest. Professor Hausman states that 'regulation massively distorts the investment decision, resulting in suboptimal behaviour from the infrastructure owner (delays, mis-sizing of investment, and no investment) and distorts access seekers' decision making. Since it gets the mispriced option it too often rents rather than buys since it is getting a discounted price'.

Furthermore, investment will be delayed. Coordinating efforts to get multi-party agreement and vertical alignment makes investment harder to agree on, and makes it less likely for investment to be timely given global developments. Additionally, the presence of regulations adds months or even years to the

28 McKinsey research.
29 Hazlet, T W, 'Rivalrous Telecommunications Networks With and Without Mandatory Sharing', *Federal Communications Law Journal*, Volume 58, Issue 3, pp 478–506.
30 The Buckingham Research Group, 'Communication Services', p 90.

approval process. O'Donnell comments that 'access terms and conditions struggle to deal efficiently or effectively with capacity expansions and investments in the infrastructure and lead to expansion and investment being inhibited or delayed'. Professor Hausman emphasises that 'regulatory intervention can lead to significant periods of delay or even sub-optimal levels of investment which will decrease economic efficiency'.

This lower and slower investment will impose a very large cost on Australia due to the perishable and contestable opportunity to gain global market share and capture the benefits of Australia's resource position.

C. Declining global competitiveness

Global scale has proven to be essential for winning players in the resources industry. Only low-cost, large and long-life mines have the ability to make sustainable returns through the cycle and justify the large long-term sunk investment in infrastructure to bring massive volumes reliably to market, and to maintain the highest occupational health, safety and environmental standards. Only mines with long-term global competitive advantage can credibly pre-empt the investment required to gain long-term market share during demand upswings.

Access provision sponsors inefficient entry and reduces global competitiveness, and allows players with lower scale, lower quality and higher cost resources to enter the market by 'playing on the upswings' and free-riding on others' investments. As a result, the average scale and profitability of the Australian producer will fall and the sustainability of production will be jeopardised. In the long run Australia will risk losing its relatively advantaged position on the cost curve with ramifications for creating growth and wealth in the industry.

Meanwhile overseas miners without access provisions will have accelerated investment and productivity improvement and will capture 'sticky' market share.

D. Australian consumer surplus will not be affected

Australian consumers are not directly affected by the effect of access regulation applying to the Australian producers in export-oriented bulk commodities. Prices are set globally for all downstream products and so the Australian consumer surplus remains unchanged with or without third-party access regulation. And in any case, the vast majority of consumption occurs outside of Australia.

Chapter 3—The impact of a commercial outcome

In an environment without mandatory access regulation, each stakeholder will respond to the commercial incentives they face. Infrastructure owners will expand rapidly and in scale if they have a global competitive advantage and are likely to earn returns which reflect their individual risk appetite. Potential new entrants have the option of building their own infrastructure, or securing access to another's on mutually beneficial commercial terms which would reflect the value of both parties' alternatives, either selling their resource to an infrastructure owner, or staying out of the market. In either case only economically privileged resources will gain a share in the infrastructure capacity, while subscale, low-quality or short-life resources will not be able to cover the true economic cost of the infrastructure. This leads to greater economic surplus from Australia's natural resources sector and suggests that the underlying economic forces are sufficient to create the optimal outcome for Australia—put simply, there is an absence of market failure needed to justify regulation.

3.1 Advantaged vertically integrated infrastructure owners will pursue aggressive expansions in output

Vertically integrated infrastructure owners with privileged resource positions—owing to their large size, access to markets, low cash extraction costs, high/consistent ore grade and long life—will have the greatest incentive to maximise output and in doing so will earn potentially high pre-tax returns.

First, these players have the resource life, quality and margin potential to make building their own long-life infrastructure worthwhile. And, owing to their global competitiveness, a desire to pre-empt other global parties will further drive investment to capture market share, as this share, once gained, tends to be 'sticky'—this will create first-mover advantage, since committed capital will change the incentives and likely payoffs of other players overseas looking to expand. As a result, the economically advantaged player will invest pre-emptively, which means the rate of capacity added by the first mover will be large and swift and there could even be short periods of apparent planned excess capacity. Knowing that the investor will keep any upside returns to this risky pre-emptive investment makes this strategy feasible.

In cases where the returns to new investment are marginal, it is in the infrastructure owner's interest to delay investment, because the option value of deferring exceeds the 'exercise value' of committing to the project now. Due to this real options effect, investments are likely to be made only where the internal rate of return exceeded the 'weighted average cost of capital' by a large margin. So in equilibrium we will predominantly observe very large, relatively high-returning investments, owing to the underlying nature of the optimisation decision.

In addition to investing new capital, the vertically integrated infrastructure owner will do much to improve efficiency, by introducing new technologies and work practices. Strong incentives to improve—as additional throughput will be very valuable and any such benefits accrue solely to the asset owner given the globally set price—will be matched by the ability to pursue improvements due to unified control, visibility and self-coordination of the system.

As a result of these economic forces, high pre-tax returns will accrue to those few producers who are in a position to take these investment risks, translating to substantial returns for the Australian economy. The outcome will reflect fair and genuine global competitive advantage, rather than a lack of competition.

3.2 Holders of undeveloped resources will only develop them if they have world-class potential

The holder of an undeveloped or underdeveloped resource position is faced with four choices:

A. It can install its own infrastructure, bearing the full costs and capturing the full benefits internally. This would require the entrant to have a large, long-life and low-cost asset that was worth monetising through building infrastructure. Given the scale of current worldwide greenfield expansion, this is clearly economic for the best resources. Under this option, the notional entrant would respond to the same optimisation incentives as outlined in section 3.1 above

B. It can 'rent' capacity from an existing infrastructure owner on commercial terms. For the infrastructure owner to accept such terms, the price would have to reflect the opportunity cost of scarce capacity to the owner (if this capacity exists at all), the efficiency losses that result from sharing access, and the option value implicit in any expansion decision. The resource owner would only rent capacity if building its own infrastructure was not optimal in the first place and it is in the interests of the infrastructure owner to do so (ie if there would be mutual benefit in cooperating). If the economic value of the access seeker's deposit exceeds the incumbent's, it is more likely that a commercial access deal will be struck, but if the deposit is of lower quality, the access seeker is unlikely to be able to pay the opportunity cost of the incumbent's own lost potential output

C. It can sell the resource position to the existing infrastructure owner. For the infrastructure owner to be interested, the resource would need to have similar or better value than the brownfield expansion options it already has. So, in general, this outcome is unlikely: if it were a world-class resource, options 1 and 2 are likely to have a very good payoff, and if it were not, the incumbent is unlikely to be interested in buying it

D. It can stay out of the market, if choices 1 and/or 2 were not economic. This means some resources might not be developed—but only those that are not truly competitive on a world scale. Conversely, only the biggest and best resources would be developed (and as per the above argument they would be developed aggressively). Coincidentally, this situation also leads to the best environmental outcome for the industry as high-quality resources are best positioned to maintain the highest environmental and safety standards.

As a result, similar to the incumbents' position, the new entrants' options and incentives in an unregulated environment align with the optimal industry outcome for rapid investment in only the truly world-class deposits.

3.3 Therefore, the Government should not mandate third-party access to infrastructure

An unregulated environment in export-oriented bulk commodities will produce the optimal outcome for Australia: the fundamental economic forces are sufficient to promote social surplus and there is no market failure. Regulation of infrastructure access in this instance will result in poorer returns for incumbents and poorer outcomes for Australia.

For the Australian Government to be confident that an unregulated environment would not result in an abuse of market power, it needs to have confidence in the framework and legal system designed to detect and punish such breaches. It is our view that the existing legal framework has a number of effective safeguards in place to prevent incumbents misusing their position. In addition, governments must ensure that land corridors are available so that new entrants are able, if it is financially optimal, to build their own greenfield infrastructure.

The argument made in this document is that mandated third-party access regimes do have their place, specifically where the seven outlined conditions are, on balance, met. We have also argued that inappropriate regulation can and does have a significant negative impact on industry outcomes—and that in the case of export-oriented bulk commodities this negative impact will be very large and will not be offset by any corresponding improvement in consumer surplus.

Unless Australia is prepared to put its global leadership position in the natural resources sector at risk, the Australian Government should not mandate third-party access to private infrastructure.

Furthermore, the issues raised in this paper suggest that Australia's federal economic regulators (the NCC and ACCC) should pursue two major developments to improve the regulatory process and encourage sufficient private investment in all of Australia's industries:

- Address the shortcomings clearly evident in the regulation of certain Australian industries in a transparent and public manner. This will require identifying the shortcomings of the current regulatory approach, and identifying those arrangements that will resolve these shortcomings. This may require that they develop and publish their own version of the seven conditions outlined above as a framework for when assets may be forcibly shared, allowing investors and infrastructure owners to make investment decisions with increased confidence
- Evolve their role away from ex-ante regulation to prevent market failure before it happens towards an ex-post enforcement model to resolve and discourage egregious use of market power.

* * *

Australia stands to gain from a unique era of world history as over one-third of the global population attains prosperity for the first time. To maximise the opportunity, the Australian Government should not promote mandated third-party access regulation.

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APPENDIX A: CASE STUDIES

White Paper April 2008

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Appendix A: Case studies

A. Dalrymple Bay Coal Terminal (DBCT)

Summary

The DBCT was privatised in 2001 and made subject to access and price regulation by the Queensland Competition Authority (QCA). This has been accompanied by significant delays in capacity expansion that BHP Billiton has previously estimated at over A$1 billion in lost future revenues from unmet demand. Further, and in addition, O'Donnell(2) estimated approximately A$1.2 billion per year in foregone revenues and demurrage costs, resulting principally from a mismatch between port and rail system capacities and operational inefficiencies through the coal chain. Relating back to the above conditions:

- **Condition 1—Vertical separation undermined total value chain optimisation.** O'Donnell's review of the Goonyella Coal Chain (O'Donnell(2)) indicated that coordination issues related to having multiple participants in the system resulted in reduced overall capacity. Firstly, modelling indicated that even if every component of the system meets its target capacity 95 percent of the time the system will only meet its capacity between 60 and 70 percent of the time. Secondly, the review showed that optimising for port throughput in isolation to the rest of the chain increased the rail bottleneck and created a worse outcome for the total value chain overall. Despite both rail and port being bottlenecks in the Goonyella Coal Chain, DBCT unrealistically required trains to arrive on time and in an ordered sequence. Trains that arrived early were required to park and wait their turn, resulting in significant follow-on delays to the rail network. As a result only 73 percent of loading times were met within contractual agreements
- **Condition 2—Sharing assets within a complex system created operational inefficiencies.** Coordinating more than 30 users on a common rail network required timetable operations which was less flexible than 'go when ready' scheduling. O'Donnell(1) reports that the overall rail capacity was estimated to be reduced by 10–20 percent as a result of lost flexibility in the Goonyella Coal Chain. In addition, new technologies were delayed compared to neighbouring ports. It took DBCT 3 years longer than Hay Point to implement 'wagon vibrators' to address issues with 'sticky' coal. This was primarily a consequence of delays in aligning multiple stakeholders
- **Condition 3—High coordination costs resulted in delayed investments and expansion.** Finalisation of the DBCT regulatory arrangements took 22 months and significantly delayed capacity expansion as investment payoffs were uncertain prior to the determination of allowable charges.[1] While there are undoubtedly a range of factors influencing this, the expansion of approximately 8 Mtpa at DBCT took 5 years from planning to implementation, whereas at the unregulated Gladstone, a 28 Mtpa expansion only took 2½–3 years. Estimated costs to producers as a result of this delay were over A$1 billion per year in foregone revenues.

1 BHP Billiton—Document 5, 'Costs of Delays to Investment in Infrastructure as a Result of Regulatory Intervention', 2006.

Background

- Dalrymple Bay Coal Terminal (DBCT) is a critical facility for coal exports from the Bowen Basin:
  - Major private coal producers including BHP Billiton, Rio Tinto, Anglo Coal, Xstrata, Macarthur Coal and Peabody Pacific mine metallurgical and thermal coal from the Bowen Basin and export it to the Asian market
  - This export coal is railed to port using government owned Queensland Rail (QR) wagons, trains and tracks and loaded onto ships at five coal terminals – DBCT and Hay Point Coal Terminal at Hay Point Port, the RG Tanna and Barney Point Coal Terminals at Gladstone Port and the Abbott Point Coal Terminal at Abbott Point Port.
- In 2001, DBCT was sold to Babcock & Brown Infrastructure (BBI), then Prime Infrastructure, and made subject to third party access regulation by the Queensland Competition Authority (QCA):
  - Users were not allowed to bid for the terminal lease
  - The regulated pricing structure determined after the sale was based on an allowable rate of return on prescribed asset values, with a revenue cap.
- The established terminal operator (DBCT PL, comprising a consortium of coal producers) was retained.

Since privatisation DBCT has been slow to expand capacity and has faced operational issues

- BBI has been slow to commit to the expansions demanded by miners since the global demand for coal began booming in 2002:
  - BBI committed to the pre-existing expansion plans of approximately 50 to 60 Mtpa
  - However, BBI delayed in committing to further expansions due to uncertainty surrounding the outcome of the development approval process. This process determines how much revenue they are permitted to earn from expansion investments. It was only after this was decided and revenue capped installed that BBI confirmed the expansions – BBI has since committed to two further capacity increases (from 60 to 68 Mtpa in 2008 and from 68 to 85 Mtpa in 2009).
- This delayed expansion was exacerbated by a failure of the coal chain generally to deliver already contracted volumes, and it led to the need for a process of ordered rationing of constrained capacity amongst the terminal users:
  - The queue management system was necessary to avoid gaming' behaviour by the users whereby they over-ordered ships in an attempt to maximise their access to terminal capacity which was allocated on the basis of the order of arrival of ships for loading.
- Significant operational issues have also surfaced:
  - DBCT chooses to match its ordering of trains to the position of ships in the arrival queue in order to optimise terminal throughput. However, as is inevitable in a complex multi-user system, trains arrive out of order and are told to wait, leading to further bottlenecking of the rail network and reducing the effective capacity of the chain overall
  - DBCT delayed implementation of new technology. Problems associated with 'sticky' coal can be minimised by using 'wagon vibrators'—implemented 3 years after they were introduced at Hay Point Coal terminal. The root causes include benefits accruing to both the rail and port (reduced loading times) and therefore, DBCT only sharing in part of the whole value chain improvement, and coordination challenges in aligning multiple users.
- DBCT provides minimal blending compared to Hay Point, where up to 35 percent of cargoes are blended. Blending provides an ability to control variability at the closest point to customer sales. Coupled with reduced stockpile management, DBCT has not upgraded its blending capability to refine the products of its users.

Impact

- The failure of DBCT to achieve contracted throughput cost users an estimated $900 million in lost revenue and $300 million in demurrage in FY07 (O'Donnell(2))
- Since declaration, DBCT has experienced a delayed investment profile compared to other terminals, compounding bottleneck issues in the Goonyella Coal Chain. It has taken over 5 years to increase capacity at DBCT from approximately 60 to 68 Mtpa. By comparison other terminals have expanded more and faster:
  - RG Tanna Coal Terminal has increased capacity from 40 to 68 Mtpa in just 2½–3 years. This included design, approval and implementation
  - Hay Point Coal Terminal has expanded from 34.5 to 44 Mtpa in just 3 years
  - Abbott Point Coal Terminal is planning a 2-phase expansion to increase capacity from 21 to approximately 50 Mtpa by 2010, and then increase to approximately 100 Mtpa soon afterwards.

B. Pilbara Rail and Port Network

Summary

BHP Billiton and Rio Tinto individually operate proprietary iron ore rail and port infrastructure in the Pilbara. End-to-end ownership and control has been business-critical in delivering positive operational outcomes:

- **Condition 1—End-to-end control optimises for the whole supply chain.** Limited demurrage at the Pilbara ports evidences the benefits of end-to-end control of the supply chain. A shortfall in one product or operational difficulties at a mine can be resolved by a short-term reconfiguration of the supply chain, which is only possible due to the unified control available to the participants
- **Condition 2—Single-user system maximises operational efficiency.** BHP Billiton was able to deliver 3–4 percent operational improvement in their proprietary Pilbara rail network over 6 weeks through experimenting with a 'go when ready' operation rather than the traditional

'timetable' approach used in multi-user settings. Further, other innovations such as driverless trains are more feasible without network sharing.

Background

- BHPB and Rio Tinto operate in the Pilbara region of Australia. This region accounts for almost all iron ore exports from Australia:[2]
  - Both BHPB and Rio Tinto own vertically integrated networks comprising multiple lines, rail and port operations—Fortescue, prospectively the third-largest miner, is currently investing in its own rail and port facilities to service its mines at Cloud Break and Christmas Creek
  - The end-to-end ownership and control of the chains has enabled BHPB and Rio Tinto to drive driving operational improvement and undergo rapid capacity expansions—the ability to do this has been highly valuable in the current high-demand environment
  - Between 2002 and 2006 Australian iron ore exports were able to increase 43 percent by volume enabling Australia to maintain its share of the global iron ore market.[3]
- The Pilbara is likely to face increasing opportunities to sell its iron ore over the coming years as its close proximity to China puts it in a beneficial position. This will likely put increased pressure on its infrastructure development plans:
  - The Pilbara's share of the seaborne iron ore market is currently 40 percent. It is thought that this could expand up to as much as 50–60 percent[4] over the next 10 years
  - Demand for iron ore from Pilbara is forecasted to expand from its current 235 million tonnes per year (Mtpa) to 400–560 Mtpa within the next 10 years and up to 560–890 Mtpa in the next 20 years[5]
  - This growth will put severe pressure on expanding the infrastructure in a timely manner.

Benefits of vertical integration

- Vertical integration of the iron ore chains has enabled miners to concentrate on improving efficiency and rapidly expanding:
  - BHPB was able to deliver 3–4 percent improvement in its rail network over 6 weeks by changing to a 'go when ready' operation
  - Between 2002 and 2006 iron ore exports were able to increase 43 percent.
- Vertical integration enables miners to achieve maximum benefits from scale. BHPB has been able to increase the economic reserves in its Jimblebar and Newman mines by blending the ores to leverage the complementary properties:
  - Blending ores across BHP Billiton's Jimblebar and Newman mines leverages complementary physical and chemical properties to offset impurities
  - This process can extend the life of the combined resource base by up to 20–30 percent
  - This would not be possible if the value chain was split, as blending requires producers to control the infrastructure asset. Moreover, blending between multiple producers is unlikely to be feasible due to the high complexity of the process and because a deep understanding and control of ore quality produced from different mines is necessary.
- Additionally limited demurrage at the Pilbara ports evidences the benefits of end-to-end control of the supply chain. A shortfall in one product or operational difficulties at a mine can be resolved by a short-term reconfiguration of the supply chain, which is only possible due to the unified control available to the participants.

C. Newcastle Port

Summary

Port Waratah Coal Services (PWCS) requires its Board to approve any expansion. Capacity expansions have been delayed and bottlenecks are occurring. These delays are costing Hunter Valley coal producers over US$100 million per year in demurrage[6] and are resulting in significant lost revenue opportunities (10Mt pa equals US$700 million).[7] These delays have led frustrated coal producers to commit to a greenfield investment in a new terminal nearby, instead of feasible brownfield expansions. Meanwhile PWCS has recently announced its intention to expand further from 2010 up to 140 Mtpa—however, it is not clear if this is possible:

- **Condition 3—High coordination costs from aligning multiple users.** Newcastle coal exports grew just 21 percent between 2002 and 2005[8] compared to 61 percent growth at the comparable vertically integrated chain in Cerrejon, Colombia.[9] While there are different views as to why slower and lesser expansion occurred, it is not unlikely that, among other issues, divergent views on market conditions and growth aspirations led to misalignment between stakeholders on how much and when to expand existing capacity at PWCS. Because of the common user regulation capacity increases require consensus of key stakeholders and this was only achieved after multiple rounds of consultation. The common-user regulation at PWCS means that users do not get capacity in proportion to their shareholding; this situation makes it near impossible for one user to individually drive capacity increases and may have resulted in hold-out behaviour as different growth objectives drove shareholders to pursue different outcomes.

2 AME Iron Ore Cost Curve, 2007.
3 United Nations Conference on Trade and Development (UNCTAD), 2007.
4 Pilbara Ports Study 2006.
5 Department for Planning and Infrastructure Report, February 2007.
6 *Australian Financial Review*, 2007.
7 Average spot price of US$70/tonne; J F King.
8 Port Waratah Port Services—Financial Community Tour, June 2006.
9 Cerrejon website, http://www.cerrejoncoal.com/, 2008.

Background

- The Hunter Valley Coal Chain (HVCC) runs between the mines in the Hunter Valley and Port Newcastle. It is the largest coal chain by volume in the world exporting 85.6 Mt in 2007, 11 percent[10] of globally traded coal:
  - The thirty coal mines in the Hunter Valley are operated by 17 miners. Four miners, BHPB, Rio Tinto, Xstrata and Anglo American collectively account for 70 percent of the volume[11]
  - Rail tracks are owned by the Australian Government through the body, ARTC
  - Rolling stock is owned and operated by two competing companies Pacific National (private) and QR (State owned)
  - All coal is currently being exported through two terminals at the Port of Newcastle. The terminals are owned by Port Waratah Coal Services (PWCS) which is privately owned by a collection of miners and customers.
- Port Waratah Coal Services operates two terminals as common-user terminals
- PWCS' largest shareholders are Rio Tinto (30 percent), trading house Japanese Trading (18 percent) and Newcastle Coal Shippers, a collection of smaller mine owners (37 percent)[12]
- Current access arrangements applying at Kooragang Island and Carrington require the terminals to offer capacity to all miners and they mandate a common loading price per tonne. Shareholders do not receive capacity in proportion to shareholding:
  - There is no link between capacity allocation and shareholding. This creates significant delays in agreeing to capacity additions due to conflicting shareholder objectives and given no expansion obligation exists in the PWCS lease agreements.
- PWCS terminals operate on a just-in-time basis. This makes the system fragile to delays.

Delayed expansions at PWCS have resulted in a competing greenfield terminal being built

- PWCS was slow to respond to the upturn in world coal demand, presumably due to conflicting priorities of its shareholders:
  - PWCS' majority shareholders have slower growth trajectories and aspirations than some other miners in the Hunter Valley and thus were slow to commit capital for expansion.
- In 2004 the NSW Government called for an open tender to develop a new coal terminal adjacent to Port Waratah. NCIG, a group of six miners led by BHPB, won this tender. It is scheduled to open in 2010:
  - PWCS was out-bid for the terminal despite being the natural owner on the grounds of port efficiency
  - The new terminal is not required to provide common access. Capacity has been allocated to each of the six shareholders in proportion to their shareholding and any additional users are able to negotiate on commercial terms for access
  - The NCIG terminal is scheduled to open in 2010 and add 30Mt pa additional capacity to the coal chain.

Coordination issues have resulted in hvcc growing exports significantly slower than a comparable, unregulated chain

- Coordination issues through the coal chain have seen coal exports through PWCS rise by only 22 percent between 2002 and 2007. In comparison the vertically integrated coal chain in Cerrejon, Colombia has increased export volumes by 61 percent. This is costing Hunter Valley producers significant amounts in lost revenue:
  - PWCS exports have increased from 70.0 Mt in 2002 to 85.6 Mt in 2007
  - Cerrejon coal chain in Colombia has increased export volumes from 18.5 Mt in 2002 to 29.8 Mt in 2007:
    - Cerrejon is a vertically integrated, single-user chain and thus does not have conflicting interests among parties
    - Cerrejon mine has been able to commit to three expansions within 5 years as opposed to the one to two expansions that Hunter Valley coal miners have been able to pursue.
- The delayed expansion is creating a significant lost revenue opportunity with every 10 Mt of reduced export costing ~US$700 million at today's thermal coal price
- These expansion delays, combined with the upturn in world demand, have created considerable bottlenecks which are estimated to have cost US$100 million in demurrage in 2007.

D. California Electricity Crisis

Summary

Reviewing a non-minerals example, excessive regulation of the Californian electricity industry resulted in underinvestment in generation capacity and blackouts in 2001. California privatised its electricity industry in 1998 but while doing so vertically split generation and retail and imposed excessive regulations and price caps. Although the regulation of electricity can be made to work, this case illustrates the importance of implementation, and the non-trivial risk that regulation can be ineffective in practice, even if effective in theory.

More than 13 regulatory bodies were put in place to oversee the industry and price caps were imposed on both retail and wholesale parts of the chain. The depressed and uncertain returns that this regulation created resulted in underinvestment in California, as investors chose to invest in other states (Exhibit 23). This resulted in mismatched supply and demand, eventually leading to a series of blackouts in 2001:

10 Press search.
11 Port Waratah Port Services—Financial Community Tour, June 2006.
12 Ibid.

- **Condition 3—High coordination costs.** Onerous permitting procedures required Californian generators to navigate 13 regulatory bodies before investment was approved. The average time to approve new generation investment in California was 20 months compared to just 7 months in Texas.[13]
- **Condition 6—Non market-based returns to infrastructure providers.** Leading up to privatisation in 1998, price-cap regulation was applied to the retail market, but not to the wholesale market. As a result, generators chose to export excess capacity to neighbouring states through the interconnecting transmission grid. This resulted in a decline in the reserve margin (demand less peak load capacity) from 26.0 percent to 3.5 percent, laying the foundation for blackouts in 2001.[14]

Background

- California privatised its electricity market in 1998 to increase competition in electricity generation:
  - It was the first state to implement The Electric Utility Industry Restructuring Act passed in 1996
  - Government-based, investor-owned utilities (IOU) were required to sell off their generation capacities to privately owned companies.
- This required disaggregation of a vertically integrated value chain:
  - Separate generation and retail markets were created
  - Transmission lines remained government-owned, but were allocated to generators via an independent system operator (ISO).
- Initially, benefits accrued to consumers and utilities:
  - Consumers were given the choice of 'Direct Access' and could shop for the best deal from the most competitive utility[15]
  - Utilities could source electricity from generators through a power exchange (limited purchase times).[16]
- However, sustained underinvestment coupled with demand and supply shocks led to outages and eventually, blackouts:
  - Excessive regulatory procedures and uncertainty deterred investment in the lead up to deregulation
  - Maladaptive pricing mechanisms created market failure and exacerbated capacity shortage.

Underinvestment occurred before privatisation

- Before privatisation California had underinvested in capacity generation compared to other states:
  - New supply did not come on line—between 1994 and 2001 only six new power plants were built which represents less than 2 percent of the state's total capacity[17]
  - Capacity growth was significantly below that of other states
  - Excessive regulatory bodies and an unclear market structure created significant regulatory uncertainty
  - Significant delays to approve new investments compared to other states
  - This uncertainty induced systemic underinvestment in capacity generation.

Maladaptive price-cap mechanisms created market failure

- Key supply shocks reduce generation capacity in the system:
  - Lack of rainfall on the West Coast caused hydroelectric output to be 28 percent below the previous year[18]
  - Poor coordination of maintenance schedules, particularly at nuclear power plants, resulted in 5 Gigawatts of generation power to be taken off line.[19]
- In response, the regulator imposed a retail price cap in 2000 to control price spikes:
  - However, this resulted in net export of generation capacity to other states, compounding supply shortage; importing electricity into California also declined[20]
  - In addition, certain demand factors led to a decline in reserve margin (supply capacity less demand) from 26.0 percent to 3.5 percent[21]
  - An unpredicted heatwave increased demand from a background 2 percent per year growth to 8 percent in 2000
  - Consumers were not aware of the supply shortage as prices were capped, and so did not curtail their consumption.
- Price caps prevented free market forces to adjust demand and supply:
  - Utilities were left with long-term fixed-price obligations to deliver energy to consumers, but there were no long-term supply contracts from generators, putting significant margin at risk.

Blackouts ensued

- The California market experienced blackouts in 2000–01:
  - Loss of economic output to California from the two blackouts in January and March 2001 were estimated to cost US$139.8 million[22]
  - Average wholesale prices quadrupled, however, retail prices remained fix
  - Demand increased also as a result of high prices for substitute energy, particularly natural gas.

13 The Bay Area Economic Report—A Knowledge Economy Needs Power: Bay Area Economic Forum, April 2001.
14 Ibid.
15 Under *The Electric Utility Industry Restructuring Act 1996*, the retail market was also technically deregulated, however, price caps were put on the retail market till 2002.
16 The state confined utility purchases to three spot markets: the day ahead, the day of, and on market. The Bay Area Economic Report—Bay Area Economic Forum, April 2001, p 2.
17 The Bay Area Economic Report—Bay Area Economic Forum, April 2001.
18 The Bay Area Economic Report—Bay Area Economic Forum, April 2001.
19 Ibid.
20 Ibid.
21 Ibid.
22 The Bay Area Economic Report—Bay Area Economic Forum, April 2001.

- This prompted even further artificial price manipulation by the regulator:
  - Wholesale price caps in peak hours were implemented which led to further electricity exports to other states.

E. Richards Bay Coal Terminal (RBCT)

Summary

The RBCT ships the majority of South Africa's export coal mined from the Witbank Highveld Coal Basin. Although unregulated and operated by a consortium of miners, expansions have been hampered by limited complementary expansion of the government operated rail network, Transnet. Delays in adding new capacity are costing miners up to US$1.5 billion in lost revenues per year:[23]

- **Condition 1—Vertical separation created operational inefficiency.** Government regulation opening up terminal capacity to new entrants resulted in RBCT investing in significantly increased capacity without a coordinated increase from Transnet. None of this additional capacity has been utilised given the unchanged rail network bottleneck. From the second half of 2009 it is forecast that RBCT will have up to 19 Mt more capacity than the rail network[24]
- **Condition 3—High contracting costs.** Protracted pricing negotiations between the miners and Transnet have delayed rail capacity expansions. Transnet is seeking a 60 percent increase in rail tariffs in addition to take or pay contracts.

Background

- The Richards Bay Coal Chain runs from The Witbank Highveld Coal Basin to Richards Bay Coal Terminal (RBCT). It is a critical export link for South Africa, carrying 96 percent of exported coal:
  - Major coal producers including BHP Billiton, Anglo Coal and Xstrata, and mine metallurgical and thermal coal from the Witbank Highveld Coal Basin export through RBCT. These miners make up the majority of RBCT's volumes
  - This export coal is transported from the mines to RBCT by Transnet, a government-owned infrastructure company
  - Richards Bay Coal Terminal is a for-profit commercial company owned by the major coal producers who allocate capacity according to their respective shareholdings. BHPB Anglo Coal and Xstrata are the majority owners.
- Government-owned Transnet controls the trains and tracks that lead from Witbank Highveld Coal Basin to RBCT:
  - Transnet is a wholly owned infrastructure company within the South African Government. They own the tracks and trains that run between the coal mines and Richards Bay within their Freight Rail division. Transnet is not regulated
  - Transnet is overstretched with a major capital expenditure program, operational issues on a number of lines and capability gaps through key parts of its organisation
  - Transnet's freight division generates the majority of their profits from their coal and iron ore export lines. Transnet's monopoly position on these lines is unregulated.

RBCT opened up to new entrants and committed to large expansion

- Two government initiatives, the Coal Industry Task Team (CITT) in 2003 and the new Mineral and Petroleum Resources Development Act (MPRDA) in 2004, opened up the Witbank Highveld Coal Basin to smaller mines and increased the competition for capacity on the coal chain:
  - Both initiatives encouraged the formation of small mines. These small mines are now growing as a percentage of total volume
  - To enable the expansion of these new entrants, CITT agreed with RBCT to open up capacity at the terminal. The allocation to new entrants has grown from 1 Mtpa in 2003 when four new entrants used RBCT to 4 Mtpa in 2007[25] with 18 new entrant miners. This is commonly known as the Quattro allocation.
- This coincided with the upturn in worldwide demand for export coal and in response RBCT committed in 2005 to a large expansion plan to increase capacity from 72 Mtpa to 91 Mtpa[26] by the second half of 2009:
  - This expansion is intended to ensure existing shareholders are able to retain their capacity allocations as RBCT accommodates new miners
  - The expansion will provide 19 Mt of capacity to new entrants.

Operational and pricing issues have delayed transnet from matching RBCT's expansion

- Underinvestment in the coal line and operational issues have prevented Transnet from meeting its capacity objectives for the last couple of years, creating a bottleneck for the coal chain:
  - In 2007 Transnet only managed to transport 64.7 Mt of its 72 Mt capacity on the coal export line, mainly due to derailments and unscheduled maintenance
  - The rail line suffers from underinvestment with some of the track and rolling stock being up to 30 years old.[27]
- Moreover, protracted pricing negotiations between the miners and Transnet have delayed required expansions for capacity to match RBCT. These delays have occurred despite Transnet committing $6 billion[28] towards expanding the line's capacity from 72 Mt to 78 Mt in 2007:

23 J F King.
24 Richards Bay Coal Terminal Company Limited Presentation, 2006.
25 Provision of Export Facilities at the Richards Bay Coal Terminal 2007; Department of Minerals and Energy, Republic of South Africa.
26 Richards Bay Coal Terminal Company Limited Presentation, 2006.
27 Transnet—Pradeep Maharaj; Platts International Coal Report.
28 Transnet Anuual Report, 2007.

- Transnet's Board will not agree to capacity expansions until miners sign 'take or pay' agreements covering Transnet's expansion risk
- Transnet is currently demanding miners accept a 60 percent increase to the existing rail tariff which was based on a cost of capital pricing mechanism—partly as a result of this demand the parties have not yet even begun to negotiate prices and this is delaying the signing of take or pay contracts and hence capacity expansions:
  - Price negotiations between the multiple players in the supply chain continually slow development down: 'It took 21 months for BHPB to sign their last 2-year price contract'.
- Transnet's capacity expansion costs are also generally regarded as higher than required
- So far no capacity expansion agreements have been reached.

Lack of rail expansion will cost South Africa US$1.5 billion in potential export earnings

- These delays caused by the conflicting interests and objectives of multiple players in the supply chain are hurting the industry development in South Africa at a time when rapid growth is essential to hold market position:
  - Since 1997 the volume of coal exported through RBCT has remained fairly static between 62 Mt and 69 Mt per year[29]
  - Over the past 4 years worldwide demand has increased significantly. Over this period South Africa has seen its percentage of world-traded coal market share drop from 11.4 percent to 9.7 percent[30]
  - The 19 Mt of lost exports due to delays in rail expansion will cost South Africa about US$1.5 billion per year (J F King) in lost export revenues.
- In comparison the vertically integrated coal chain in Cerrejon, Colombia has increased export volumes by 61 percent:[31]
  - Cerrejon coal chain in Colombia has increased export volumes from 18.5 Mt in 2002 to 29.8 Mt in 2007—Cerrejon is a vertically integrated, single-user chain and thus does not have conflicting interests among parties.

F. Kumba Iron Ore

Summary

The Orex rail line between the Sishen iron ore mines and Port Saldanha rails the majority of South Africa's iron ore exports. Similar to RBCT, expansion delays by Transnet has constrained volume growth:

- **Condition 1—Vertical separation undermined total optimisation.** Planned rail expansions were delayed from 2004 to 2006 as a result of Transnet struggling with operational issues and a large capital investment program across its entire network. The delay of the first stage 10 Mt expansion is costing South Africa US$900 million in lost export revenues[32]
- **Condition 2—High contracting costs.** Complex negotiations between Transnet and the two iron ore miners over allocations of capacity, 'take or pay' contracts and rail tariffs resulted in hold-out behaviour. Eventual planned capacity expansions fell short of those demanded by miners due to Transnet's constrained capital and differing risk appetites.

Background

- The Orex rail line runs between the Sishen iron ore mines and Port Saldanha in South Africa. It is a vital link for South Africa's iron ore exports:
  - Two iron ore miners, Kumba Iron Ore and Assmang, use the line and collectively ship about 30 Mt of iron ore per year[33]
  - Both Port Saldanha and the Orex line are owned and operated by Transnet, a government-owned infrastructure company
  - Both iron ore mines have sufficient reserves to significantly expand and take advantage of the current high demand for export iron ore.
- Government-owned Transnet controls the trains, rail tracks, port operations and port infrastructure that enable exports from Sishen to Port Saldanha:
  - Transnet is a wholly owned infrastructure arm of the South African Government. They own the tracks and rolling stock within their Freight Rail division
  - Transnet is overstretched with a major capital expenditure program, operational issues on a number of lines and capability gaps through key parts of its organisation
  - Transnet's freight division generates the majority of its profits from their coal and iron ore export lines. Transnet's monopoly position on these lines is unregulated.

Operational issues and protracted negotiations are creating delays in rail capacity expansions

- In 2004 Transnet and Kumba Iron Ore agreed to expand the existing rail capacity from 30 Mt to 41 Mt[34] to enable Kumba to increase volumes. Transnet's internal issues, however, delayed work on this expansion until 2006 when it was increased to 47 Mt to accommodate Assmang's planned expansions—current projections are for this to be completed by 2009/10:
  - Transnet is internally stretched as it embarks upon a major capital investment program across South Africa. Transnet has committed 78 billion rand of capital expenditure over the next 5 years with 7 billion rand[35] assigned towards the iron ore export facilities

29 Richards Bay Coal Terminal Company Limited Presentation, 2006.
30 SSY; EIA.
31 Cerrejon website, http://www.cerrejoncoal.com/, 2008.
32 Deutsche Securities, 'General Mining Kumba Iron Ore Ltd', April 2007.
33 Ibid; press search.
34 Press search.
35 Transnet Annual Report, 2007.

- Access and price negotiations between the three parties added further to the delays—Transnet is using its commercial position to extract large price increases from the miners in addition to offering take or pay contracts
- Despite common ownership, Transnet, the port owners and the port operators all worked largely independently until recently. This undermined decision making by the three entities, with each of the entities following different political and commercial agenda
- Kumba Iron Ore has just begun work to expand its mine by 9 Mt—this expansion is more than 2 years later than originally planned.[36]

- Furthermore, beyond the current expansion plans both miners and Transnet diverge on the scale of required future capacity expansions. Kumba Iron Ore would like to add an additional 20 Mt of capacity to its Sishen project but Transnet is delaying its commitment to such a large expansion:
  - Transnet is not prepared to commit to such a large expansion due to the capital risk it involves
  - Transnet prefers a lesser expansion as they believe it could be done at a much reduced capital cost.

The delayed and reduced expansion of the Orex line is costing South Africa US$0.9 billion in export revenue per year

- These delays caused by the conflicting interests and objectives of multiple players in the supply chain are hurting the industry development in South Africa at a time when rapid growth is essential to hold market position:
  - The 2-year delay in the Orex line expansion will cost South Africa US$900 million per year in lost export revenue and will see South Africa lose international market share. Mining company Kumba Iron Ore's share of the Chinese iron ore market fell from 8 percent in 2002 to 5 percent in 2006[37]
  - Further if Transnet caps expansion at 60 Mt compared to the miners' demands for 67 Mt, it will cost South Africa a further US$630 million.[38]

G. US Broadband Case

Summary

Federal legislation was introduced in the USA in 1996 forcing wireline telecom providers to give access at regulated prices to their existing copper networks. This access regulation imposed significant coordination costs and importantly created uncertainty over the regulatory treatment of future investment in networks. This uncertainty caused a lack of investment in next generation broadband infrastructure. Regulation was relaxed in 2005 and fibre networks were given exempt status. Since then investment has increased significantly to 22 percent Compound Annual Growth Rate (CAGR) (Exhibit 24).

Comparatively, in the UK and Europe network owners have been given no assurances regarding the regulation of future investments and correspondingly investment has been very low.[39] LECG research on European telecommunication shows access regulation caused an 18 percent investment decline in competing broadband infrastructure:[40]

- **Condition 4—The assets are not a natural monopoly.** Wireline operators in the US face significant competition in providing broadband from cable providers and in the future are likely to face wireless competition. Hence, from an end-user perspective they are not a natural monopoly. The uncertainty over whether access regulation would be imposed upon fibre networks reduced the attractiveness of these assets relative to other forms of providing broadband
- **Condition 5—Returns (demand) have high uncertainty.** Considerable uncertainty exists in telecommunications over technology platforms. This uncertainty, combined with the high cost of fibre networks (for European telcos the cost is estimated as 5 years of total wireline and wireless cashflow[41]), delayed investment
- **Condition 6—Non-market based returns for infrastructure providers.** The regulated rate of return created a situation where returns were far more attractive for infrastructure access seekers than for infrastructure owners.[42] Hence all parties held off investing in network upgrades, thus delaying broadband investment. Capital investment as a percent of revenue was just 13.5 percent in 2003 and exceeds 20 percent after deregulation.[43]

Background

- Federal legislation was introduced in 1996 opening up local copper networks to competitors. The legislation aimed to encourage infrastructure investment by giving competitors a stepping stone into the market. The regulation instead resulted in hold-out behaviour and a lack of investment:
  - Local copper networks were viewed as appropriate for access regulation as it was deemed that coordination costs were low and that because the networks were not capacity constrained they could be viewed as a natural monopoly
  - The regulation required incumbent operators to provide access to their proprietary copper networks—the link between customers and the network
  - Individual state regulators were given the responsibility of setting prices for this access
  - The resultant market structure heavily favoured free-riding behaviour and hence infrastructure investment slowed.

36 Deutsche Securities, 'General Mining Kumba Iron Ore Ltd', April 2007.
37 Platts International Coal Report.
38 Deutsche Securities, 'General Mining Kumba Iron Ore Ltd', April 2007.
39 Ovum, British Telecom.
40 LECG, 'Access Regulation and Infrastructure Investment in the Telecommunications Sector: An Empirical Investigation', 2007.
41 McKinsey research.
42 Hazlet, T W, 'Rivalrous Telecommunications Networks With and Without Mandatory Sharing', *Federal Communications Law Journal*, Volume 58, Issue 3, pp 478–506.
43 The Buckingham Research Group, 'Communication Services', p 90.

- In 2005 new legislation was introduced to address the inefficiencies of the previous Act. The new regulation made two adjustments: (1) in competitive markets it allowed incumbents to move towards commercial negotiations for access; and (2) it excluded next-generation fibre networks from the access regulation. Since this new Act came in, infrastructure investment has rapidly increased.

Access regulation resulted in a lack of investment in broadband technologies

- The access regulation and wholesale price caps imposed in the 1996 regulation resulted in a lack of investment:
  - The regulation created a situation where returns were far more attractive for infrastructure free riders than for infrastructure owners. Hence all parties held off investing in additional infrastructure, thus delaying broadband investment
  - The regulated access prices also acted as a barrier to the efficient access of the market by disrupting signals between investors and consumers
  - Capital expenditure as a percentage of revenue was just 13.5 percent in 2003,[44] lower than the 15–20 percent investment that is required to maintain capital stock according to Morgan Stanley
  - There was no investment in next-generation fibre networks.
- The regulation also resulted in increased consolidation within the sector as opposed to increased competition. The number of wireline network owners in the US declined from 10 in 1996 to 6 in 2005.[45]

Relaxing access regulation has resulted in rapid increases in infrastructure spending

- Since deregulation in 2005 there has been a sharp increase in capital investment in broadband technology:
  - Capital expenditure as a percentage of revenue has risen to above 20 percent in 2007[46]—a 50 percent increase on 2005 levels
  - Verizon has announced an investment of US$23 billion in its FiOS service,[47] involving a rollout of fibre-to-the-home technology.

In contrast UK regulations are still creating delays in investment

- In the UK, both wholesale and retail pricing regulations are strict, and the regulator, Ofcom, has indicated it will apply similar restrictions on next-generation network upgrades[48]
- As a result there are no plans to roll out a fibre network in the UK, and British Telecom (BT) is in intense negotiations with Ofcom over access terms for network upgrades—in 2004 BT announced plans to upgrade its network but has still not begun doing so.

44 ALTS annual report 2004.
45 Press search.
46 The Buckingham Research Group, 'Communication Services', p 90.
47 LECG, 'Access Regulation and Infrastructure Investment in the Telecommunications Sector: An Empirical Investigation', 2007.
48 Ovum, British Telecom.

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Economic Analysis of Mandatory Access Provision

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I have been asked by BHP Billiton (BHP) to consider the economic effects of mandatory access provision as applied to infrastructure for the mining industry in Australia. I have previously analyzed the effect of regulation of infrastructure in the US, UK, Australia, and New Zealand for the past 12 years.[1] I first introduced the notion of the effects of regulation of sunk cost investment and the modern theory of real options in 1996 and spoke at an ACCC conference on my research in 1997. I have previously concentrated on the regulation of two industries, telecommunications and railroads.

In this paper I first consider when regulated mandatory access should exist within the context of the Australian mining industry. Since the mining industry in Australia is an export industry competing in world markets, the usual "bottleneck monopoly" theory does not apply. I do my analysis in the context of "social surplus" taking into account consumer interests, producer interests and government interests. I find that the interests of the mining firms who have invested in infrastructure coincide with maximizing social surplus so mandatory access regulation in these industries is not called for.

I next consider the question of vertical integration. Why have firms such as Rio Tinto (Rio) and BHP found it best to both do the mining and also operate their own infrastructure of railroad and port facilities in Western Australia? I discuss the economic theory of vertical integration and find that for asset specific sunk investments vertical integration solves the "holdup" and incomplete contract problems inherent in these types of industries. Also, economies of scale and scope exist in system integration that allows more efficient optimization of the system than separate optimization of each of its component parts. I compare the situation in Western Australia to outcomes in the Queensland coal industry where the absence of vertical integration has led to the system working below capacity and over a billion dollars of lost revenues and excess costs over a 10 month period.

[1] See e.g. Hausman (1997, 1999, 2003) and Hausman and Myers (2002).

Next I consider the economics of private access provision. A "natural monopolist" may refuse to provide access to protect its market power. However, I find in export mining industries that firms do not have market power to defend. Thus, if they do not provide access it is because they find the profitability of their increased output without infrastructure sharing exceeds the profitability of the incremental revenue from providing access. Thus, their decision is consistent with the criterion of social surplus, which I discussed above. No adverse inference regarding protection of market power should arise from the firm's access decisions.

Lastly, I consider mandatory access regulation. Most economists recognize that mandatory access regulation creates decreased investment incentives. I explain the 3 causes of problems that regulation creates: asymmetric risk, mispriced options, and free options. It is a notable result that after telecommunication regulators in the US decided not to require mandatory access for new broadband networks, both of the large US local access providers began building next generation fiber to the home or fiber to the node networks for residential consumers.

I. When Should Regulation and Mandatory Access Occur?

Most economists agree that economic regulation should be used only when a significant market failure occurs. Often, market failure occurs because of[2]:

- the exercise of market power, i.e. the ability to set prices above the competitive level or
- externalities

The regulation of a "natural monopoly" causes producers surplus to decrease while consumers surplus increases because price are decreased below the supra-competitive level they would attain in the absence of regulation.[3] The goal of mandatory access regulation is to end the "natural monopoly" by permitting competitors to use the bottleneck facilities that create the natural monopoly. This competition is supposed to lead to lower prices and greater product variety for consumer, leading to an increase in consumer surplus.

[2] See e.g. A.E. Kahn (1988).
[3] I define a firm to be a natural monopoly if one firm can produce a desired output at a lower cost than two or more firms.

Market power can also arise where a vertically integrated producer denies access to part of its value chain. In this situation, the goal of regulation is to regulate the upstream price and to increase competition by allowing firms to compete downstream thus leading to lower prices.[4] In both situations, the goal of regulation is to increase consumer surplus by more than the reduction in producer surplus so that society as a whole is better off, or societal surplus is increased. [5]

Historically, wireline telephone companies were regulated because they were seen to be "natural monopolies" where an unregulated firm could exercise significant market power. An externality rationale also existed because the utility of the telephone network increased with increasing penetration. However, in the current situation in advanced economies where numerous companies compete in wireline telecommunications, four or more mobile providers typically exist, and telephone and mobile penetration is nearly 100%, neither the natural monopoly nor externality rationales for regulation continue to apply.[6] Indeed, a wide range of deregulation has occurred with a number of large states in the U.S. de-regulating the prices of wireline telecommunications.[7]

In the absence of the "natural monopoly" rationale an explicit rationale in terms of economic welfare should be used to determine whether regulation is in the best interest of consumers, and society more generally.[8]

When mandatory access is considered, both static efficiency and dynamic efficiency considerations apply. Imperfect competition is the rule in most modern industries, whether they are mining industries, semiconductor industries, or telecommunications industries. Thus, the observation that these industries are oligopolies

[4] However, it is well known in economics that because of double marginalization, profits may be higher and prices lower with a vertically integrated firm instead of a single upstream provider with competition downstream. See e.g. Tirole (1988). For an outcome with regulation upstream where vertical integration led to lower prices see Hausman et. al. (2002)

[5] Social surplus is the sum of producer surplus plus consumer surplus and includes tax payments. In terms of the goal of regulation I am considering the Australian context. In some countries producers surplus is treated differently than consumers surplus.

[6] In small population countries such as New Zealand only two mobile operators currently exit although a third operator has announced its intention to enter. In larger population countries such as Australia, four or more operators is typically observed.

[7] See J. Hausman and G. Sidak (2008). California and New York have deregulated prices in the U.S. and Canada has de-regulated prices nationwide.

[8] See J. Hausman and G. Sidak (1999). Australia has adopted a consumer welfare approach to telecommunications regulation where the test is whether a policy is in the "Long Term Interest of End Users." (LTIE)

does not provide an economic rationale for regulatory intervention. In terms of access intervention for growing industries or technologically changing industries, dynamic efficiency considerations become extremely important since these types of industries depend on massive amounts of new investment to fund growth or technological change. Regulatory intervention can lead to significant periods of delay or even sub-optimal levels of investment which will decrease economic efficiency.[9] Thus, in the non-natural monopoly situation, I believe it is incumbent on regulators to demonstrate that requiring access will increase overall economic efficiency.[10]

A. Economic Efficiency Considerations

Economic efficiency is typically considered to be the sum of consumers surplus plus producers surplus.[11] As I consider exports of natural resources, in particular coal and iron ore in my analysis, consumers surplus is not a relevant consideration because prices are determined in world markets, and Australian consumers are not affected directly by outcomes in these industries, in terms of prices and quantities.[12] Producers surplus is profits and rents that firms earn in these industries. Producers surplus is significant because of the high capital investment required in these industries and the growing Chinese demand for coal and iron ore, which has led to rapidly increasing prices over the past five years.

An additional consideration arises here which is the tax and royalty revenue that the Australian federal government and the state governments receive. For example in the 2007 financial year (July 2006-June 2007) BHPB paid $1.154B on its iron ore profits to the federal government and $338M to state governments in royalty payments and state

[9] In Hausman (1997) I estimated that the regulatory delay in the introduction of mobile telephone in the U.S. caused a loss in consumer surplus of approximately $50 billion in a single year. Hausman and Sidak (2005) review the effect of mandatory unbundling on investment in next generation broadband networks in the US, UK, Canada, Germany and New Zealand. In the US the Federal Communication Commission determined not to require unbundled access on fiber optic residential networks, and the two largest providers have both begun operation of fiber optic networks for consumers.

[10] Mandated third party access to private infrastructure can be an erosion of property rights. A significant body of economic literature highlights the importance of property rights in allowing for the operation of an efficient economic system.

[11] Tax revenues are typically a reduction in producers surplus and cause an increase in consumers surplus. I explicitly consider tax revenues below.

[12] Australian consumers are indirectly affected because greater output in these industries leads to more jobs and higher wages in the Australian economy.

taxes. These substantial payments to government would be included in the measure of "social surplus" which would be the sum of consumers surplus plus producers surplus plus tax revenues.[13]

In the current situation the analysis of economic efficiency is straightforward. Individual producers, e.g. BHP, will attempt to maximize shareholder valuation which includes profits and rents from their mineral deposits over time. While government taxation if often distortionary, in the current situation where most of the tax revenue is from profits and rents financed by retained earnings, marginal investments will not be distorted absent regulation.[14] To the extent that part of government revenue, approximately 22%, is paid through royalties on gross revenue rather than net revenue after deductions of variable costs, a distortion does arise from government taxation. However, since the proportion of variable costs compared to price is relatively low in mining industries because of the high fixed costs and the high rents currently being earned, the economic distortions created by royalty taxation should be relatively small. Thus, economic analysis of government policy which attempts to maximize social surplus will be approximately equal to maximization of industry profits.

B. Competitive Condition in Coal and Iron Ore

In the case of export industries such as coal and iron ore no "natural monopoly" exists which has caused prices to be above the competitive level. Instead, price is set by competition I world markets. Further, these industries are export industries so Australian consumers are not directly affected by the investment and production decision made by the firms involved.[15] In 2006 Australia exported 111Mt of thermal coal, almost all of it to Asian destinations with Japan importing over 50% of the Australian supply.[16] However, Indonesia's competing coal exports in 2006 were 183Mt and they are growing

[13] Tax revenues are included in the social surplus measure since governments provide goods and services to consumers based on tax revenues. As an approximation in my analysis, I will assume that the goods and services are provided in a non-distortionary manner, which is the usual assumption in economic analysis. See e.g. Diamond and McFadden (1974).
[14] See e.g. Stiglitz (1976). I am assuming the presence of true economic depreciation here. While true economic depreciation is unlikely to hold exactly, as an approximation it is acceptable.
[15] Australian consumers are directly affected with respect to environmental considerations. However, these considerations do not arise with respect to granting mandatory access.
[16] McCloskey Steam Coal Forecaster, Q1: 2007.

much more rapidly than Australian exports. Thus, Australian firms face significant competition in the Asian thermal coal market. Similarly in metallurgical coal (met coal) Australia exported 79Bt in 2006, out of a total seaborne supply of 123Bt.[17] Further, BHP and Rio Tinto face numerous competitors in both Australia and other nations such as South Africa and Canada.

In iron ore BHP and Rio Tinto face competition in the Asian iron ore market from Vale (formerly know as CVRD), a Brazilian company which is the largest worldwide iron ore producer as well Indian imports into China and Chinese domestic production. Chinese demand for iron ore has grown rapidly with a CAGR of 22.6% per year for 2002-2007. This explosive growth in demand has led to a rapid increase in price of a CAGR of 23.7% per year over the same period. In response to this rapid growth in demand and price the three major iron ore producers have announced significant expansion plans as show in Table 1:

Table 1

Announced planned future capacity, CVRD, Rio Tinto and BHP Billiton

Company	Project/ Brand	2007	2008	2009	2010	2011	2012	2013	2014	2015
CVRD	Total capacity	248.00	256.00	265.30	275.30	285.30	295.30	315.30	365.30	375.00
	Annual increase	-	8.00	9.30	10.00	10.00	10.00	20.00	50.00	9.70
Rio Tinto	Total capacity	182.10	206.10	231.10	231.10	231.10	231.10	266.10	336.10	366.10
	Annual increase		24.00	25.00	-	-	-	35.00	70.00	30.00
BHPB	Total capacity	106.00	122.00	132.00	143.00	161.00	187.00	223.00	278.00	310.00
	Annual increase	-	16.00	10.00	11.00	18.00	26.00	36.00	55.00	32.00

Source: BHP Billiton supply model, not probability adjusted

Thus, BHP expects to increase capacity by 14% per year over the period 2007-2015 and Rio Tinto expects to increase capacity by 9% per year over the same period. These capacity increases will require tens of billions of dollars of investments in mine expansion, railway expansions, and port expansions. Also, new entrants such as Fortescue Metals Group (FMG) have begun operation in Western Australia and expect to

[17] McCloskey Metallurgical Coal Quarterly, Q1: 2007.

begin shipping in May 2008 with exports expected to reach more than 90Mtpa over the next few years.[18]

Thus, no competitive problem exists in either coal or iron ore where government imposed mandatory access to a bottleneck facility will potentially increase competition.[19] Further, significant buyer power exists in these markets as evidenced by the continuing ability of Chinese and Japanese iron buyers to refuse to compensate Australian iron ore exporters for the cost saving created by the significantly lower freight costs between Australia and Asia and Brazil and Asia.[20] Regulation will not increase competition in an export industry such as iron ore or coal.

BHP and Rio Tinto intend to invest tens of billions of dollars to increase their capacity and ability to meet growing Chinese demand for these resources. However, significant non-diversifiable risk exists for these investments because their success depends on continuing growth in Chinese demand. For example, approximately 88% of the forecast increase in Asian iron ore demand for the period 2007-2107 is from growth in Chinese demand.[21] If growth in Chinese demand for iron ore were to decrease, price would likely decrease significantly and Australian companies would find it difficult to sell their increase output since demand for iron ore is not growing significantly in either the EU or North or South America. Further, investment in capacity expansion is largely a sunk and irreversible investment. Much of the cost of mine expansion, railway expansion, and port expansion cannot be recovered if supply does not increase, which causes the investment to be sunk. Nor would the rail or port facilities be used in any significant way for other export commodities, given their geographical location. Lastly, these capacity expansion typically have a significant "time to build" of 3-5 years or even longer for port expansions. Thus, these sunk and irreversible investments in capacity expansion have a very high degree of non-diversifiable risk. Distortions created by

[18] Source: FMG website, http://www.fmgl.com.au/IRM/content/project_mining.htm. FMG has built its own rail facilities and will export from Port Hedland.
[19] The claim that competition might increase in a market for "rail iron ore transport in Western Australia" does not make economic sense. Demand for rail transport is purely a derived demand arising from iron ore production where no competitive problem exists. Thus, no effect on economic efficiency can occur with the dispute large arising over rent transfers, which do not have economic efficiency effects.
[20] In 2007 the freight difference reached $58 per ton with recent differences in the range of $35 per ton.
[21] CRU Table 43. Over the period 2004-2007 China growth in iron ore demand represented over 95% of overall growth in Asian iron ore demand.

regulatory induced forced access provisions could have a significant negative effect on their future economic viability.

II. Economic Analysis of Vertical Integration

A wide variety of arrangements exist for infrastructure in Australia. In coal the Queensland government operates the rail facilities and public port authorities operate the port facilities with the exception of BHP's Hay Point operation, which is essentially a private coal port. In Western Australia BHP and Rio Tinto operate their own privately owned rail facilities. BHP exports iron ore from Port Hedland, a publicly operated port while Rio Tinto exports from Cape Dampier, a publicly operated port, and from Cape Lambert, a privately operated port which Rio Tinto owns. While historical development explains in part the economic structures observed in coal and iron ore, economic analysis also has studied the factors leading to vertical integration. For example, why have BHP and Rio Tinto developed their own rail facilities rather than jointly operating a single rail network?

The modern economic theory of vertical integration emphasizes the presence of market imperfections as a cause of observed vertical integration.[22] Modern economic analysis emphasizes vertical integration as a response to attributes of transactions between buyers and sellers and considers vertical integration as a cost saving or efficiency increases response to these transactions. Transactions costs arise in the creation and enforcement of contingent contracts along with efficiency losses because of opportunistic ex post performance of the contracting parties. Vertical integration eliminates many of these potential problems because economists (and lawyers) have long realized that is not feasible to specify contractually the full range of contingencies and stipulate appropriate responses[23] In the absence of complete contingent contracts, vertical integration may be preferable to incomplete contracts in a given situation. Problems most often arise when "relationship specific investments" are made which have much lower value in alternative uses.

[22] See e.g. P. Joskow (2005). While the traditional approach to vertical integration emphasizes market power as an important market imperfection leading to vertical integration, market power in coal and iron ore export markets does not exist so I do not further consider it as a possible explanation.
[23] See Williamson (1971).

These investments, which are sunk and irreversible investments, create the opportunity for potential "hold up" or opportunistic behaviour when circumstances change, unless contractual arrangements exist that specify the response to the changed circumstances.[24] The potential of these ex-post hold up problems affects the amount and efficiency of ex ante investment often leads to underinvestment. Thus, vertical integration is often a response to potential problems that arise from sunk and irreversible investments where two firms may have differing interests when circumstances change and contracts are, at best, incomplete.[25]

Vertical integration can also occur because of economies of scale and scope in system operation. Optimization of an overall system can yield better outcomes than optimization of separate components because of coordination problems and planning problems.[26] Optimization problems can occur with both day to day operations and with conflicts over investment in expansion of the system. Thus, vertical integration can create the conditions for productive economic efficiency—the situation where an economy produces the greatest amount of output for the use of a given amount of inputs.[27]

The recent (2007) Goonyella Coal Chain system review found that the significant recent problems of coal supply shortfalls which cause the system to "underperform" arose in part from conflicts between the operator of the Dalrymple Bay Coal Terminal, Babcock and Brown, and the coal producers who questioned the proposed cost of the port

[24] See Williamson (1979). Often even if a contract does have provisions for changed circumstances, the specified response may be inefficient and it may be in the best interest of both parties to engage in a different response. However, the question of ex post bargaining to determine the division of gains remains and creates potential hold-up problems.

[25] Costs also arise in vertical integration that can offset the benefits since costs to internal organization also exist. Large integrated firms with associated incentive and bureaucracy problems may be less able to adapt to changed circumstances than smaller independent companies. However, given the very long term investments required in the mining industry, where mine operation is often expect to last for 50 years or more, economic factors leading to vertical integration assume increased importance because of the high probability of changed economic circumstances over such a long time period.

[26] The well-known double marginalization problem can also occur here where the owner of a component charges "average total costs" while the efficient price signal is appropriately measured marginal costs. In the US the local and long distance operation of AT&T were separated in 1984 but by 2006 they were re-combined, in large part because of economies of scale and scope and the economic distortions caused by double marginalization.

[27] Productive economic efficiency occurs when society cannot increase the output of one good without reducing the output of another good. See e.g. P.A. Samuelson and W.D. Nordhaus, Economics, McGraw Hill, New York, 16th ed., 1998, p. 14. Prof. Samuelson (the Nobel Prize winning economist) has stated that productive economic efficiency is the most important outcome for an economy. Ibid.

expansion.[28] Thus, coordination of investment decisions caused an important delay. Further problems arose from the operation of rail access by QR Network Access and rail haulage by QR National.[29] The review found that the presence of a large number of coal producers, the port operator and the rail companies could not efficiently coordinate their investment and operational decisions. Mr. O'Donnell found a "lack of flexibility in daily operations and ….difficulties in aligning contractual frameworks to deal with commercial relationships between system participants," which are the exact type of problems identified by economic analysis which lead to vertical integration. Mr. O'Donnell found the lack of flexibility reduced the system capacity by approximately 10% to 20%.[30] The Review called for a central coordinator of the supply chain that could improve its efficiency.

Note that these coordination problems and capacity expansion problems have been largely absent from the supply of iron ore from Western Australia, even though exports of iron ore have grown faster than exports of coal from Queensland. BHP operates it own rail facilities and until 2008 has been the only exporter of iron ore from Port Hedland.[31] Rio Tinto operates its own railroad and is the only exported of iron ore from Dampier while it owns and operates the port at Cape Lambert. Thus, BHP and Rio Tinto have chosen to vertically integrate their mine production and rail facilities which has led to superior system operation, compared to coal exports from Queensland. Given the very high returns to efficient operation of resource exporting industries and the high degree of uncertainty, arising in part from the significant time to build new facilities, coordination through vertical integration has proven to be a better economic framework than the approach that has arisen in the Queensland coal industry.[32]

This discussion demonstrates that not all supply chains are able to be efficiently split up (vertically separable), and inefficient outcomes can arise because of complexity

[28] Letter from Stephen O'Donnell to Queensland Resources Council and Queensland Transport, "Re: Goonyella Coal Chain Capacity Review," 29 July 2007.
[29] Both of these are government owned rail operators.
[30] Affidavit of Stephen O'Donnell, 21 December 2007, pp. 7-8.
[31] FMG will begin exports of iron ore from Port Hedland in 2008.
[32] The Goonyella Coal Chain Capacity Review, Supporting Documentation (30 July 2007), p, 5, found an approximate $900 million economic loss in the 10 month period of July 2006 to May 2007. Mr. O'Donnell found an additional cost of $300 million in additional demurrage due to rail and port problems. Affidavit of Stephen O'Donnell, 21 December 2007, p. 7.

of operatiional and investment interactions and the difficulty (impossibility) of writing complete contracts.

III. Economic Analysis of Private Access Provision

A firm may find it profit increasing to sell access to a competing firm, especially when the competing firm is able to "expand the market" by reaching new customer segments. The distinction between "market expansion" and "cannibalization" or "business stealing" is a key consideration in a firm's decision. For example, in Australia, the US, and the UK mobile companies have entered into access arrangements with Virgin, which is better able to market mobile service to younger consumers. However, traditionally "natural monopolists" have been less willing to enter into access arrangements because the resulting competition will lead to lower prices and the commodity nature of their product often implies that little market expansion will occur, with most of the demand for the new competitor arising from cannibalization of existing demand and lower prices.[33] Thus, the "natural monopolist" would have lower profits so that refusing access is the rational economic response.

However, even under condition of competition among vertically integrated firms without the presence of a dominant firm, the competing firms may not find it profitable to offer access at a price that an entrant finds acceptable. Diseconomies of operations and investments discussed above can mean that there is no price in which (a) access makes sense and (b) the other party is willing to pay an amount equal to the increased costs or lost profits. A widely held view is, that in the absence of these diseconomies, a firm will find it profitable so supply an entrant because of the additional revenue created along with the competitive pressure. The key tradeoff is the extra revenue from selling access to the new competitor compared to the loss of existing customers to the entrant, e.g. "cannibalization" or business stealing. The key determination is the proportion of the new entrant's demand that will arise from market expansion instead of cannibalization of an incumbent's business. One might expect that an incumbent firm could charge the new entrant a sufficient markup for access to replace the profits it loses due to cannibalization

[33] The form of regulation for the "natural monopolist" may also be an important reason for an absence of an economic incentive to sell access to a competitor.

However, under conditions where the access supplier loses a disproportionate share of its output to the new entrant or prices decrease sufficiently, neither competing firm may find it profitable to supply the entrant at a price that the entrant finds acceptable.[34]

In the situation of export industries an entrant would be quite unlikely to have an effect on the market price, e.g. the spot price of iron ore in China is determined by domestic Chinese production and Indian imports where Australian production is relatively low cost "infra-marginal" production.[35] Thus, BHP will only decide to deny access to its railroad or Rio Tinto to its port facilities when their output will be reduced by providing access since the price will not change. That is, the extra revenue from providing access will be more than offset by the lower amount of production since the Australian firms will be able to sell all of their output in China given their lower costs than Chinese or Indian production and their freight cost advantage relative to Brazilian iron ore.

These considerations have occurred in the Queensland coal industry where coordination problems have led to a reduction in exports significantly below system capacity. Further, given the current demand for Australian coal and iron ore, the exporting companies are attempting to utilize their rail and port facilities at full capacity. Given the high amount of required investment in ports and rail facilities, it is optimal in terms of shareholder value for BHP and Rio Tinto to fully utilize their capacity.[36]

I thus make the inference that BHP and Rio Tinto are not denying access to be able to exercise market power, but rather they are attempting to maximize their own output and shareholder value. Providing access would create coordination problems and lead to lower output of the firm. Vertical integration permits greater system flexibility in terms of the response to: (1) demand variability (2) variability in quality of ore bodies (3) equipment sharing and (4) breakdowns and other system disruptions. This inference is

[34] Contractual terms which limit competition between the access supplier and the new entrant may decrease cannibalization and thus lead to access provision since most of the entrant's demand will arise from market expansion. This type of outcome is observed in territorial restrictions in patent licenses where the entrant services a geographic area where the patent owner is not present or has a weak competitive position.
[35] Similarly, the high cost supply for long term contracts is Brazilian or Canadian supplied as explain above since Australian firms are low cost producers and have a significant freight cost advantage over Brazilian or Canadian exports to Asia.
[36] Only if a mistake in planning occurred, so that a bottle neck appear in say the port facility which caused significant excess capacity to exist in rail capacity would a firm find it profitable to provide access.

consistent with Mr. O'Donnell's statement of a 10%-20% decrease in output when coordination of facilities operation is required. The inference is also supported by the economies of scale present in iron ore operations where blending of different mines' output can lead to greater supply.[37] BHP estimates a 20%-30% increase in output arising from blending of ore from different mines. The increase in output arising from blending has also been estimated in BHP's estimates of increased output of combining the output of BHP mines with the output of Rio Tinto mines.

Higher output of BHP and Rio Tinto is consistent with greater economic efficiency as I explain above in my explanation of social surplus from export-based mining industries in Australia. Thus, government should permit private firms to make their own decisions about providing access since the private firms' objectives in this situation are consistent with economic efficiency.[38] Mandated access, to the contrary, is likely to reduce output and also to decrease investment as I now explain.

IV. Mandatory Access Regulation: Asymmetric Risk, Mispriced Options, and "Free" Options

The essential economic characteristic of investment in access infrastructure such as railroad or ports is that it is sunk and irreversible investment. If times turn out to be good, the investment is valuable. However, if times turn out to be bad, the investment cannot be shifted to an alternative economic use.[39] Thus, the effects of uncertainty are of fundamental importance to evaluation of sunk and irreversible investment since the investor typically has the option to wait until some of the uncertainty is resolved.

This option to wait means that it is not economically rational to undertake an investment until the opportunity cost of extinguishing the deferral real option is more

[37] This saving arises from allowing the impurity deficiencies of one ore to be offset by another ore. BHP Yandi ore has significant impurities with respect to silica (SiO_2) and alumina (Al_2O_3); however, these impurities are distributed unevenly across the ore body. Currently, BHPB blends its output from Yandi 1 and Yandi 2 to keep SiO_2 to acceptable levels of under 5.4%.

[38] Put another way, if the access seeker is unable to pay the infrastructure owner a sufficiently high price to provide access, it is likely that the access seeker has inferior assets which will lead to an overall output decrease. Thus, mandated access will lead to decreased government revenues as well as decreased economic efficiency.

[39] Some of the investment may be re-useable, but typically only a small proportion. Even the rolling stock for BHP's railway infrastructure in Western Australia uses custom build cars, which could not be readily shifted to other uses. Further, an industry specific shock to the iron ore industry would leave little demand for cars designed to haul iron ore.

than offset by the present value of the expected profit stream. The existence of the deferral option means that the forecast investment returns need to be greater, potentially significantly greater than the discount rate calculated in accordance with the weighted average cost of capital (WACC) for the investment to be undertaken in the current period even if it has NPV > 0.

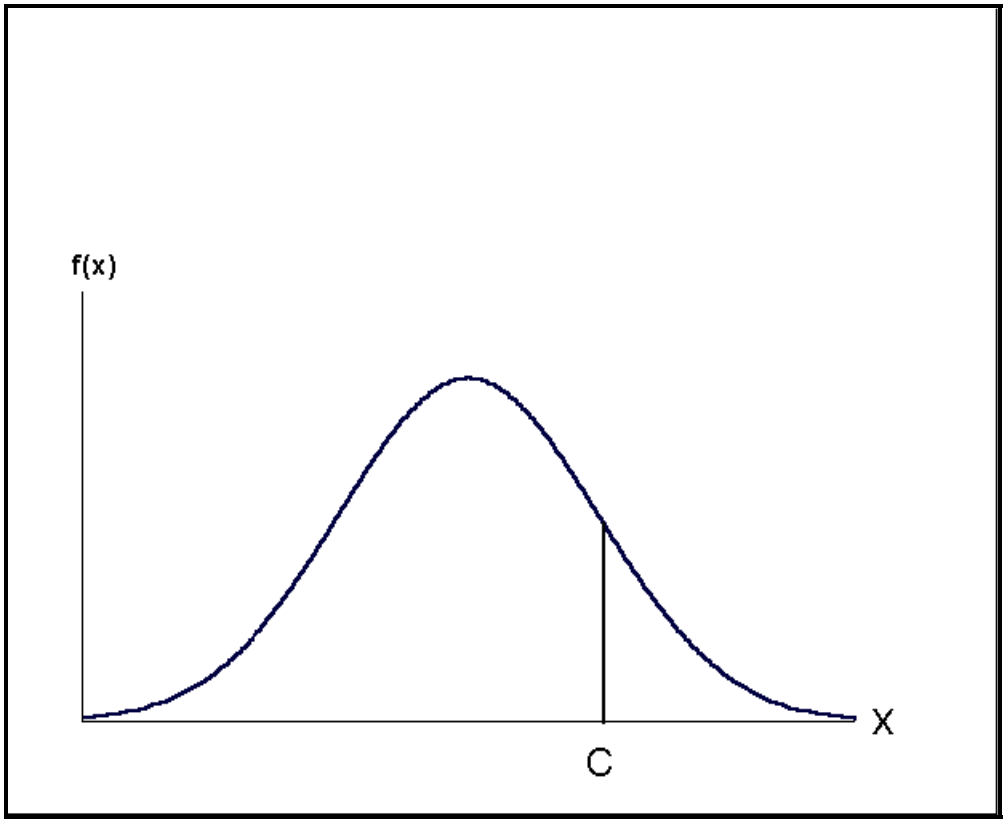
In my previous academic research, Hausman (1997, 1999, 2003) and Hausman and Myers (2002) I have emphasized three failures of regulation of access infrastructure that lead to underinvestment by the incumbent: (1) regulation fails to account for asymmetric risk. That is, the incumbent investments are irreversible so they will exist in good times or bad times but the access seeker only purchases access in good times. (2) regulation uses a measure of "total service long run incremental cost" (TSLRIC) so it misprices the option to invest by failing to take into account the option to wait and (3) it grants a "free option" to the access seeker who has the option to demand service if times are good but to cease buy the service if time turn bad. I now further explain these economic concepts, while at the same time noting that in general these three issues are additive in their impact on the infrastructure provider and investment..[40]

Asymmetric risk: Forecasts used in future revenue projections are always subject to uncertainty.[41] The further the time in the future for a forecast, the greater is the uncertainty and the greater and more diverse are the possible future outcomes. The effect of uncertainty can be especially large in infrastructure investment since it is typically irreversible and very long-lasting. Since no one can predict the future for certain, a band of uncertainty always surrounds a forecast. In a regulated market, worse-than-expected outcomes will typically not attract access seekers while better than expected outcomes are likely to attract access seekers. Thus, the band of uncertainty will be asymmetric, and the actual expected value of future revenues and profits will be less than the mean forecasts because of the asymmetric nature of market entry[42]. The regulators forecasts will be upward-biased for future revenues because of the failure to allow for the effects of the

[40] See Guthrie (2006) for a recent survey paper on regulation of infrastructure.
[41] Here I focus on revenue uncertainty. Other types of uncertainty exit, which I consider subsequently.
[42] This outcome assumes that the access seeker is subsidised by the infrastructure provider, because of the issues of mispriced and "free" options granted to the access seeker which I discuss below.

possible future competitive entry that can occur in a contestable market. Thus, asymmetric risk causes a truncation of returns as shown in Figure 1:

Figure 1: Truncated Returns Caused by Regulation



If the mean return is μ then the effect of truncation of returns at point c where returns follow a normal distribution with standard deviation σ, the expected value of the return when it is truncated at cost c is:

$$E(y \mid y < c) = \mu - \sigma M(c) \qquad (1)$$

where M(c) is the inverse Mills ratio evaluated at c.[43] Thus, the expected value of the investment is always decreased so that at the margin less infrastructure investment will occur. Note that as the uncertainty increases as the standard deviation σ increases the

[43]. The inverse Mills ratio is the ratio of the density function and distribution function of the standard normal distribution evaluated at $(c - \mu)/\sigma$. The inverse Mills ratio M(C) is positive and it increases monotonically as c decreases for a given μ and σ, e.g. W.H. Greene (1990), p. 718.

effect of truncation at a given point c has a greater effect of decreasing the expected return of the investment. Thus, infrastructure regulation decreases investment by the incumbent. This decrease in investment occur because of transfer of property rights from the incumbent to the entrant when "times are good" (outcome to the right of point c), even though consumers may not be made better off if the transfer arises from pure rents, and is not created by market power.[44] Thus, the incumbent bears the asymmetric risk of expropriation through regulation.

Mispriced options: Consider the value of a project under no demand uncertainty with a risk adjusted discount rate of r and assumed known exponential economic depreciation at rate δ. Assume that price, net of the effect of economic depreciation of the capital goods, is expected to decrease with growth rate $-\alpha$. The initial price of output is P. The value of the project is:

$$V(P) = \int_0^\infty \lambda \exp(-\lambda t)\, P\, \frac{1 - \exp(-\delta t)}{\delta}\, dt = P/(\lambda + \delta) \qquad (2)$$

where $\lambda = r + \alpha$. Suppose that the cost of the investment is I. The rule for a competitive firm is to invest if V(P) > I. Equivalently from equation (2),

$$P > (\lambda + \delta)\, I. \qquad (3)$$

The economic interpretation of this expression is that the price (or price minus variable cost) must exceed the cost of capital, which includes the change in price of the capital good to make the investment worthwhile.[45] Equation (3) is the correct version of the NPV rule based on the WACC.

As I understand, this approach underpins the "building block approach" used by Australian regulators, and is fundamentally based on the simple net present value rule and

[44] An example might be useful here. Suppose by foresight or luck an investor bought property in North Sydney near the north end of the Harbour Bridge in 1970. The investor decided to build a 15 story office block which now achieves high rents because of its convenient location both to the bridge and to a subway stop. If an access seeker now claimed it needed retail space on the ground floor of the building because its business strategy was to locate a convenience shop next to all busy subway stops in Sydney, the response would be to tell it to pay market rents. No market economy would truncate the building owners return from taking the risk that property near the Harbour Bridge would appreciate greatly.

[45] For simplicity, I am assuming only capital costs and no variable costs in this calculation. Variable costs can be included by reinterpreting P to be price minus variable costs which will lead to the same solution.

the weighted average cost of capital. As noted above, this may be correct (but not necessarily) in the absence of uncertainty.

I now account for the sunk nature of the investment and its interaction with fundamental economic and technological uncertainty. Given the fundamental uncertainty and the sunk nature of the investment, a "reward for waiting" occurs because over time some uncertainty is resolved. The uncertainty can arise from at least 4 factors: (1) Demand uncertainty, (2) Price uncertainty, (3) Technological progress (input price) uncertainty, and (4) Interest rate uncertainty.[46] Now the fundamental decision rule for investment changes to:

$$P^s > \frac{\beta_1}{\beta_1 - 1}(\delta + \lambda)I \qquad (4)$$

where $\beta_1 > 1$ so that the markup factor $m = \beta_1/(\beta_1 - 1) > 1$. The parameter β_1 takes into account the sunk cost nature of the investment coupled with inherent economic uncertainty.[47] Parameter m is the markup factor required to account for the effect of uncertain economic factors on the cost of sunk and irreversible investments. Thus, the critical cut off point for investment is $P^S > P$ from equation (3). Note that the markup factor equals unity, m = 1, for fixed, but not sunk investments or when uncertainty does not exist so no deferral option exists. However, the markup of m > 1 occurs with sunk and irreversible investment under conditions of uncertainty so the deferral option has a positive value. As the uncertainty decrease over time, e.g. demand for a new technology

46. Regulators typically incorrectly assumed that taking account of expected price changes are sufficient to estimate the effect of changing technology and demand conditions. Thus, regulators implicitly assumed that the variances of the stochastic processes which determine the uncertainty are zero, e.g. that no uncertainty exists. Under this approach the values of all traded options should be zero (contrary to stock market fact), since the expected price change of the underlying stock does not enter the option value formula. It is the uncertainty related to the stochastic process as well as the time to expiration which gives value to the option as all option pricing formulae demonstrate, e.g. the Black-Scholes formula.

47. This equation is the solution to a differential equation. For a derivation see e.g. Dixit and Pindyck (1994), pp. 254-256 pp. 279-280, and p. 369. The parameter β_1 depends on the expected risk adjusted discount rate of r, expected exponential economic depreciation δ, and the net expected price -α, and the amount of uncertainty in the underlying stochastic process. Note that this result holds under imperfect competition and other types of market structure, not just under monopoly, as some critics have claimed incorrectly. See e.g. Dixit and Pindyck (1994), Ch. 8, "Dynamic Equilibrium in a Competitive Industry".

becomes less uncertain, the markup factor decrease towards unity and equation (4) is satisfied and the investment occurs. Rearranging equation (4):

$$\frac{P^S}{m} > (\delta + \lambda)I \qquad (5)$$

Equation (4) demonstrates that the value of the investment is discounted by the factor m to take account of the sunk costs, compared to the fixed (but not sunk) cost case of m = 1. Sunk cost investment must have higher values than fixed costs investments, other things equal, to be economical to undertake. Note that regulation that uses equation (3) is making the implicit assumption that the investment is not sunk and irreversible or that uncertainty does not exist, which is contrary to most infrastructure investment and real world conditions.

To see how important this consideration of sunk costs can be, we can evaluate the markup factor m. The parameters β_1 and m depend on a number of economic factors. It can be demonstrated that as uncertainty increases, i.e. the variance of the underlying stochastic process, β_1 decreases and the m factor increases[48]. Also, as δ increases, β_1 increases which means that the m factor decreases. As r increases β_1 decreases so that the m factor increases. MacDonald and Siegel (1986) and Dixit and Pindyck (1994, p.153) calculate m = 2 so that, for instance, $V^S = 2I$. A TSLRIC calculation which ignores the sunk cost feature of infrastructure investments would thus be off by a factor of two.[49] Thus, the failure of regulators to take account of the interaction of uncertainty and sunk and irreversible investment when applied to the investment cost component of TSLRIC to account for the interaction of uncertainty with sunk and irreversible costs of investment causes the option offered to access seekers to be price too low.

This mistake has a fundamental effect that will both deter investment in new infrastructure and encourage third party access as I now explain. Also, mandated access where there are significant diseconomies of sharing will further deter investment in new infrastructure as I discussed above..

[48] See e.g. Dixit and Pindyck (1994, p.153)

[49] In the context of telecommunications I estimated I calculate the value of m to be around 3.2 to 3.4. See Hausman (1997, 1999). These findings are consistent with academic research which finds that corporation use hurdle rates for investment that substantially exceed their costs of capital, their WACC. See e.g. Summers (1987).

Free options: By Regulators failing to consider the practical application of real option theory they require the incumbent to give a free option to the access seeker, where an option is the right but not the obligation to purchase the use of the incumbent's infrastructure investment. Typically, when one purchases an call option (e.g. a call option for Intel stock at 25 on say July 1) the price is positive because the call option allow purchase when times are good (Intel stock exceeds 25 at expiration) but does not require purchase when time are bad.

However, regulation allows the access seeker to use the infrastructure when times are good are to stop using it when times are bad, yet the access seeker gets the option for free. That is the access seeker pays nothing for the option of getting to wait until much of the uncertainty is resolved and deciding to investment only when "times are good." Instead of undertaking the entire risk of the investment the access seeker only sees the right hand tail of Figure 1, and the access seeker does not compensate the incumbent investor for the asymmetric risk. Since the free option granted by the regulator shifts value from the investor to the access seeker, the value of a new investment will decrease causing overall investment in infrastructure to decrease as well. Further, the access seeker will use the free option to wait for the resolution of uncertainty so it will defer investment and use the incumbent's infrastructure when times are good. Overall investment by both the incumbent and the access seeker will decrease below the optimal level.[50]

Given the very long lead time between planning and completing of projects in natural resources industries, on the order of 3-5 years or longer, uncertainty in mining industries exceeds uncertainty in most other industries. Also given future commodity price uncertainty (which is often quite volatile) together with the fact that most growth in demand is coming from a single country China further increases the uncertainty because of absence of diversification. Lastly, when the real option is "deep-in-the-money" as we observe today with very high world prices of coal and iron ore so that the outcome is far in the right tail of the distribution in Figure 1, value destruction to the infrastructure investor will be larger than usual. It is for deep-in the-money options where the free

[50] The recent paper by Sappington (2005) fails to take account of the effects of asymmetric risk and the free option when he concludes that investment decisions b the access seeker will not be distorted by regulation. He only considers a decision process where no uncertainty exists.

option granted to the access seeker will cause the greatest transfer of value from the infrastructure provider to the access seeker.

In natural resource extraction industries it has been BHP's experience that gaining market share is very valuable as market shares can be relatively stable over extended periods of time.[51] Further, gaining market share in periods of high demand can be easily accomplished, and because of a significant positive correlation between price and demand, will prove very attractive financially. For these reasons firms in industries that have significant demand uncertainty and long "time to build", such as bulk commodities, will ***aim*** to carry spare, or latent, capacity. This capacity can be viewed as a call option over (unanticipated) demand upside. Investing in latent capacity is therefore likely to be in the producers' interests, and will be in Australia's interest in terms of expected social surplus.[52] However, the regulatory practice of viewing this as spare capacity to be granted to an access seeker is another example of providing a "free option" to the third party, which will decrease the economic incentive of carrying this valuable latent capacity, to Australia's detriment. [53]

In a real options framework, societal value destruction can occur if:

- The time to exercise an option is increased. Say the time to build increases from 3 to 5 years to 4 to 6 years due to the effects of regulation. Even if the option is exercised optimally, value will have been destroyed by the longer period between exercise of the option and commissioning;
- Regulation causes real options to be exercised too late. Arguably, this outcome is what is currently happening in Australia, where deep in the money options are taking too long to exercise
- Regulation can causes real options to be exercised too early. It is not unequivocally the right thing to do to encourage early investment, for

[51] For example, some steel producers optimize their iron ore production for certain grades and impurity specifications. They find it preferable to sign long term contracts for their iron ore supply.

[52] Economic theory recognizes situations where spare capacity can serve as a credible commitment that creates barriers to entry. See e.g. Tirole ibid. However, because of the ability to sign long term contracts with large customers in natural resource industries to finance entry as FMG has done with the Chinese, the barrier to entry effect is much reduced or eliminated. Also, while the aim of BHP has been to have latent capacity, the unanticipated demand shock created by rapid Chinese growth has eliminated latent capacity from the current situation.

[53] Providing access to this capacity at a market rate of return could only be calculated using real option theory, which is not currently done by regulators

example. Private firms without market power will choose the optimal time to exercise options.[54]

This section highlights the challenges the regulator faces in determining a market rate of return to the infrastructure provider, especially in the presence of sunk cost investment and significant and valuable real options. This challenge is increased when key economic parameters, such as future distributions of market demand and price, can be forecast only with a high degree of uncertainty, and when significant investment is required in the industry. In this case, the economic effect of the regulator determining access prices which are too low will likely have a significant deterrent impact on investment.

V. Conclusion

No competitive problems exist in Australia's mining industries that require mandatory access since no "bottleneck monopoly" problem exists. BHP and Rio Tinto compete in world markets for coal and iron ore where they cannot exercise market power. Their incentives to maximize profits are consistent with the maximization of social surplus in Australia given that the federal and state governments derive significant tax revenue from these industries. Good economic reasons exist for the vertical integration observed in Western Australia and its superior performance compare to the non-vertically integrated situation in Queensland. The decision by firms to use their infrastructure to maximize their own profits is consistent with output increases by the mining companies which own infrastructure. Lastly, economists now recognize that regulation of access infrastructure leads to less investment by both incumbents and access seekers. This lack of investment can have very significant societal costs and is most evident in industries that have complex vertically integrated supply chains with significant expansions being required. In this case, Regulatory practice that fails to allow for asymmetric risk, real options and system efficiency will decrease economic efficiency. Further, where the industries supply competitive export markets there will be no offsetting gain in consumer welfare, as arguably can occur in "natural monopoly" industry situations.

[54] See Guthrie (2006).

The best solution for Australian economic welfare is for the Australian government not to require mandatory access but to allow the firms to make commercial agreements in the best interest of their shareholders.

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Issues posed by Infrastructure Regulation in Australia's Bulk Commodity Export Sectors[1]

1. Introduction: The Policy Basis for Infrastructure Regulation

Australia's general purpose regime providing for access to nationally significant 'essential facilities'[2], contained in Part IIIA of the *Trade Practices Act* 1974 (TPA) is based directly on the recommendations of the 1992-1993 Independent Committee of Inquiry (Hilmer Committee). The Committee's Report, *National Competition Policy* (Hilmer Report)[3] became the basis of the *Competition Principles Agreement* between the Commonwealth, State and Territory governments. The agreement of all Australian governments was needed not least because the issues it dealt with were almost entirely concerned with infrastructure with natural monopoly characteristics that had, for historical reasons, been developed and operated by the public sector. The infrastructure in question was chiefly in utility sectors (electricity, gas etc) serving households and businesses in predominantly domestic markets:

> "In designing the regime, the Committee was conscious that almost all cases of essential facilities identified for the Committee were in the public sector because of the history of government ownership of infrastructure."[4]

The standard rationale for regulatory intervention in the case of infrastructure that has natural monopoly characteristics[5] is that the infrastructure owner may have the ability, and incentive, to charge monopoly prices, and – if the owner is also a competitor in upstream or downstream markets (i.e. is vertically integrated) – to inhibit access to the infrastructure by rivals in those markets. The Hilmer Committee's clear focus was indeed on promoting competition in upstream or (usually) downstream markets, but *not* as an end in itself; rather the driver was the public interest: to promote economic efficiency, in other words the economic welfare of the Australian community:

> " Competition policy is not about the pursuit of competition *per se*. Rather it seeks to facilitate effective competition to promote efficiency and economic growth ..."[6]

I would add that, of the several dimensions of efficiency recognised by economists – productive, allocative and dynamic – competition is especially targeted at *dynamic efficiency*. That is, it is seen particularly as a spur to innovation and productivity improvement – the key sources of growth in per capita output and improvement in the economic welfare of the community.

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1 This paper was prepared at the request of BHP Billiton Limited, but the author, Dr Vince FitzGerald, Chairman, The Allen Consulting Group Pty Ltd, is solely responsible for its content.

2 'Essential facilities' is a term long used in economics and in American competition law, referring to facilities which it is not economical to duplicate, i.e. which has natural monopoly characteristics. How that should be interpreted is discussed below.

3 AGPS, Canberra, 1993.

4 Hilmer Report, p 239.

5 Another possible rationale for regulation is to correct for externalities (e.g. pollution costs imposed on others), but that is rarely relevant in the context considered here.

6 Hilmer Report, p xvi.

The Hilmer Committee was very conscious of the need to protect the interests of the facility owner, importantly to maintain incentives for both investment and technical innovation:

> "The Committee is conscious of the need to carefully limit the circumstances in which one business is required by law to make its facilities available to another. Failure to provide appropriate protection to the owners of such facilities has the potential to undermine incentives for investment."[7]

> "Appropriate access prices may depend on factors such as the extent the facility's existing capacity is being used, firmly planned future utilisation and the extent to which the capital costs of producing the facility have already been recovered. Decisions in this area also need to take account of the impact of prices on the incentives to produce and maintain facilities and the important signalling effect of higher returns in encouraging technical innovation."[8]

Accordingly, in the context of the issue whether a facility should be considered not economical to duplicate, and access provided, the Committee was careful to strictly circumscribe this to cases where access was *essential in order to compete effectively* in a downstream or upstream market *and* consistent with the overall *public interest*:

> "Unless the owner of a facility consents to access being declared, the Minister could only make such a declaration where:
>
> I *Access to the facility in question is essential to permit effective competition in a downstream or upstream activity;*
>
> Clearly, access to the facility should be essential, not merely convenient.
>
> II *The making of the declaration is in the public interest, having regard to:*
>
> (a) *the significance of the industry to the national economy; and*
>
> (b) *the expected impact of effective competition in that industry on national competitiveness.*"[9]

This paper examines issues that are posed when access regulation is applied well outside the sphere of infrastructure serving domestic markets – the prime focus of the Hilmer Committee and of the policy adopted by Australian governments in response – and, in particular, when it is applied to infrastructure dedicated exclusively to supporting Australia's exports of bulk commodities to global markets.

2. Australian Public Interest Considerations

Australia's bulk commodity export sectors sell their output predominantly into global markets in which they face strong competition from foreign rivals (and each other) and in which buyers have high levels of countervailing market power. That is, while there is a degree of concentration on both sides of the relevant markets, they are effectively competitive, as discussed below. The commodities in question here are iron ore, coal (both metallurgical and thermal) and manganese, the last on a smaller scale than iron ore and coal.[10] [11]

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[7] Hilmer Report, p 248.

[8] Hilmer Report, p 253.

[9] Hilmer Report, p 251.

[10] Liquefied natural gas (LNG) is another commodity exported in bulk, but is not in scope here because it is highly intensive in specific capital and highly integrated to an extent that essentially rules out third party access as an issue.

The market for iron ore is clearly global. Data collated by respected industry analyst CRU indicate that 29 countries imported iron ore in 2006.[12] The market for imported iron ore is dominated by China (44.0 per cent of global imports in 2006) and Japan (18.6 per cent of global imports in 2006). Iron ore is sourced from suppliers around the world: CRU analysis indicates that 21 countries exported iron ore in 2006. The leading competitors in the market for exported – as distinct from domestically sourced – iron ore are Vale of Brazil (32.2 per cent of global exports in 2006) and BHP Billiton and Rio Tinto of Australia (34 per cent of global exports, combined, in 2006).[13]

However there are other significant players in the market, and more are emerging. India has in recent years emerged as a large-scale iron ore producer and exporter. Between 1996 and 2006 exports of iron ore from India approximately tripled, to 87.3 million tonnes or 11.3 per cent of the seaborne market.[14] Moreover, domestic producers in importing countries are an important force in the market. As a case in point, it is estimated that China consumed 640 million tonnes of iron in 2006 and of this total, on an iron content equivalent basis, approximately half was sourced from seaborne trade and half from Chinese domestic suppliers.[15] Domestic production of iron ore in China has increased by about 160 million tonnes since 2001 in response to increases in the prices available for domestic iron ore producers.[16]

An example of an emerging competitor is Australia's Fortescue Metals Group Limited (FMG), which states that it is aiming to achieve production of 55 million tonnes per annum (mtpa) by May 2008, 100 mtpa by 2009/2010 and double that in the longer term.[17]

Australia faces at least equally strong competition in global markets for coal, particularly thermal coal. Australia exported 132 million tonnes (mt) of metallurgical coal, of which 83 mt was high quality (predominantly to Asia), and 112 mt of thermal coal (almost all to Asia) in 2006.[18] However Indonesia exported 170 mt of thermal coal in that year, and is at least as well placed as Australia to ship to the major Asian markets; other large thermal coal exporters include the Russian Federation, South Africa, China and Colombia. Canada and the United States are competitors in metallurgical coal, particularly in European markets, although together they account for just under half of Australia's exports. As with iron ore, domestic production in user countries is also an important source of competition.

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11 A small part of the output of iron ore and metallurgical coal is used in Australia. In the case of thermal coal, almost all that is used domestically is produced separately, in conjunction with electricity generations and out of scope here.

12 CRU 2007, *The Iron Ore Market Service*, Interim Report, December, p 88.

13 Ibid.

14 Ibid.

15 BHP Billiton Iron Ore 2007, *An Outstanding Business with Tremendous Growth Opportunities*, Western Australian Iron Ore Presentation by Ian Ashby, 28 October, slide 6, available at http://www.bhpbilliton.com/bb/investorsMedia/investmentPresentations.jsp. The original source of the data is cited as UNCTAD Commodities Branch, September 2007 – *Iron Ore Statistics*. (ABARE data are on a slightly different basis but show a similar picture.)

16 Rio Tinto Iron Ore 2007, *Market Outlook and RTIO Response*, Presentation by Ian Bauert, 10 June, http://www.riotinto.com/documents/RTIO_Financial_Community_100607.pdf.

17 FMG presentation to BBY Roadshow, February 2008, available on FMG website.

18 ABARE, *Australian Commodity Statistics 2007*, Tables 247-251.

Quite clearly, there is no issue here of any monopoly power that may reside in the relevant mining, land transportation and port infrastructure being used, actually or potentially, to extract rents from Australian *domestic* consumers. Hence there are no obvious equity issues either. Maximising Australian economic welfare may thus, in this context, disregard Australian consumer surplus and focus on maximising (pre-tax) producer surplus in these sectors.[19]

Clearly, therefore, the Australian public interest is to facilitate the maximisation of the producer surplus component of these sectors' export revenues, and the efficiency with which they deliver those revenues, consistent with meeting society's other requirements – e.g. requirements such as good environmental stewardship. (Maximising these sectors' export revenues and their efficiency, i.e. also minimising their use of scarce resources, equates to maximising the sectors' overall generation of producer surplus or profits.)

The benefits generated by the competitive success of these export sectors flow widely throughout the Australian community. The most obvious channels are the incomes of those who work in them and the dividends received by the Australian shareholders of the individual companies. However a major channel is the taxes they pay to governments – corporate income tax, royalties[20] and various other taxes such as payroll tax.

- Over the current decade to date, Commonwealth government revenues have, year after year, exceeded prior expectation by cumulative amounts accounting to many tens of billions of dollars. These increases in revenues have been attributable in substantial part to increased corporate taxes. In 2001-02, before the current resources boom began to gather strong momentum, company tax collections were $27.5 billion, or 16.8 per cent of Commonwealth budget revenues. For 2007-08, they are projected at $63.8 billion or 25.3 per cent of revenues.[21] Company tax paid by resource companies has made a major contribution to that increase: in the fiscal year to 30 June 2007, BHP Billiton paid A$3.53 billion and Rio Tinto A$1.78 billion in Australian taxes, both largely in respect of their bulk commodity business, and both up substantially on earlier years.[22]

[19] As discussed further below, via taxes government shares in producer surplus, and through it, so does the wider community.

[20] Royalties, as taxes on output or revenue, are in principle a distorting type tax, unlike a tax on profits, but in these sectors the latter are predominant.

[21] Source: Commonwealth 2007-08 *Mid Year Economic and Fiscal Outlook*, and *Budget Papers* for earlier years.

[22] Source: Australian taxation expense reported in the companies' financial statements for fiscal year 2007, available from their websites – converted from US dollars using the average AUD/USD interbank rate for that period.

- The benefits of the increased fiscal capacity have been widely distributed as tax cuts, increases in welfare payments and increases in government consumption expenditure. The Treasury's *Economic Roundup* for summer 2008 reports (p 30), for example, that (excluding GST payments to the States), real growth in Commonwealth government spending was greater over the period 2004-05 to 2007-08 than in any other four year period since the early 1990s recession. And of course major rounds of personal income tax cuts occurred under the Howard government, with cuts worth around $30 billion (including a $2.3 billion education tax refund) still in the pipeline.[23]

In essence, then, the public interest objective of any decisions about regulation is to facilitate the maximisation of these sectors' generation of profits in Australia – export revenues less costs – over the long time frames associated with development and operation of infrastructure. To put it another way, the objective is to assist in maximising their ability to compete in, and to maintain and grow their shares of, increasingly competitive world markets. The rewards for succeeding in this are obviously very high currently, and this is expected to remain the case for some years to come, with demand for bulk commodities predicted to continue growing strongly, due to the rapid growth of China in particular. For example CRU projects that global seaborne iron ore imports will grow from 793 mt in 2007 to 1123 mt in 2012, with the great bulk of the increase going to China.[24]

To seek to capture the opportunities presented by these prospects, all the major bulk commodity exporters are planning major capacity expansions. For example, Rio Tinto, in a presentation to media representatives on a January 2008 tour of its Pilbara operations,[25] projected expansion of its iron ore production from around 180 mt in 2007 to 270 mt in 2010, with further expansion envisaged beyond that. BHP Billiton (BHPB) announced in a press release on 4 February 2008 interim funding approval for its 'Rapid Growth Project 5' (RGP5) which, together with its predecessor RGP4 (currently in train) will take the firm's iron ore production capacity from about 110 mtpa in 2007 to over 200 mtpa in 2012. As noted earlier, FMG is also planning to achieve those production levels in the longer term. And of course all of these Australian players face Brazilian and Indian competitors also planning major expansions.

Clearly, in pursuing the rich rewards currently in prospect, the critical focus must be on *maintaining incentives for investment in Australia* in these highly capital intensive sectors – particularly investment in infrastructure (which accounts for around 60-70 per cent of their total investment).[26]

The importance of this is underlined further by the facts that in many relevant categories of infrastructure (e.g. East Coast port facilities for loading coal onto ships) capacity is already rationed and at a premium; and that there are supply constraints on many of the important inputs to investment and expansion, including skilled labour as well as many kinds of plant and equipment (e.g. rolling stock).

[23] Source: ALP 2007 tax policy statement, from ALP website.

[24] CRU, op. cit., p 88.

[25] Available from Rio Tinto's website.

[26] Source: BHP Billiton advice.

3. Similarities and Contrasts with Infrastructure Serving Domestic Markets

Similarities: Sunk Investment, Long Lead times

All infrastructure shares some obvious characteristics. The most relevant similarities between the infrastructure dedicated to supporting bulk commodity exports and that serving domestic, or primarily domestic, markets – e.g. electricity, gas, water and telecommunications infrastructure – are that:

- *investments, once made, are essentially sunk*. Their ownership may change, but typically little of the capital invested can be recovered if they are no longer used for their original purpose. Hence the investor must take the risk that if market demand turns out not to warrant the addition to capacity, the capital cannot be withdrawn, or not all of it; and
- *lead times to bring investments into operation are typically long*, although typically more so in the case of the bulk commodity export sectors than in say, the case of incremental investments to gas or electricity distribution. An incremental increase in bulk commodity export capacity will typically require balanced expansion of capacity along the whole supply chain – capacity at the mine site (for extraction, crushing and/or other treatment, stockpiling and blending, loading onto land transport etc), rail and/or other land transport capacity, and port works and facilities (for unloading, stockpiling and blending, ship berthing and ship loading, and possibly channel dredging etc). Lead times from initial planning and design are typically 3-5 years in these sectors.[27]

The implications are that investments typically need to be committed well before new capacity is to come on stream, and therefore with some degree of uncertainty about the market environment and other factors that may then prevail; and that the investor bears the risk that capital invested may not earn an adequate return, yet will not be able to be recovered.

These factors typically apply with various kinds of infrastructure, but are particularly pronounced with bulk commodity export infrastructure. Some of the reasons for that are elaborated below.

Contrasts

Multi vs Single/Few Users

A major contrast is that whereas domestic infrastructure networks are typically designed to serve numerous customers (both households and businesses), bulk commodity export infrastructure is typically dedicated to one or a very small number of users. Indeed in iron ore, all three leading competitors in the global seaborne trade (BHP Billiton, Rio Tinto and Vale) operate their infrastructure as highly (vertically) integrated, and highly coordinated, supply chains – from mine site to ship.

[27] Source: BHP Billiton advice.

This maximises operating efficiency and throughput, and the ability to maintain consistent product characteristics as demand, ore quality and many other factors change. It also facilitates the taking of decisions on changes to operations or on new investment without delays due to negotiation/contracting with other parties, and ensures maximum incentive for technical improvement or innovation, i.e. dynamic efficiency gains, since the rewards are fully internalised. Such control, flexibility and incentive for improvement are often not attainable, to a comparable degree, in multi-user networks.

The situation in coal is distinctly different to that in iron ore, however: rail and port infrastructure in the Eastern coal mining regions is typically multi-user and not vertically integrated. The issues are drawn out very clearly, in the case of Queensland coal, in the reports of an independent review commissioned in May 2007 by the Queensland Government and the Queensland Resources Council. These reports, into Goonyella Coal Chain Capacity, by Mr Stephen O'Donnell,[28] describe the great complexity in this non-integrated multi-user supply chain of the inter-dependencies and interactions among users, of the interfaces, and of the consequent issues of lack of coordination and wastage of capacity. Mr O'Donnell concludes that the resulting "... underperformance has resulted in a lost economic benefit in excess of $1 billion during the past year alone".[29]

Potential for Rent Extraction or Foreclosure

Apart from those differences in control, flexibility and incentive to improve efficiency, an important difference between infrastructure serving multiple domestic users and one or a few bulk commodity exporters is that the operator of the domestic infrastructure, assuming it is not economical to duplicate, may have the ability (absent regulation) to extract rents from domestic customers – or possibly, to foreclose potential rivals in dependent, usually downstream, markets. Clearly the operators of bulk commodity export infrastructure have no potential to extract rents from domestic customers, raising no public interest concerns on that score.

Moreover, where incumbent bulk commodity exporters own and operate their own infrastructure (implying that they have sufficient scale to justify the 'lumpy' investments involved), they have no rational commercial motive to foreclose potential access seekers either, since:

- for rivals with sufficient scale (and ore of sufficient quality), the option of making their own investments that they can fully control will typically be preferred to accessing a multi-user environment;[30] hence for such players, foreclosure is a non-issue; and so

[28] Released by the Queensland Premier and Minister for Trade under cover of a press release dated 30 July 2007, and available at http://www.transport.qld.gov.au/Home/Industry/Rail/Goonyella_coal_chain_capacity_review.

[29] Goonyella Coal Supply Chain Review, *Supporting Documentation*, at cited website.

[30] Fortescue Metals Group Ltd (FMG) is, following the pattern established by Vale, Rio Tinto Iron Ore and BHP Billiton Iron Ore, constructing its own rail line from its major Chichester Ranges deposits (initially at or near Cloud Break) and its own port facilities at Anderson Point, Port Hedland.

- access seekers are likely to have only small to moderate scale operations – or to seek access only for smaller deposits remote from their main operations. Since global iron ore markets are (as discussed above) effectively competitive, sales into it by such players are unlikely to affect the sales or prices realised by the incumbents in any material way. In the case of iron ore, for example, any incremental Australian sales would probably be at the expense of second tier 'swing suppliers', principally Chinese domestic producers, and also India.[31]

Hence there are not likely to be legitimate concerns about the incumbent denying access in order to foreclose rivals in the downstream markets for these commodities either. From an Australian public interest perspective, the greater concern is the potential for the reverse: i.e. for inefficiently produced ore to displace efficiently produced ore (where infrastructure capacity is fully utilised).

Predictabilty vs Uncertainty of Markets, Other Factors

Another important contrast between domestic and bulk export infrastructure is that for much of the former, to a greater or lesser extent, demand is typically relatively stable and predictable. Obvious examples are electricity, gas and water transmission and distribution (or reticulation) infrastructure, the demand for which can, generally speaking, be predicted with reasonable certainty. By contrast, the timing and extent of future market demand for bulk commodities (aggregate market demand and its break-up among sub-markets, and the shares of Australia and individual exporters) is generally much more uncertain. The ability to take maximum advantage when market demand is very strong – as is the case at present for bulk commodities, and looks set to remain the case for some time – is crucial.

An important implication is that for much domestic infrastructure, since demand for its services is relatively stable and predictable, the fact that investment lead times, from initial planning and design to operation, may be long does not present the firm with significant risks or associated real options.

Of course, there are some exceptions where risks may be significant – depending on the nature of the infrastructure, how new the markets for it are, and so on. E.g. for some highly technology intensive telecommunications infrastructure, not only may there be significant uncertainty about demand, but also about how technology may change.

Accordingly, the firm in such an environment is likely to have a range of very valuable options – options not simply to time investments optimally as information about market demand accumulates, but in respect of choices of technology, which deposits to exploit in which order or mix, etc. It is well known that in such a case, the firm will rationally and reasonably require a rate of return on an investment, and apply to the evaluation of it a hurdle rate, that is well above its weighted average cost of capital (WACC).[32]

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[31] This comment is based on the fact that, on an equivalent iron content basis, Chinese iron ore costs two to three times more to produce than Brazilian or Australian iron ore, and is still substantially more costly after freight costs are included. Also, on a freight inclusive basis, spot prices in China for Indian ore in late 2007 were more than double Australian iron ore contract prices, and also far above Brazilian contract prices. (Indian iron ore is usually sold to China on a spot basis.) Source: CRU 2007, *The Iron Ore Market Services*, Interim Report for 2008, Summary, pp 3-7.

[32] See for example, Robert L. McDonald 1998, "Real Options and Rules of Thumb in Capital Budgeting" in M.J. Brennan and L. Trigeorgis (eds), *Project Flexibility, Agency and Competition*, London: Oxford University Press, 2000 (originally circulated in mimeo, March 1998; available in that form at author's website).

The numeric examples canvassed in the paper by McDonald just cited demonstrate why it is rational for many firms to adopt hurdle rates well above their WACC, and why they need to do so to capture as much as possible of the value of their real options. If those options are valuable enough (due to prevailing market uncertainties etc), the required return on a new investment may be a multiple of the WACC (in realistic cases, twice or more).

In the domestic infrastructure context, there are cases where real option value is large (e.g. newer areas of telecommunications, it would appear), but these are the exception rather than the rule. However with bulk commodity export infrastructure, they are typical, not exceptional. A firm in these markets will have a considerable range of valuable real options, for example:

- most obviously, in the timing of making an infrastructure investment, i.e. whether to invest pre-emptively (risking having a period of excess capacity, but positioning the firm to capture any growth) or to delay until the market situation is clearer (risking being left behind, but not prematurely incurring investment costs);
- but also in a range of other decisions – e.g. which selection and mix of the available ore bodies to exploit, and in what order (with risks depending on how the market's preferences for specific ore characteristics may evolve, and on the prices it will pay, depending in turn on technological as well as market factors in the using industry); what extraction, processing, blending and transportation methods to opt for, and so on.

Like the firm in a very new, technology-intensive domestic market grappling with significant demand and technology uncertainties, a bulk commodity export firm will rationally need to apply to prospective investments in additional infrastructure hurdle rates well above its weighted average cost of capital, to compensate for the loss of real option value it will incur when choosing a particular course.

4. Problems with Regulating Access to Bulk commodity Export Infrastructure

It is assumed here that where third party access to infrastructure comes under regulation, the approach taken by the regulator to determining the access prices that the facility owner may charge is likely to be along lines that have become standard regulatory practice – e.g. the 'building block' approach commonly adopted by Australian regulators. This is an approach essentially based on allowing the facility owner to recover its efficient costs and earn its weighted average cost of capital (WACC) on the regulated asset base.

Inevitably, where the facility owner has valuable real options attaching to its decisions about is infrastructure investments – as is certainly the case (as discussed above) in the circumstances prevailing for bulk commodity export infrastructure, this approach *truncates* the owner's actual and prospective returns and thus significantly under-compensates the owner for the loss of option value. That is, the owner will earn less from access fees than own use of the infrastructure would earn in the market when market conditions are good, but may simply face poor market returns in poor market conditions. Clearly, on average, the owner's prospective returns from investment are reduced. The access seeker, on the other hand, is under-charged – i.e. in effect is subsidised at the facility owner's expense, since the access seeker is provided with the option to use the facility or not without compensating the owner for receiving that option or for various other opportunity costs (since access is at the conventionally determined regulated price).

- The effect is to bias the access seeker's incentives towards the purchase of the services of the infrastructure services it requires to export its ore, relative to investment in its own infrastructure (or other options, including sale of one ore or deposits to another miner, joint ventures etc).
- Especially given that regulatory processes and negotiations among the parties typically inevitably take considerable time, there may be potential for 'gaming' of the regulatory system, or at the very least, for dead-weight losses to be incurred, as in the Queensland coal chain case.
- The notorious example in the Queensland context is that surrounding the expansion of the Dalrymple Bay Coal Terminal. A proposed expansion of the capacity of the terminal (from 60 to 68 mtpa) was delayed for 22 months, between early 2003 and early 2005, while the Queensland Competition Authority was considering the draft access undertaking and determining a terminal user charge. Lost revenues incurred were in the order of $1 billion per annum during this delay, plus demurrage and other costs. Meanwhile, without regulatory intervention, *two* stages of expansion were commissioned at Hay Point before the regulated expansion of Dalrymple Bay finally came on stream in February 2008.[33]
- For the incumbent facility owner, depending on the uncertainties surrounding the expected market environment, the effect is to reduce or possibly even to eliminate the incentive to make the investment. For example, the incumbent may be contemplating making a pre-emptive investment in expanded capacity that will not be fully utilised immediately (because of long lead times) but would provide the owner with the option to increase export sales if the market proves to be favourable. If the owner faces the prospect that the capacity will be diverted to access seekers at prices that do not compensate for the lost option value, the owner's incentive to proceed will clearly be diminished, if not eliminated.

[33] Source: public announcements.

Scale Economies, and Implications

It is important, in the context of these bulk commodity export sectors, to appreciate that the activities they involve exhibit very strong *scale economies*. In iron ore, in particular, the three first-tier competitors in the global seaborne trade all produce at scales of over 100 million tonnes per annum currently, and all are planning to expand to multiples of that. All are, as already noted, vertically, integrated – i.e. own and control their own infrastructure, operate it as part of fully integrated supply chains – from mine site to ship – and thereby achieve high levels of capital and operating efficiency, including high degrees of flexibility to maximise throughput and maintain product consistency in the face of a range of uncertainties in demand and mining conditions.

As also noted, the gains from technical improvement are fully internalised, so that incentives to improve are strong and are reflected in continual gains in technical efficiency over time. For example, through operating improvements (partly the result of a long-term program of research), BHPBIO has increased axle loads and hence wagon loads and throughput on its Western Australian iron ore rail system from 30 tonnes to 37.5-40 tonnes per wagon in the past 30 years. A move to more flexible train departure sequencing in 2005 increased potential throughput by 3.5 per cent. Productivity per employee in that system in the past ten years (measured in million tonnes railed per employee) has more than doubled.[34]

Another example is BHP Billiton's strategy involving blending of ores (of high medium and low grade) with complementary physical and chemical properties, drawn from across the company's extensive portfolio of deposits. This, in effect, will substantially extend the size of the total resource base, or equivalently, extend mine life, by 20-30 per cent.[35] This is essentially an efficiency attributable to scale, and realising it depends on coordination and integration of production, loading, transportation and blending.

- These examples suggest that vertical integration in this sector is a valid business response to the existence of significant scale economies.
- Another implication of the existence of these scale economies is that if a potential access seeker controls ore deposits of marketable grade at substantial scale, or has prospects of raising production to requisite scale, such a firm should, *absent regulation*, prefer to provide its own infrastructure in order to achieve the efficiencies and optional profitability of fully integrated operation. The risk of regulation, on the standard model, is that it may bias the choices of such an access seeker towards choices which are less efficient for *both* the facility owner *and* the access seeker. Nevertheless it appears likely that a firm with large enough operations (actual or prospective) will prefer own provision, even if access to another's infrastructure is effectively subsidised.

[34] Source: BHPBIO presentation to WA Government, *BHP Billiton Iron Ore-Western Australia: An integrated System*, 25 July 2006.

[35] Source: Presentation slide on 'Project Bamboo' provided by BHP Billiton.

- A further implication, then, is that access seekers are more likely to be those with small (and so not maximally efficient) scale, or with sub-scale discrete mine sites (remote from firms' major operations). Hence there is a clear risk, as noted earlier, that access achieved by firms for intrinsically inefficient smaller scale operations, may displace more efficient, and more profitable, export sales by efficient large scale miners/facility owners.

Consequences

The prospect is that access regulation, insofar as it is likely to produce such outcomes, will bring about a net reduction in Australian export revenues and profits (and tax flows based on them), due both to the inhibition of investment in expanded capacity *and* to reduced throughput and operating efficiency caused by:

- delays in establishing access arrangements;
- ongoing contracting and coordination costs;
- congestion and inflexibility (diseconomies of scope) costs brought about by the move from an integrated, flexible operating environment with a single coordinator and user to a multi-user, more rigidly scheduled environment. These diseconomies translate to a combination of reduced throughput for given investment and reduced operating efficiency. Mr Stephen O'Donnell has commented, based on his Queensland experience, that "... in a multi user system it is generally necessary to build an additional 10 to 20 per cent capacity into the system to achieve the same throughput as could be achieved with flexible operation of that system, under the control of a single user and operator."[36]

In essence, operating infrastructure to meet the needs of multiple users of some parts or all of the chain will inevitably mean that the performance of the total supply chain is sub-optimal, as Mr O'Donnell's review demonstrates. In longer time-frames, the considerably reduced incentives for technical improvement will compound the reductions in efficiency (since gains cannot be fully internalised, but will be shared by all users – who will not, under the standard approach to access pricing, bear a proportionate share of the costs incurred to achieve the gains, if any share).

The combination of all of the above consequences of applying regulation to bulk commodity export infrastructure clearly indicates that to do so is inconsistent with the fundamental objective of maximising the Australian public interest.

5. A Superior Approach

A far better alternative to mandating access to the infrastructure of this sector, at the clear risk of impairing its competitiveness in global markets, is to leave issues of access to infrastructure to commercial negotiation among the parties.

[36] Stephen O'Donnell, Affidavit submitted in proceedings before the Australian Competition Tribunal in relation to the application by Fortescue Metals Group Ltd for review of the Commonwealth Treasurer's deemed decision not to declare the track services of the Mt Newman Railway, affidavit affirmed 21 December 2007, para 25.

As discussed above, an incumbent firm with its own infrastructure in one of these sectors has no significant motivation to foreclose smaller scale prospective exporters (the most likely access seekers) from selling into export markets – since their own export sales and prices will not be materially affected. Indeed an incumbent may have a positive incentive to provide access to capacity which it is not for the time being using (e.g. because it has expanded capacity) to an access seeker *provided that such arrangements are on commercial terms.*

- This means that the arrangements must as far as possible preserve the efficiencies of integrated operation, and that the access provider is fully compensated for the value of real options forgone, and for other opportunity costs. That is, the facility owner's returns from the investment must be preserved, in order for it to enter into an access arrangement without being disadvantaged.
- These observations also present the obvious explanation why an incumbent would prefer not to grant access on terms less favourable than full compensation, if at all (given that full compensation is hard to measure). That explanation is not that the owner has a motive to foreclose a rival, but simply that it will typically be more profitable for the incumbent to retain full flexible control of the infrastructure without contracting costs and other diseconomies, to retain the options it presents to exploit market conditions, and generally, to make use of it to maximise its own earnings from the market.

An access seeker of similar efficiency to the incumbent would, in this scenario, face unbiased incentives as between own investment and access seeking. One of large enough scale would rationally opt for the former, but (if indeed similarly efficient) could viably, i.e. profitably, negotiate and utilise access on fully commercial terms – e.g. enter into a joint venture for new capacity serving both firms but under one's coordinating control.

Such an approach, eschewing regulation in these sectors in favour of commercial negotiation among the parties, is far more likely to maximise economic benefit to Australia than regulated access, since it will maximise the efficiency and intensity of use of bulk commodity export infrastructure; incentives to invest in it and the speed of doing so; and incentives to continuously improve its efficiency.

In short, it will maximise the Australian public interest.

6. Summary

In summary, while mandated third party access regimes have a legitimate role to play in the case of some infrastructure networks serving domestic markets, they have no valid public policy rationale in respect of infrastructure serving bulk commodity export industries since in general:

- there is no externality rationale;
- there is no issue of extraction of monopoly rents from Australian domestic customers;
- there is no issue of the facility owner foreclosing competitors in the downstream global markets;

- application of standard rate of return approaches to regulating access prices (based on the owner's cost of capital) will inevitably fall short of compensating the owner for lost option value and other costs, and typically do so by large margins;
- this presents access seeks with prices and options for which they do not pay full value, biasing their choices towards access seeking and away from own investment;
- since the effect is to truncate the owner's returns (in some states of the world and on average) and to under-compensate for other costs and lost value, the owner's incentives to invest are also reduced;
- the export sectors in question exhibit strong scale economies, so that there is a significant risk of displacement of more efficient by less efficient production – resulting in less societal surplus to Australia;
- converting highly integrated and coordinated supply chains into multi-user mode inevitably involves diseconomies – interference effects, ongoing contracting costs and so on. This means lower throughput per real investment dollar and/or higher ongoing variable costs – i.e. deadweight losses of efficiency;
- moreover, regulation and access negotiations inevitably take considerable time, adding substantially to the deadweight losses;
- over time, reduced incentives to make technical and operating improvements will add to the efficiency losses.

These outcomes make the application of mandated access regimes to infrastructure in these bulk export sectors contrary to the national interest. The national imperative at present is to remove all obstacles to maximising Australia's share of the enormous opportunities currently and prospectively on offer in these sectors, *not* to erect new obstacles.

The far better approach is to leave issues of access to bulk commodity export infrastructure to be negotiated among the parties on a fully commercial basis.

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