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Operating expenditure productivity growth

A report for Ausgrid and Endeavour Energy

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Disclaimer

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1. Introduction

This report has been prepared at the request of Ausgrid and Endeavour Energy. Its subject is the estimation of the operating expenditure (opex) 'productivity growth' component of the annual 'rate of change' formula applied by the Australian Energy Regulator (AER) in making its determination on opex.

The 'base-step-trend' approach is the preferred means by which the AER assesses a distribution network service provider's (DNSP's) proposed opex allowance for compliance with the National Electricity Rules (the rules). The 'trend' element of this approach involves projecting opex requirements in future years by application of an annual 'rate of change', which accounts for the effect of expected changes in output, real prices and productivity.

A change in opex productivity arises when the quantum of outputs produced by a DNSP, for which there are various measures, increases relative to the value of its opex program.

In previous distribution determinations the AER determined a zero opex productivity growth forecast, however, it is currently reviewing its approach to forecasting opex productivity growth. We have not been asked to respond to the 'draft decision paper' recently published by the AER.

Rather, Ausgrid and Endeavour Energy asked us to undertake a first-principles assessment of the estimation of the opex productivity growth rate under the AER's framework and by reference to opex multilateral partial factor productivity (MPFP) measures recently published by the AER.

The remainder of our report is structured as follows, ie:

- in section 2, we describe the backdrop against which the AER is making its determinations on opex for Ausgrid and Endeavour Energy;
- in section 3, we describe the AER's conceptual framework, which has important implications for forecasting productivity growth rates;
- in section 4, we explain the methodological principles that arise from the AER's conceptual framework and its 'base-step-trend' approach to assessing opex; and
- in section 5, we conclude and provide our opinion on the appropriate forecast productivity growth rate to be applied by the AER in light of the opex MPFP measures it recently published.

2. Background and context

In this section we briefly summarise the context to Ausgrid and Endeavour Energy's proposed opex allowance for the 2019 to 2024 regulatory control period.

Both Ausgrid and Endeavour achieved substantial improvements in opex productivity during the 2014 to 2019 regulatory control period. This was a transformational period for both businesses, reflecting:

- the partial lease by the NSW Government of a 50.4 per cent stake in both businesses in 2016; and
- the implementation of a range of opex productivity enhancing activities, eg, restructuring their workforces so as to reduce the level of full-time equivalent (FTE) roles.

We summarise these opex-enhancing initiatives and the resulting productivity improvements in the remainder of this section.

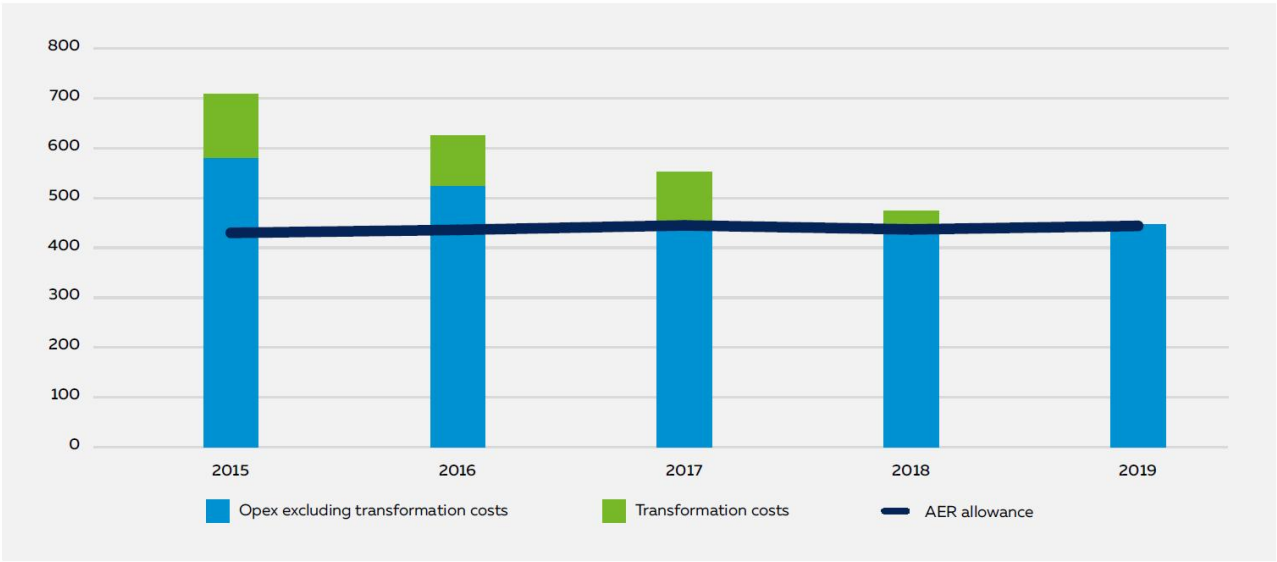
2.1 Ausgrid productivity enhancing activities

Over the 2014-19 period Ausgrid achieved ongoing opex reductions of more than $100 million per annum, which translates to an annual saving of $76 per annum.[1]

The principal means by which Ausgrid achieved this improvement in opex productivity was a transformation program involving the removal of almost 3,000 FTE positions, which reflects a 44 per cent reduction to its workforce.[2]

However, this transformation program required Ausgrid to incur a material level of up-front 'transformation costs', which arose from obligations under its enterprise bargaining agreements. These transformation costs were in excess of $100 million per annum in some years, as illustrated in Figure 1.

Figure 1 – Ausgrid Opex comparison for 2014 to 2019 ($ million, real FY19)



[1] Ausgrid, *Regulatory Proposal 2019-2024*, April 2018, p.114.

[2] Ausgrid, *Operating expenditure issues paper on the remitted decisions for NSW/ACT 2014-19 electricity distribution determinations*, November 2017, p.3.

Source: Ausgrid, Ausgrid's regulatory proposal 2019-2024, April 2018, p.118.

In addition to these upfront transformation cost, which are not expected to persist beyond FY18, Ausgrid also explained that the substantial reduction to its workforce:[3]

> …has had a profound impact not just on the employees directly affected but also on our wider workforce.

This observation is consistent with findings from the administrative science and human resources management literature, which we summarise in Box 1 below.

Box 1 – Observations of downsizing from the literature

Our review of the administrative science and human resources management literature identified a number of short-term challenges arising from reductions to a business' workforce, which have the potential to give rise to a temporary decline or stagnation in productivity.

For example, Said (2007) highlights that:[4]

> The performance effects of major personnel reductions are more complex and unpredictable than that simplistically predicted by the economic rational argument.

Similarly, Shah (2000) highlights disruptions to relationship networks within a firm, Said et al (2007) notes the loss of valuable human, intellectual and social capital and Wagar (1998) highlights management focus on downsizing and a shift away from innovative behaviour, along with:[5]

> …the more time consuming but critical elements of redesigning the organisation and developing a systematic strategy predicated on massive cultural change within the firm.

These factors all have the potential to contribute to temporary declines or stagnation in productivity.[6]

2.2 Endeavour Energy's productivity enhancing activities

Endeavour Energy achieved significant improvements in its opex productivity over the 2014-19 regulatory period.

Its most significant improvement arose from a restructuring program that commenced in 2012 and reduced the level of FTE staff by almost 30 per cent.[7] This reduction contributed to cumulative opex savings of approximately $891 million between 2012 and 2018. Importantly, Endeavour was able both to reduce its opex and maintain its service standards.[8]

[3] Ausgrid, *Proposal for the remake of Ausgrid's 2014-19 distribution determination (proposal)*, August 2018, p.3.

[4] Said, T., Le Louran, J. and Tremblay., 2007, *The performance effects of major workforce reductions: longitudal evidence from North America, International Journal of Human Resources Management*, 18:12, pp.2017-2094.

[5] See: Shah, P. P., 2000, *Network Destruction; The Structural Implications of Downsizing*, The Academy of Management Journal, vol. 43, No.1, p.111; Said, T., Le Louran, J. and TremblayM., 2007, *The performance effects of majore workforce reductions: longitudal evidence from North America, International Journal of Human Resources Management*, 18:12, pp.2017-2094; and

[6] Mone, M. A., 1994, *Relationships between Self-Concepts, Aspirations, Emotional Responses, and Intent to Leave a Downsizing Organisation*, Human Resource Management; Summer 1994; 33, 2, pp.281-298; Cascio, W. F., 1993, Academy of Management Executive, Vol. 7 No. 1, pp.95-104; and Wagar, T., 1998, *Exploring the consequences of workforce reduction*, Canadian Journal of Administrative Sciences, 15(4), pp.300-309.

[7] Endeavour Energy, *Regulatory proposal: 1 July 2019 to 30 June 2024*, April 2018, p.164.

[8] Endeavour Energy, *Proposal for the remittal of the Endeavour Energy 2014-19 determination*, April 2018, p.2.

Consistent with the experience of Ausgrid, Endeavour Energy's restructuring program resulted in it incurring significant restructuring costs. The level of restructuring costs peaked in 2016, reduced over the following two years and is expected to be zero from 2019 onwards.

This restructuring program contributed to a marked reduction in Endeavour Energy's opex over the 2014-19 regulatory control period. By way of example, it reduced its average opex per customer over the 2014-19 period by $50 per annum (real, FY19), as compared with that over the 2009-14 period.[9] Further, Endeavour Energy explained that these programs resulted in:[10]

> …reducing our opex by $64.1 million (real, FY19), since 2013-14 to achieve the AER's benchmark by year four…

These circumstances well-illustrate the up-front costs generally incurred in the pursuance of opex productivity improvements. We explain the implications of these upfront costs for forecasting opex productivity costs in section 4.1 and 4.3.

Further, the business restructuring undertaken by Ausgrid and Endeavour Energy in recent years are strong examples of DNSPs making significant strides towards, or catching up to, the productivity frontier. We explain the implications of DNSPs catching up to the productivity frontier for forecasting opex productivity in section 4.2.

[9] Endeavour Energy, *Regulatory proposal: 1 July 2019 to 30 June 2024*, April 2018, p.157.

[10] Endeavour Energy, *Regulatory proposal: 1 July 2019 to 30 June 2024*, April 2018, p.20.

3. AER framework

In this section we describe the conceptual and empirical framework applied by the AER to determine the productivity growth component of the rate of change and highlight key implications for the application of that framework.

3.1 The workably competitive market paradigm

The Australian Energy Market Commission (AEMC) explains the fundamental objective of economic regulation to be the reproduction of the production and pricing outcomes that would arise in a workably competitive market.[11]

In a workably competitive market, productivity gains available throughout the industry can be expected to be achieved by firms operating efficiently and, by means of the competitive process, reflected in market prices. One consequence is that, in a workably competitive market, the achievement of industry-wide productivity gains will lead to the derivation of normal returns by firms operating efficiently. On the other hand, exceeding or falling short of those productivity gains will result in greater or lesser than normal returns, respectively.

The AER's approach to accounting for changes in productivity is intended to reflect this workably competitive market paradigm, eg, it explains that:[12]

> All else equal, a price taker in a competitive market will maintain constant profits if it matches the industry average productivity improvements reflected in the market price. If it is able to make further productivity improvements, it will be able to increase its profits until the rest of the industry catches up, and this is reflected in the market price. Similarly, if a NSP is able to improve productivity beyond that forecast, it is able to retain those efficiency gains for a period through the EBSS.

We briefly explain below the AER's approach to accounting for changes in opex productivity.

3.2 AER's approach to assessing operating expenditure

The AER's 'base-step-trend' approach is the preferred means by which it assesses most categories of opex.

It involves estimating the efficient level of opex in a year of the current regulatory control period and applying a 'rate of change' to assess the efficient level of opex in each year of the forthcoming regulatory control period. The subject of this report is the 'productivity growth' component of that 'rate of change'. [13]

It follows that there are two potential sources of adjustment for opex productivity under the AER's framework – in the base year and in the 'rate of change' – which the AER may apply contemporaneously. This reflects its view that:[14]

> The forecast productivity change of an efficient individual NSP can be disaggregated into 'catching up to the frontier' and frontier shift. Any base year adjustment we apply will capture any catch up required. Thus the forecast productivity change included in the rate of change should represent the forecast shift in the productivity frontier, not average industry performance.

[11] AEMC, *Rule Determination – National Electricity Amendment (Economic Regulation of Transmission Services) Rule 2006 No.18*, 16 November 2006, p.93.

[12] AER, *Expenditure forecast assessment guidelines for electricity distribution*, November 2013, p.65 and 66.

[13] The AER may add or subtract step changes for any costs not captured in base opex or other opex required to forecast the level of opex that meets the opex criteria.

[14] AER, *Explanatory Statement – Expenditure Forecast Assessment Guideline*, November 2013, p.70.

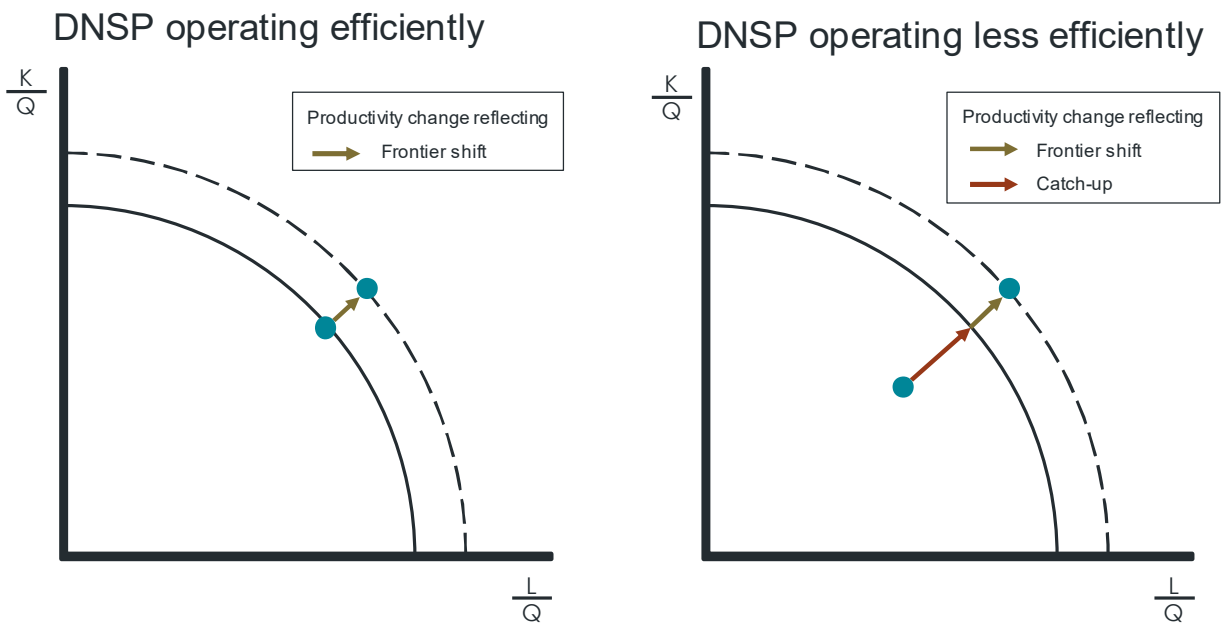
In other words, the AER draws a distinction between productivity changes that reflect:

- a DNSP operating less efficiently moving towards the productivity frontier ('catch up'); and
- a shift in the productivity frontier ('frontier shift').

We illustrate this conceptual distinction in productivity changes in Figure 2 below, ie:

- on the left we show the effect of a shift in the productivity frontier on a DNSP operating efficiently; and
- on the right we show the productivity changes that might be achieved by a DNSP operating less efficiently, comprising both 'catch up' and 'frontier shift'.

Figure 2 – Illustrative distinction between 'frontier shift' and 'catch up'



By way of emphasis, we again highlight the AER's view that:

> To the extent we find the NSP to be materially inefficient, or substantially below the efficiency frontier, we will adjust base opex to reflect the difference. This will effectively place the inefficient NSP on the efficiency frontier for forecasting purposes. [15]
>
> …the forecast productivity change included in the rate of change should only represent the forecast shift in the productivity frontier. [16]

Importantly, the AER provides no explicit allowance for the costs associated with implementing opex productivity-enhancing activities that are required to achieve the forecast opex productivity change (the shift in the productivity frontier), other than to the extent its capex allowance reflects expenditure that might assist productivity growth. Further, the AER also affords a DNSP no benefit for achieving its forecast productivity change.

[15] AER, *Explanatory Statement – Expenditure Forecast Assessment Guideline*, November 2013, p.70.

[16] AER, *Explanatory Statement – Expenditure Forecast Assessment Guideline*, November 2013, p.66.

3.2.1 Sharing of marginal productivity gains and losses

Having determined a DNSP's opex allowance for a forthcoming regulatory control period, the AER provides for a sharing of *marginal* gains or losses in opex efficiency, as between shareholders and customers.

In particular, the efficiency benefit sharing scheme (EBSS) and the capital expenditure sharing scheme (CESS) provide rewards (or impose penalties) for differences between allowed and actual levels of opex and capex, respectively.

Since the EBSS and CESS distribute only marginal efficiency gains and losses (ie, relative to the opex allowance), a DNSP:

- receives no benefit for achieving the level of productivity growth embedded in the 'rate of change'; and
- is penalised for any failure to achieve that level of productivity change, where the cost of that failure is shared with customers.

The AER provides no explicit allowance for the cost of productivity-enhancing measures required to achieve the AER's determination of forecast productivity growth,[17] which reflects its view that these efficiency enhancing measures are 'self-funding', ie, because the EBSS and CESS permit a DNSP to retain a share of any net efficiency gain and to share with customers the cost of any failure to realise marginal productivity gains.

This means that the productivity growth component of the rate of change must reflect the anticipated change in opex productivity after accounting for all expenditure and associated incentive scheme effects required to achieve those gains. Put differently, it must reflect the *net effect* of productivity enhancing activities. We discuss the consequences of this conclusion in section 4.

Off-setting sources of productivity gains and losses

Following the AER's determination of a DNSP's opex allowance, the DNSP and customers share the costs or benefits of any changes in circumstances that are not accounted for in step changes or cost pass-throughs.

The marginal productivity gains or losses realised by a DNSP therefore reflect the net effect of myriad drivers of opex, each with potentially off-setting effects on opex efficiency. For this reason, it is important to evaluate opex productivity changes on the basis of the *net change* in opex productivity. To do otherwise risks focusing on particular sources of opex efficiency that may have, or may be, offset by other factors.

3.3 Implications for forecasting 'productivity growth'

The AER's framework operates such that a DNSP:

- receives no benefit from achieving the AER's forecast of productivity growth, but it must bear (in part) the cost of any failure to achieve that productivity improvement; and
- in contrast, it is afforded a share of the net benefit of any further, marginal productivity gains.

Put differently, the AER applies:

- a negative incentive ('a stick') to incentivise the achievement of the forecast productivity change; and
- a positive incentive ('a carrot') to incentivise further productivity gains.

One consequence of providing a DNSP no explicit opex allowance for the cost of productivity enhancing measures and no share of the resulting benefits is that forecast productivity growth must reflect the expected *net effect* of productivity enhancing measures. This means it must reflect the anticipated change in opex

[17] Other than to the extent its capex allowance reflects expenditure that might enhance opex productivity.

productivity after accounting for all expenditure – both capital and operating in nature – required to achieve those gains and the effects of its incentive mechanisms.

Any failure to meet this requirement when forecasting productivity growth would not provide a DNSP with a reasonable opportunity to recover its efficiently incurred costs and derive a normal return, in contrast to the revenue and pricing principles in the rules and the workably competitive market paradigm.

4. Forecasting opex 'productivity growth'

In this section we describe foundational principles to be applied in estimating the opex 'productivity growth' component of the 'rate of change'. These principles arise from the essential characteristics of the AER's framework for assessing opex, which we discuss in the previous section.

4.1 Lower end of expected productivity outcomes

We explain in section 3.3 that, for a DNSP to be afforded a reasonable opportunity to recover at least its efficiently incurred costs, forecast productivity growth must reflect the expected *net effect* of opex productivity-enhancing activities. We consider below the implications of this conclusion on the AER's approach to forecasting opex productivity growth.

4.1.1 The net effect of productivity-enhancing activities

Accounting for the net effect of productivity-enhancing activities requires the anticipated opex productivity growth to reflect all expenditure required to achieve those gains, as well as the effects of the AER's incentive mechanisms.

Upfront costs required to achieve productivity growth

The pursuance of opex productivity generally requires a DNSP to incur upfront costs, with the intention of realising a disproportionately larger opex saving in the future. These upfront costs:

- may be capital and/or operating in nature; and
- give rise to a risk that, if the anticipated future opex savings are not forthcoming, the DNSP will realise a decline in opex productivity.

To the extent capital costs were incurred in the pursuance of operational efficiencies, observed historical changes in opex alone will likely overstate the net effect of opex productivity changes.

Relevantly, opex productivity improvements in many cases arise from the implementation of new information, communication and technology systems, the costs of which are generally treated as capital in nature. We understand that both Ausgrid and Endeavour Energy have, or are in the process of, implementing new systems directed at improving opex productivity.

Given this interrelationship between capex and opex, differences in capitalisation policies across DNSPs and/or changes in a particular DNSP's capitalisation policy may also distort observed changes in opex productivity.[18]

If the approach to forecasting opex productivity does not account for capital expenditure incurred in the pursuit of opex productivity, the resulting forecast may incorporate an upwards bias. On the other hand, there also exists the potential that observed declines in opex productivity result from opex incurred in the pursuit of improvements in capex productivity, eg, from implementing non-network solutions that enable the deferral or avoidance of capex.

[18] By way of example, amendments to Ausgrid's capitalisation policy reduced its reported opex over the 2004 to 2009 period, although those 'cost savings' were reflected in higher capex than would otherwise have been the case.

Risk of pursuing productivity growth

Because of these upfront costs and the possibility that the anticipated opex savings will not be realised, the pursuance of improvements in opex generally involves a degree of risk. For example, TasNetworks explains that:[19]

> Unproven technology on TasNetwork may fail, or cause project delay… [and] there is a risk that the technology won't be accepted by the business.

A consequence of this is that any upwards bias in forecast opex productivity could encourage a DNSP to bear an excessive degree of risk in endeavouring to achieve the necessary productivity improvement, as compared with that which would be borne by a DNSP operating efficiently. Any cost consequences would then be passed (in part) on to customers through the AER's incentive schemes.

There also exists the potential that, in light of those risks, a DNSP opts not to pursue the full improvement in opex productivity implicit in the AER's forecast. This could give rise to perverse incentives for a DNSP to take a strategic approach to the penalties that might arise under the AER's various incentive schemes, eg, strategic decisions as to whether to exceed the AER's opex allowance and share part of that cost (through the EBSS) or to not exceed the AER's allowance and risk penalties under the AER's Service Target Performance Incentive Scheme (STPIS).

4.1.2 Forecasting productivity growth using opex multilateral partial factor productivity

Ausgrid and Endeavour have asked us to review the appropriate methodology for forecasting opex productivity growth under the AER's framework and using the opex MPFP measures published by the AER. We understand this is one of the approaches currently being considered by the AER in its review of its approach to forecasting opex productivity. The AER had previously explained that it will forecast future shifts in the productivity frontier:[20]

> …using the PFP [partial factor productivity] change of the most efficient business (or highly efficient businesses as a group) to gauge the scope of further productivity that may be achieved by individual businesses—this assumes that relevant drivers (such as technical change and scale change) and their impact remain the same over the two periods considered (historical versus forecast).

Opex multilateral partial factor productivity (MPFP) measures the relationship between total output and opex. It will therefore provide a biased indicator of productivity change whenever a change in the mix of capex and opex inputs has the potential to affect productivity.

This approach contributed to the AER applying a zero opex productivity growth rate in its previous distribution determinations.

4.1.3 Conclusion

It is uncontroversial that there exists a relationship between a DNSP's opex and capex requirements. Further, opex productivity improvements often arise by consequence of capital projects, eg, the implementation of new systems. Since opex MPFP does not account for capex incurred in the pursuance of opex productivity improvements, it will therefore overstate whole of firm productivity gains, or understate productivity declines.

It follows that forecasting productivity growth on the basis of opex MPFP estimates is unlikely to afford a DNSP a reasonable opportunity to recover its efficiently incurred costs and derive a normal return. To mitigate these risks, in our opinion forecast productivity growth should be set at the lower end of the range of expected productivity growth outcomes.

[19] TasNetworks, *Network Innovation*, December 2015, p.9.

[20] AER, *Explanatory Statement – Expenditure Forecast Assessment Guideline*, November 2013, p 70.

4.2 Productivity changes for DNSPs operating most efficiently

In this section we explain that, to avoid a potential upwards bias, productivity growth should be forecast by way of reference only to those DNSPs taken to be operating most efficiently over the historical evaluation period. This mitigates the risk of conflating 'catch up' and 'frontier shift'.

4.2.1 Risk of conflating 'catch up' and 'frontier shift'

An observed historical change in a DNSP's opex productivity may reflect:

- a movement from a less-efficient position towards the productivity frontier, ie, 'catch up'; and/or
- a movement that reflects a shift in the productivity frontier, ie, 'frontier shift'.

This has important implications for forecasting productivity changes since, as the AER explains:[21]

> …the forecast productivity change included in the rate of change should represent the forecast shift in the productivity frontier.

Observed historical changes in opex productivity will overstate historical shifts in the productivity frontier to the extent those observations reflect DNSPs (operating less efficiently at the time) 'catching up' to the productivity frontier. For this reason, the AER correctly recognised that[22]

> If there is a wide spread and more even distribution of efficiency levels then the effects of catch-up could be excluded by limiting the sample for the estimation of the opex cost function to the relatively efficient NSPs.

Given this potential source of upwards bias in the forecast of productivity change we consider below the extent to which observed historical changes in opex productivity are likely to reflect DNSPs 'catching up' to the productivity frontier.

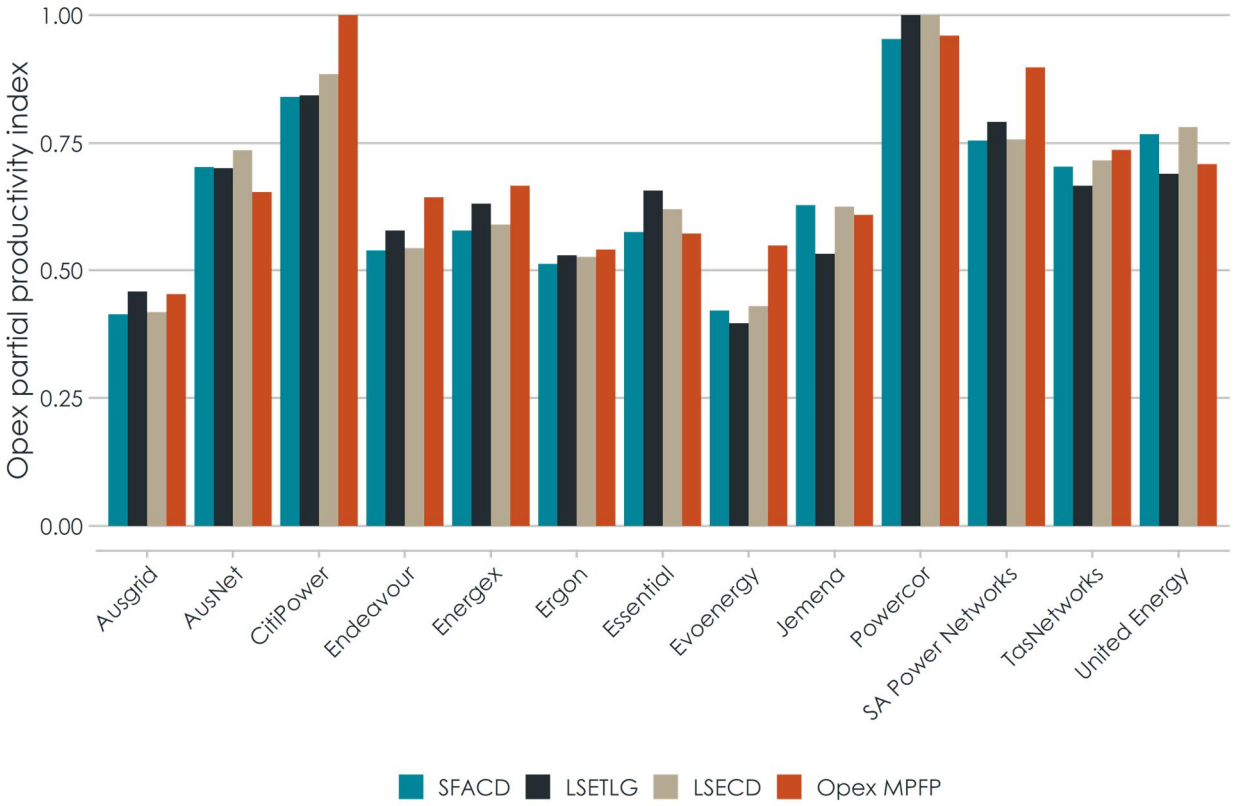
4.2.2 A number of DNSPs have been 'catching up' to the frontier

The AER's 2018 benchmarking report presented average opex efficiency scores for DNSPs over the eleven year period to 2017. To assess the likelihood that some DNSPs were catching up to the productivity frontier over this period we evaluate the relative spread of these average efficiency scores, which we present in Figure 3.

[21] AER, *Explanatory Statement – Expenditure Forecast Assessment Guideline*, November 2013, p.70.

[22] AER, *Explanatory Statement – Expenditure Forecast Assessment Guideline*, November 2013, p.90.

Figure 3 – Average opex efficiency scores (2006 to 2017)



Source: HoustonKemp analysis of Economic Insights DNSP opex efficiency scores data. See: Economic Insights, Economic benchmarking results for the Australian Energy Regulator's 2018 DNSP annual benchmarking report, November 2018, p.25.

The analysis from the AER's benchmarking report (presented above) shows a wide spread in opex efficiency scores and suggests that a number of DNSPs were operating below their efficiency potential over the 2006 to 2017 period.

Consistent with this observation, we are aware of a number of DNSPs that have undertaken efficiency-enhancing activities directed at 'catching up' to the productivity frontier.

The opex cost savings arising from the business restructuring undertaken by Ausgrid and Endeavour Energy in recent years, which we describe in section 2, are strong examples of DNSPs making significant strides towards the productivity frontier over this period. Similarly, Evoenergy reduced its FTE staff levels by a comparable magnitude (approximately 20 per cent) and Essential Energy removed approximately 1,000 FTE positions over the 2012 to 2016 period.

Unless there was some innovation that significantly reduced FTE staff requirements, a DNSP operating efficiently would not be able to achieve a FTE staff reduction of this magnitude without compromising its service levels.

4.2.3 Conclusion

The available evidence shows a wide spread of efficiency scores for DNSPs over the 2006 to 2017 period, and so a number of DNSPs are likely to have been 'catching up' to the productivity frontier. Indeed, the recent productivity improvements achieved by DNSPs in NSW and the ACT could not be achieved by a firm operating efficiently unless there was some innovation that fundamentally changed the level of FTE staff required by all DNSPs.

Forecasting opex productivity changes by reference to the productivity changes realised by DNSPs that were operating less efficiently (in the past) will exacerbate the risk of conflating 'catch up' and 'frontier shift' and, in turn, risk:

- overestimating the productivity change that could be achieved by a DNSP operating efficiently, ie, the shift in the productivity frontier; and
- not affording DNSPs a reasonable opportunity to recover its efficient costs and derive a normal return.

Consistent with the AER, we therefore conclude that opex productivity change should be forecast having regard to observed historical changes in productivity for only those DNSPs taken to be operating efficiently over the 2006 to 2017 period.

4.3 Longest available evaluation period

In this section we consider the evaluation period over which observed historical changes in productivity should be assessed when forecasting opex productivity changes.

The reliability of forming future expectations by way of reference to historical observations generally rests on the extent to which the circumstances underpinning those observations are likely to persist in the future. The AER explains that it:[23]

> …generally consider[s] past performance to be a good indicator of future performance under a business-as-usual situation.

4.3.1 Historical observations of opex productivity are volatile

Shifts in the productivity frontier are driven by innovation, which, by its nature, is inherently difficult to predict.

The effect of future innovations on opex productivity will depend on their form, the rate at which they are adopted and their effect on the opex requirements of each DNSP. There exists considerable uncertainty as to each of these considerations.

Further, endeavours to achieve innovation are not guaranteed of success, and so give rise to a risk of a decline in opex productivity. DNSPs have in the past highlighted the risk of pursuing productivity-enhancing activities[24] and, similarly, the Reserve Bank of Australia Governor, Philip Lowe, explains that:[25]

> Innovation requires someone to take a risk… the risk of spending scarce resources to explore a new idea. Sometimes the effort will not pay off, but just occasionally it will...

It follows that the pursuance of innovation and the rate at which recent innovations are adopted by DNSPs will depend on their varying appetites for bearing risk. Further, even if the rate at which a particular innovation was to be adopted was known in advance, its effect on opex productivity would still be difficult to predict since it would depend on the particular DNSP's circumstances, eg, the environment in which it operates (eg, rural or urban) and its existing operational processes.

It is for these reasons that shifts in the productivity frontier, driven by innovations, are inherently difficult to predict. This observation is marked by the year-to-year volatility in, and diversity in drivers of, opex productivity over the 2006 to 2017 period.

We illustrate the high degree of volatility in measures of opex productivity over time in Figure 4, which presents each DNSP's opex MPFP scores over the 2006 to 2017 period from the AER's 2018 benchmarking report, standardised to a value of one in 2006. It is clear from this apparent volatility that the adoption of

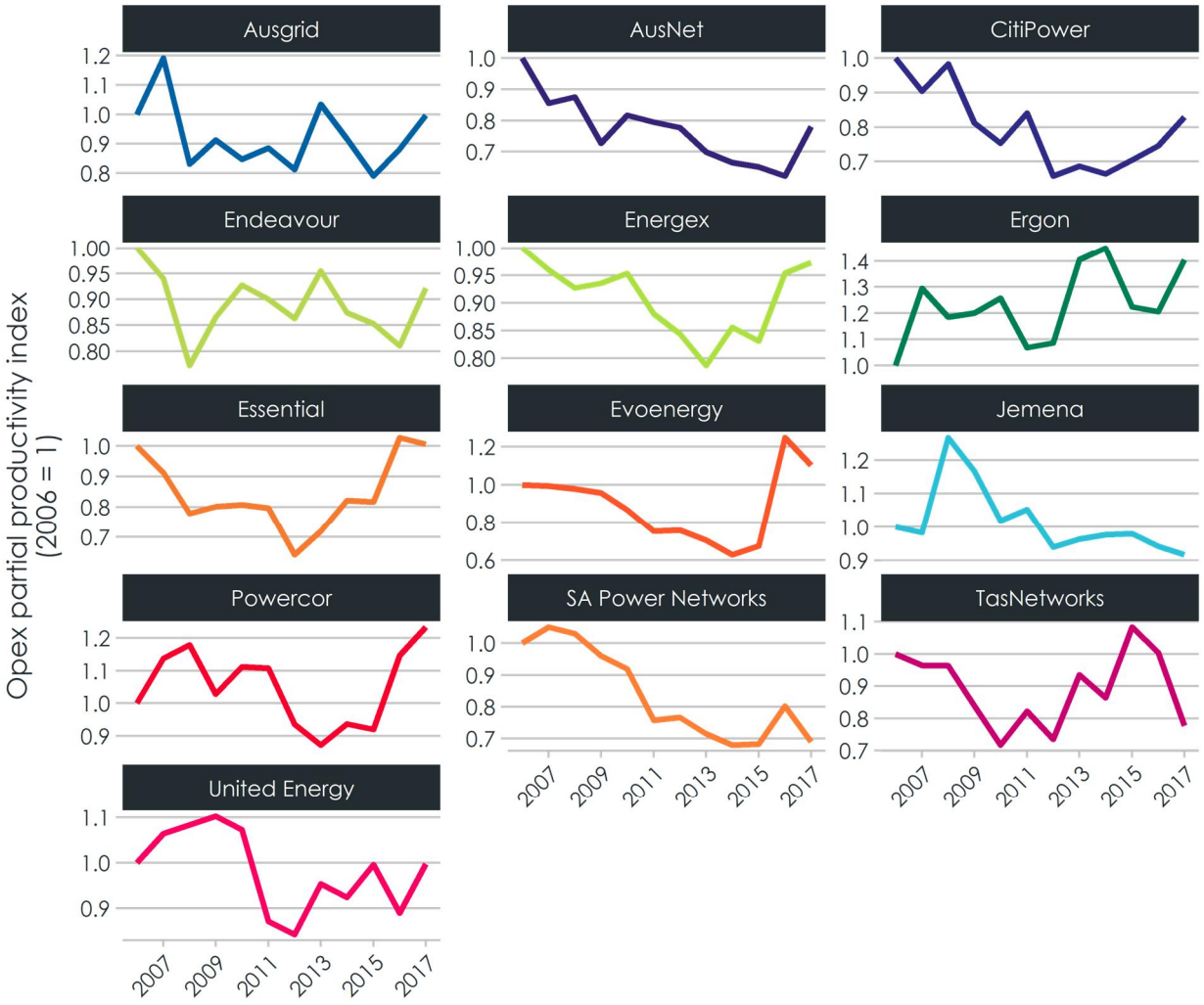
[23] AER, Draft Decision – TasNetworks distribution determination 2017−18 to 2018−19 – Attachment 7 – Operating expenditure, September 2016, p.7-15.

[24] TasNetworks, Network Innovation, December 2015, p.9.

[25] ABS, Innovation in Australian Business, 2003.

various shorter evaluation periods over this period has the potential to suggest markedly different trends in opex productivity for each DNSP.

Figure 4 – The AER's opex partial factor productivity results, standardised scale (2006 to 2017)



Source: HoustonKemp analysis of Economic Insights DNSP opex efficiency scores data. See: Economic Insights, Economic benchmarking results for the Australian Energy Regulator's 2018 DNSP annual benchmarking report, November 2018, p.17.

Similarly, our experience suggests that:

- the drivers of opex productivity are not consistent through time; and
- at any particular time, those drivers vary across DNSP.

By way of example, a number of DNSPs improved opex productivity in relation to their call centre operations over the 2011 to 2016 period, but the drivers of those improvements were varied.[26] Similarly, some DNSPs

[26] See, for example, AusNet, *AusNet Electricity Services Pty Ltd: electricity distribution price review 2016-20,* April 2015, p 174; Jemena, *Jemena 2015 – annual reporting RIN – financial information,* tab *8a. Operating(T),* August 2014; and Energex, *Energex 2014-15 annual reporting RIN – financial information,* tab *10. Operating costs,* August 2014.

have improved opex productivity by means of a common driver, eg, improved contract negotiations, but leveraged that driver of productivity at different times.[27]

4.3.2 Conclusion

In light of the apparent volatility in opex productivity from year-to-year and the absence of consistent productivity drivers – both through time and across DNSPs – regard should be had to observed historical changes in opex productivity over the longest available time frame, unless there is a robust reason to do otherwise.

This conclusion is consistent with the approaches applied to estimate total factor productivity (TFP) for the distribution sector in the United States and Canada. In the United States, very long term estimates of TFP are derived for application as the 'X factor' in price cap plans. Similarly, a report commissioned by the Ontario Energy Board highlighted that:[28]

> In most regulatory proceedings where TFP trends have been estimated using indexing methods, long-run TFP trends have been estimated using about 10 years worth of historical data. The Board used a somewhat longer, 18 year period to measure industry TFP growth…
>
> …it is often not warranted to assume that TFP growth measured for short historical periods will be a good proxy for future trends. Shorter sample periods are more likely to be distorted by factors such as the timing of expenditures or unusual output growth. …a general rule of thumb in regulatory proceedings is that a minimum of 10 years of data are needed to calculate a generally reliable estimate of the industry's long-run TFP trend.

Similarly, a report prepared for the Australian Energy Market Commission noted that:[29]

> Since TFP growth rates fluctuate yearly, it is preferable to use the longest historical time period possible to conduct the TFP study.

Further, our conclusion has parallels with the AER's recent draft decision on its *Rate of Return Guideline* to estimate the market risk premium – which is subject to considerable volatility – by reference to an assessment of historical returns over an extended period ranging from 29 years to 80 years in length.[30]

A further reason for adopting a long-term view is that the net effect of opex productivity enhancing activities can only be assessed over an extended horizon, since the full benefit may not be realised for a number of years and may be preceded by a temporary decline in productivity, ie, due to upfront costs or transitional challenges. In section 4.1 we explain that forecast productivity growth must reflect the *net effect* of productivity-enhancing activities.

Indeed, it is clear from the volatility in standardised opex scores presented at Figure 4 that a short term assessment of productivity, say, over a four year period, at various times over the 2006 to 2017 period could have suggested substantially different trends in opex productivity.

Against this backdrop, unnecessarily shortening the evaluation period would:

- risk placing an undue weight on productivity changes realised in a particular year or by a particular DNSP;

[27] See, for example, Endeavour Energy, *AER submission – ICT Investment Plan*, May 2014 p.26 and p.54; AusNet, *AusNet Electricity Services Pty Ltd: electricity distribution price review 2016-20,* April 2015, p 174; and SAPN, *SAPN 2014-15 – annual reporting RIN – financial information,* tab *10. Operating costs*.

[28] Pacific Economics Group, *Defining, measuring and evaluating the performance of Ontario Electricity Networks: a concept paper – report to the Ontario Energy Board*, April 2011, p.49.

[29] Brattle Group, *Use of total factor productivity analyses in network regulation: case studies of regulatory practice,* October 2008, p 4.

[30] The AER gives most weight to 'historical excess' returns in estimating the MRP and evaluates those returns over a period dating back to 1937. The AER did however note that it places less weight on estimates using data before 1958, due to concerns with data reliability. See: AER, *Draft Rate of Return Guidelines – Explanatory Statement*, July 2018, p.209-216

- risk not capturing the *net effect* of productivity enhancing activities, which often involve up-front costs and efficiency improvements that are realised in future years; and
- exacerbate the risk of forecasting error and of not affording a DNSP a reasonable opportunity to recover its efficient costs.

In our opinion, a balance of emphasis should only be placed on more recent observations if there exists strong evidence:

- that more recent observations do not reflect DNSPs catching up to the frontier, as discussed in section 4.2;
- the drivers of the observed shifts in opex productivity are likely to persist into the future;
- the net effect of those drivers on a DNSP's future opex requirements will be consistent with their observed historical net effect; and
- that doing so will not compromise the statistical robustness of the empirical analysis.

Consumer Challenge Panel's submission

The Consumer Challenge Panel's (CCP's) submission on the NSW DNSPs' regulatory proposals on opex productivity suggests that the 2006 to 2012 period should be removed from the empirical analysis so as to avoid any potential bias arising from changes in regulatory obligations in NSW and Victoria over that period.[31] The AER previously also highlighted the 'higher reliability standards in NSW and Queensland' as likely factors contributing to the decline in industry-wide productivity over the 2006 to 2012 period.[32]

However, the average opex MFPF scores presented in the AER's 2018 Annual Benchmarking Report suggest DNSPs in NSW and Queensland were likely to have been 'catching up' to the productivity frontier over that period. For the reasons we explain in section 4.2, considerations relevant to those DNSPs 'catching up' to the productivity frontier – including as relevant to the appropriate evaluation period – should not inform the forecast of opex productivity change.

Rather any analysis relevant to the appropriate evaluation period should relate to those DNSPs taken to be operating efficiently over the evaluation period. To that end, we note the change in regulatory obligations for Victorian DNSPs (some of which are likely to be in the 'efficient subset') following the 2009 Black Saturday bushfires.

An analysis of the effect on opex efficiency of the change in regulatory obligations in Victoria by reference to the above criteria is beyond the scope of this report. However, we observe that TasNetworks and SAPN, which were not subject to those changes in regulatory obligations and were operating relatively efficiently over the 2006 to 2018 period,[33] experienced the same declining trend in opex productivity that, for DNSPs in Victoria, the CCP attributes to changes in regulatory obligations.

It would also be relevant to consider whether the observed declining trend in opex productivity reflects the experience of DNSPs in other countries.

In summary, given the volatility in opex productivity that we illustrate in Figure 4 and the resulting potential for shorter evaluation periods significantly to compromise the reliability of the empirical analysis, strong evidence would be required to justify disregarding over half of the period for which data is available.

[31] CCP10, *Response to AER Issues paper and revenue Proposals for NSW Electricity Distribution Businesses 2019-24*, August 2018, p.31.

[32] AER, Annual benchmarking report – electricity distribution network service providers, November 2017, p.42.

[33] See the average opex efficiency scores from the AER's 2018 annual benchmarking report presented in Figure 3.

5. Conclusion

We explain in section 3 that the AER's framework for evaluating a DNSP's proposed opex allowance has important implications for forecasting productivity growth, ie:

- forecast productivity growth should reflect expectations as to the productivity change that could be achieved by a DNSP operating efficiently – the expected shift in the productivity frontier;
- forecast productivity growth must reflect the *net effect* of productivity enhancing activities, taking into all expenditure underpinning observed changes in productivity; and
- any upwards bias in forecast productivity growth risks not affording a DNSP a reasonable opportunity to recover its efficiently incurred costs and to derive a normal return.

We conclude from our assessment of the AER's framework that the forecast of opex productivity change must be guided by three methodological principles. We summarise and comment on the application of these methodological principles below.

Productivity growth should be set at the lower end of expected productivity outcomes

We explain in section 4.1 that productivity enhancing activities often involve incurring up-front capital expenditure, which is not reflected in the opex MPFP analyses relied upon by the AER to measure historical changes in opex productivity. Not accounting for the capital cost of observed historical opex productivity changes risks overstating opex productivity improvements or, alternatively, understating any decline in productivity.

Given the risks arising from overstating productivity growth (as highlighted above) this consideration gives rise to our first methodological principle – that productivity change should be set at the lower end of expected productivity change.

Productivity growth should be forecast by reference to a subset of DNSPs operating efficiently over the evaluation period

We observe in section 4.2 that a number of DNSPs have in the past been operating below their efficiency potential and that having regard to the observed historical opex productivity changes realised by those DNSPs will exacerbate the risk of conflating 'catch up' with 'frontier shift'. We agree with the AER that, to mitigate this risk and the resulting potential upwards bias in forecast productivity change, productivity growth should be forecast by reference to observed historical changes in opex productivity for only those DNSPs taken to be operating efficiently over the evaluation period.

Productivity growth should be evaluated over the longest available timeframe

In section 4.3 we highlight the inherent uncertainty in forming expectations as to the innovations that will shift the opex productivity frontier, the dynamic and diverse drivers of opex productivity and the volatility in opex productivity from year-to-year. Against this backdrop, regard should be had to observed historical changes in opex productivity over the longest available time frame, absent any robust reason to do otherwise. This will mitigate the risk of placing inappropriate weight on the drivers of productivity (and their effects) in a particular year or for a particular DNSP.

For completeness, in section 4.3.2 we set out necessary criteria to be met if any emphasis is to be placed on more recent observations of productivity growth.

5.1 Application of methodological principles

For the reasons summarised above and explained in this report, in our opinion forecasting opex productivity growth by reference to observed historical opex MFPF scores should be undertaken:

- by reference to observed historical opex productivity changes realised by those DNSPs operating most efficiently over the longest timeframe for which data is available; and
- by setting a point estimate at the lower end of expectations as to future productivity growth.

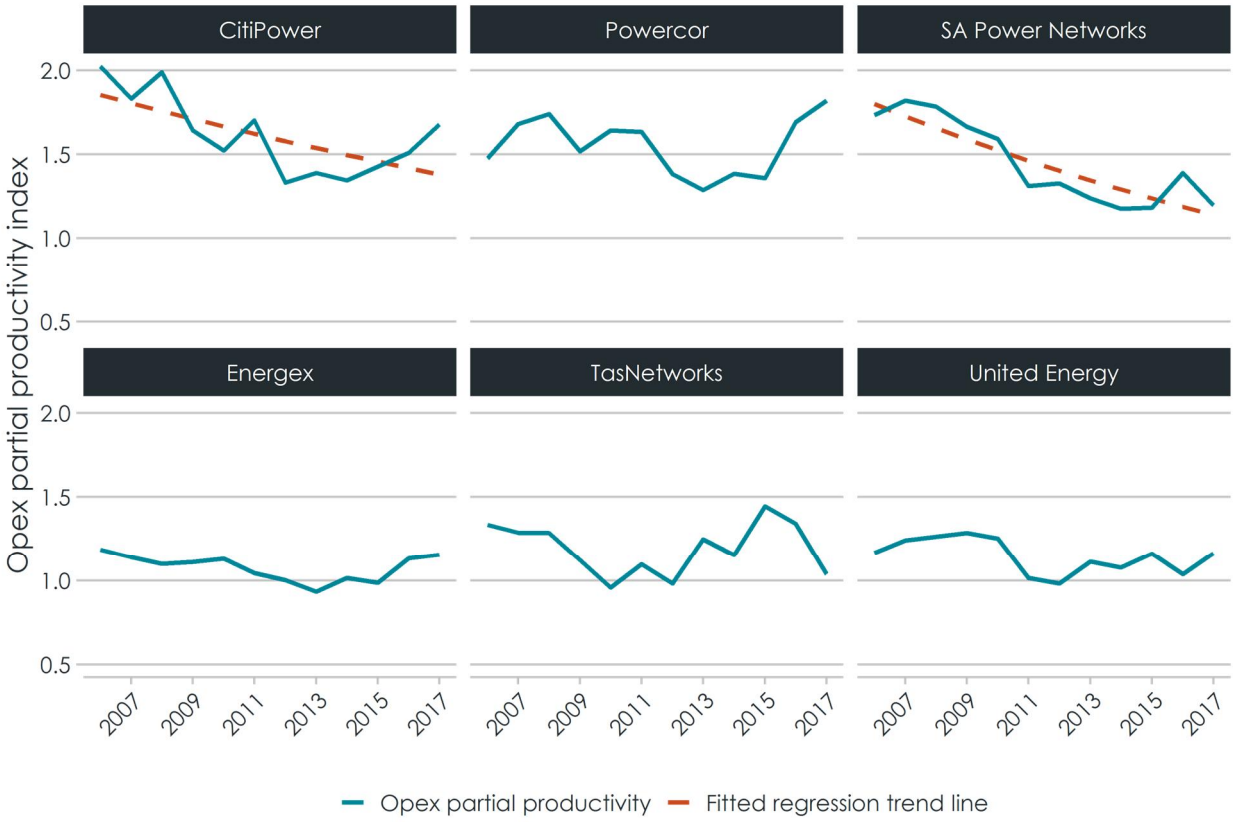
One approach to identifying those DNSPs operating efficiently in the past is by reference to the 0.75 opex efficiency score threshold previously adopted by the AER.

Our analysis of the data presented in AER's 2018 benchmarking report suggests three DNSPs – CitiPower, Powercor and SAPN – had average opex MPFP scores above 0.75 over the 2006 to 2017 period. The trend in opex productivity for CitiPower and SA Power Networks is negative and statistically significant, whereas the trend for Powercor is broadly flat over the 2006 to 2016 period and not statistically significant. We illustrate the opex MPFP scores for these DNSPs in the top row of Figure 5.

There are three other DNSPs that have opex efficiency scores very close to 0.75 over the 2006 to 2017 period and so we include these firms in our 'efficient subset' so as to mitigate any risk that might arise from placing too great an emphasis on particular DNSPs. These firms are included in the bottom row of Figure 5.

In Figure 5 we present the trend in opex MFPF scores for these six DNSPs over the full period for which data is available.

Figure 5 – Opex MPFP results for DNSPS taken to be operating efficiently (2006 to 2017)[34]



Source: HoustonKemp analysis of Economic Insights DNSP opex efficiency scores data. See: Economic Insights, Economic benchmarking results for the Australian Energy Regulator's 2018 DNSP annual benchmarking report, November 2018, p 17. Note: we undertake the regression analysis using the regression-based trend method as per Economic Insights, Memo on transmission multilateral total factor productivity results, April 2016, p 5.

The opex MPFP scores for these DNSPs are declining or broadly flat over the 2006 to 2017 period. Further, two of the three DNSPs that are least likely to have been catching up to the productivity frontier – CitiPower and SA Power Networks – realised a negative trend in opex productivity that is statistically significant at the five per cent level.

However, persistent declines in productivity would not be expected to arise in a workably competitive market. Notwithstanding the principle of setting productivity growth at the lower end of expected outcomes, in our opinion, it would be more appropriate to apply a zero opex productivity growth rate based on this evidence, consistent with previous distribution determinations by the AER.

[34] Includes trend lines that are statistically significant at the five per cent level.

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