Report on Efficiency

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Office of Local Government Guidelines (2020, p. 10) call for local governments to 'present their productivity improvements and cost containment strategies in the context of ongoing efficiency measures and indicate if the ongoing efficiency measures have been incorporated in the council's Long Term Financial Plan'.

This report investigates the relative technical efficiency for Cootamundra-Gundagai Regional Council (CGRC). I commence with a brief account of efficiency placing an emphasis on how efficiency might be expected to affect taxation and financial sustainability respectively. I then conduct an empirical analysis of relative efficiency over the period 2012 to 2020 inclusive in order to establish the 'efficiency context' (OLG, 2020, p. 10). As part of this analysis I compare CGRC to various peer groups. Following this, I examine the determinants of relative technical efficiency, which is important for understanding the potential for CGRC to realise greater efficiencies in the future. Thereafter, I present a list of executed and proposed efficiencies as provided by CGRC. I conclude with my professional opinion regarding the effectiveness of extant and proposed efficiency measures at CGRC.

1. The Economic Concept of Efficiency

There are three main kinds of efficiency that are recognised by economists. It is thus important for us to establish at the outset what it is that the Office of Local Government (OLG) intends local governments to report on in special rate variation applications.

The first type of efficiency is allocative efficiency. Allocative efficiency refers to the appropriate selection of inputs such that wants can be satisfied. Ultimately allocative efficiency is the product of the political process and is thus probably not the intended focus of the OLG (2020) Guidelines.

A second kind of efficiency is technical efficiency, also known as X-efficiency. Technical efficiency refers to the conversion of inputs into outputs. In a local government context inputs include items of operating expenditure (money) and staff time. Outputs include all of the goods and services produced by a given local government. Moreover, when considering technical efficiency one needs to be clear about the orientation employed. Output orientated technical efficiency refers to the additional outputs that might be expected to be produced from a given set of inputs (assuming that the local government under analysis is not perfectly efficient). It is not a particularly helpful concept for local government analysis because the amount of goods and services required are set by community need and want, not local government production potential (indeed, most people would not consider a local government that produced more goods and services than was wanted, to be an effective local government). Thus, economists instead generally focus on input orientated technical efficiency, which refers to the potential reduction in inputs that might be possible given a set of fixed outputs.

All things considered, more technically efficient local governments should consume less resources to produce the set of goods and services required by the community. Thus, a more technically efficient local government ought to require relatively less revenue to satisfy community demand, *ceteris paribus*. However, we must remain mindful of the fact that taxation is only one part of the revenue pie for a local government (for the 2020 financial year tax contributed just 17.24% to CGRC's revenue). It is therefore entirely possible that movements in other revenue streams – such as intergovernmental grants, fees or charges – could completely negate the

relatively marginal effect that improvements to efficiency might otherwise exert. In addition, it has also been suggested that improved technical efficiency might result in better financial sustainability, although the scholarly evidence has demonstrated that this association is rather weak and small (Drew et al., 2015a). In particular, it has been shown that it would take many years, if not decades, for the rather marginal effects of potential improvements to technical efficiency to have a material effect on financial sustainability (Drew et al., 2015a).

The final kind of efficiency is dynamic efficiency. Dynamic efficiency refers to improvements in production processes that might be expected to emerge over time in response to things such as better technology, processes, legislation, and the diffusion of best practice. Clearly it is advantageous for local governments to pursue dynamic efficiencies, although it must be recognised that many of the drivers of dynamic efficiency lay outside of the control of individual local governments. Moreover, improvements to dynamic efficiency can take many years to emerge.

In sum, it seems that the Office of Local Government (2020) Guidelines might be reasonably interpreted to refer to an input oriented consideration of technical efficiency. In the section that follows I outline the most appropriate empirical technique for establishing the efficiency context as well as presenting the first suite of results from my various analyses.

2. Comparative Analysis of Relative Technical Efficiency

Data Envelopment Analysis (DEA) is the most appropriate empirical technique for assessing relative technical efficiency (see Cooper et al., 2007 or Coelli et al., 2005 for a thorough introduction to the methodology).

Essentially DEA is an extension of the output-input ratios that most of us are familiar with (for example kilometres per hour, or expenditure per person). Specifically, DEA allows for both *multiple* inputs and outputs thus allowing scholars to overcome some of the serious and well-known limitations to ratio analysis.

A good way to understand the limitations of ratio analysis is to consider some of the problems identified with the 'efficiency' ratio employed by the OLG for the Fit for the Future work. This ratio divided operational expenditure by the estimate of population for each local government area in an attempt to understand trends in efficiency. However, the ratio was heavily criticised in the scholarly literature (see Drew and Dollery, 2015). Specifically it was argued that use of the ratio as an efficiency measure required at least three, rather implausible, assumptions to be entertained:

1. That the single largest item of local government expenditure (roads) is positively associated with population (in fact, the opposite is true – roads are negatively correlated at -0.2542[1]).
2. That local governments mainly provide services to individual persons – when indeed many services are provided to households and businesses.
3. That the same level of services are provided to various kinds of assessments such as residential, businesses, and farm businesses. This is simply not the case.

Clearly it is not possible to reasonably hold to these three assumptions. Thus, we need to employ a technique that can discriminate between the different kinds of services supplied to various categories of taxpayers, as well as take account of the single largest item of expenditure (roads; Drew, 2020). Accordingly, in the empirical work that follows I conduct DEA specified as follows:

[1] That is, as population increases, road lengths tend to decrease – not surprising given population densities in rural local government areas.

Inputs = Staff Expenditure + Other Expenditure[2]

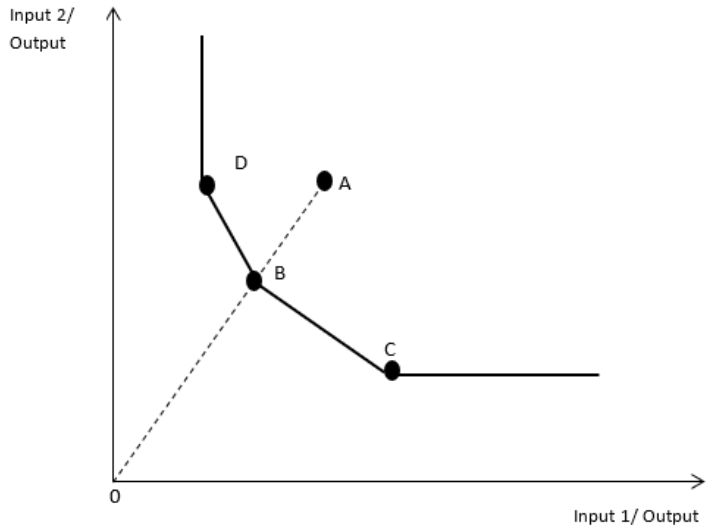
Outputs = Number of Businesses + Number of Households + Number of Farms + Length of Sealed Roads (km) + Length of Unsealed Roads (km)[3]

DEA is calculated by applying variable weights to the multiple inputs and outputs. It then uses the local governments with the best weighted ratio outcomes as peers to establish an efficient frontier against which the weighted performance of relatively less efficient local governments can be compared. This is why we speak of 'relative' technical efficiency when discussing DEA – scores are relative to the best performing local governments in a given analysis.

The easiest way to understand DEA is to consider its graphical interpretation. Figure 1, below, depicts an input orientated (constant returns to scale (CRS)) DEA. In this example we can see that local governments D, B, and C form a frontier that 'envelopes' less efficient local governments (such as Council A) lying in its interior. Local governments lying on the frontier are considered perfectly efficient relative to the other Councils under analysis and are assigned a score of 1.0. The relative efficiency of local governments in the interior is then assessed according to the ratio of the radial distances and are assigned scores that lie between 0 and 1 (sometimes these scores are multiplied by one hundred to allow people to think of them in terms of percentages). Thus, if the DEA allocated a score of, say, 0.65 to local government A then this would suggest that the Council ought to be able to produce the required outputs with approximately thirty-five percent less inputs.

[2] It is important to separate out staff and other expenditure because different combinations of input factors will result in different efficiency outcomes (Drew, 2020).
[3] It is important to separate out the two main types of road surfaces because they clearly involve different maintenance schedules.

Figure 1. Input-Orientated DEA



In some situations it is important to conduct a VRS (variable returns to scale) analysis. A VRS DEA introduces an additional constraint into the linear programming to ensure that local governments are only benchmarked against peers of a similar size. This is important to do when one is making direct comparisons with other local governments and wants to eliminate the effect of size[4] on efficiency.

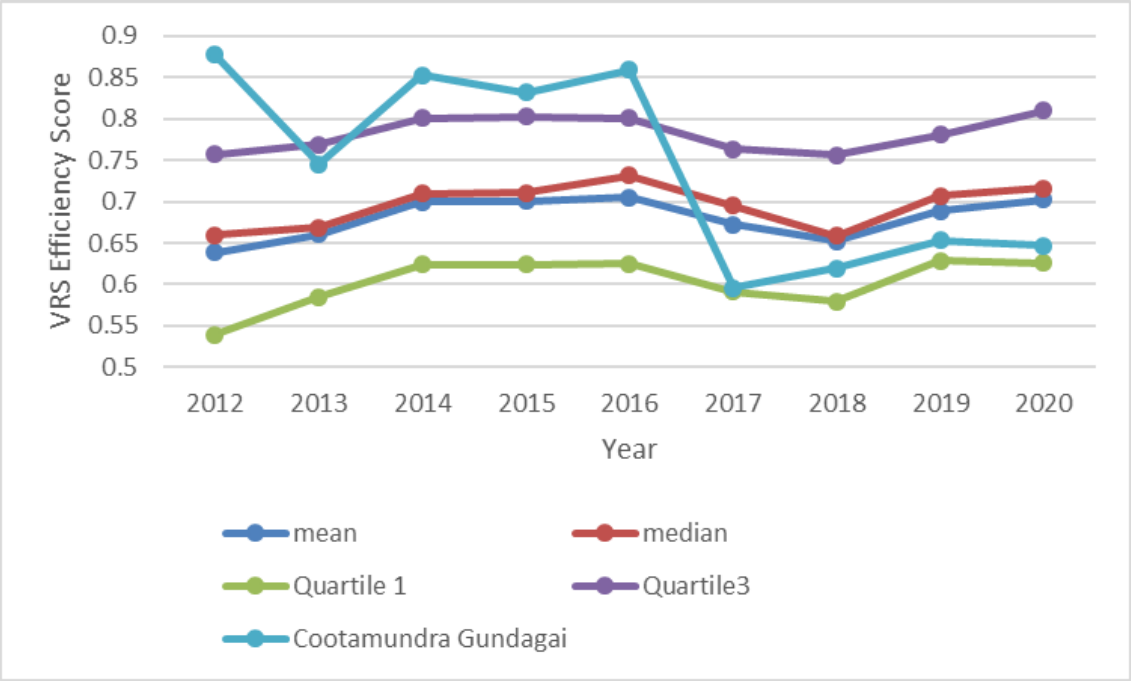
I conducted a number of bootstrapped[5] intertemporal VRS DEA (with two year windows) for Cootamundra-Gundagai and its peer group over the period 2012 to 2020 inclusive. Intertemporal DEA is the best way to isolate technical efficiency and hence avoid conflation with dynamic efficiency changes. It is also one of two methods suitable for making comparisons over time (as required by the OLG (2020) Guidelines; see Cooper et al., 2007 for a thorough discussion of intertemporal analysis).

In Figure 2, below, I chart the efficiency of Cootamundra-Gundagai Regional Council[6] from the 2012 financial year up to the most recent data (2020). I also chart measures of central tendency[7] for the other local governments in the relevant cohort.

[4] Notably the effect of size on efficiency might be either positive or negative. For example, in Councils which are greater than optimal size, economists expect scale to have a negative effect on efficiency.
[5] Bootstrapping is a probabilistic routine developed to deal with uncertainty such as that created due to the absence of some of the financial data for Councils that have been granted an extension to the due date for preparing 2020 financial year audited financial statements.
[6] I have followed the standard practice of combining all fiscal and demographic data for the two councils for the period prior to amalgamation so that fair comparisons can be made.
[7] The mean is the average. Quartile 2, or the median, is the middle score when all efficiency scores are ranked in ascending order. Quartile 1 is the middle of the first half, whereby twenty-five percent of

Relative to all other New South Wales rural local governments CGRC mostly had above typical efficiency prior to the 2016 amalgamations. Indeed, its relative technical efficiency was in the top quartile of performers in four of the five years prior to amalgamation. However, as illustrated in Figure 2, CGRC dropped down to the bottom of the second quartile following amalgamation. Since this time CGRC has mostly been in an upwards trajectory relative to the peer group and has widened the gap between Quartile 2 and itself over time. This story is consistent with the peer-reviewed scholarly literature which predicted diseconomies of scale for most of the proposed amalgamations prior to the 2016 treatment and has since demonstrated increased unit costs in the order of 11.2% p.a. for the three years subsequent to the event (see Drew et al., 2015b; McQuestin, Miyazaki and Drew, 2020).

Figure 2. Relative Technical Efficiency of Cootamundra-Gundagai Compared to all NSW Rural Local Governments, 2012-2020.

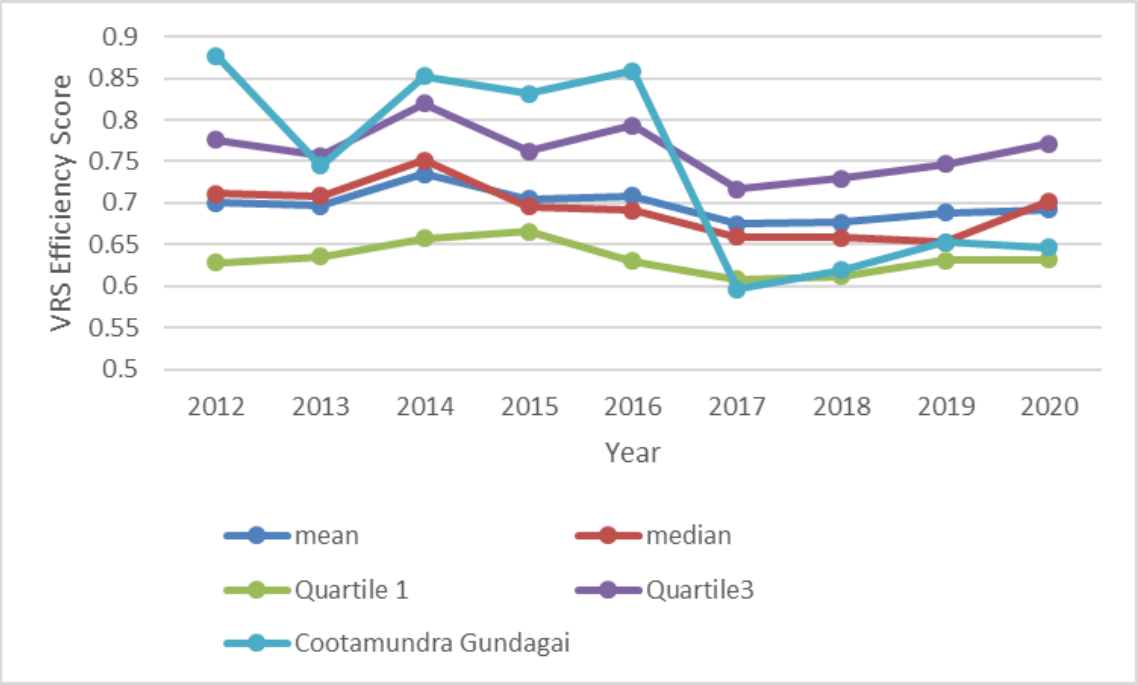


In Figure 3 I chart only the other OLG11 (large rural councils) efficiency scores. A similar story emerges – prior to amalgamation CGRC was regularly in the top quartile of efficiency performers, but since this time has mostly occupied the second quartile. Notably this chart also demonstrates significant improvement to efficiency since 2017, although it has tapered off, in a relative sense, in the most recent

local governments fall below this level of performance. Quartile 3 is the middle of the second half, and indicates the point at which the top twenty-five percent of performers first emerge.

financial year. It should be noted that 2020 is what is referred to as a 'boundary year' (it is only assessed once in the two-year window sequential analysis) and may be subject to a little uncertainty. The main thing to note is that CGRC has improved its' relative position with respect to technical efficiency since 2017. This achievement is quite noteworthy given that many of the other OLG11 councils were *not* subjected to the deleterious effects of amalgamation. Moreover, it is important to note that the significant cost-cutting that occurred from July 2020 onwards is not yet reflected in the analysis (because it won't be reported until the 2021 financial year statements become available).

Figure 3. Relative Technical Efficiency of Cootamundra-Gundagai Compared to OLG11 Local Governments, 2012-2020.



Thus, it can be seen that Cootamundra-Gundagai Regional Council has been doing a lot of hard work in terms of mitigating the deleterious effects of the 2016 amalgamations on relative technical efficiency. Moreover, recent significant efforts (saving over $2 million annually, as detailed in the Long Term Financial Plan) have yet to be reflected in the efficiency analysis. When these savings become evident, after the completion of the 2021 financial year statements, I expect that CGRC will rise to the third quartile of efficiency performers relative to other OLG11 local governments, albeit not at the heights it achieved prior to the 2016 amalgations. To fully comprehend the good work that has been done to date (and what might be

achieved in the future) we need to understand the determinants of efficiency – this is the task to which I now turn my attention.

3. Determinants of Technical Efficiency

It is important to understand what drives technical efficiency for rural local governments given that scholars have long-recognised that operating environment can prove determinative at a jurisdictional level of analysis (Drew, 2020). Moreover, comparing the determinants of efficiency to the actual characteristics of CGRC can give us greater insights into the post-amalgamation efficiencies realised thus far, and also provide us with guidance regarding the potential for further technical efficiency gains in the future.

To understand the determinants of efficiency it is common scholarly practice to conduct what is referred to as a second-stage multiple regression analysis (see, for example, Drew et al. 2015c). To do so, one takes CRS efficiency scores (recall CRS does not adjust for the size of a local government entity) and regresses this against various potential determinants (including population size which was a key focus of the Fit for the Future reforms, hence the need to use CRS DEA).

In Table 1 I list the definitions and measures of central tendency used in the multiple regression analysis that follows.

Table 1. Definitions and Means of Variables, 2018-2020

Variable	Definition	Mean
Rates		
Efficiency score	The constant returns to scale efficiency score.	0.602
Regressors		
Population (ln)	The natural log of the population.	8.861
Population density	Population divided by the area enveloped within the local government boundary.	2.029
Mean employee income	Mean employee income (lagged), divided by 10,000.	4.698
Mean unincorporated business income	Mean unincorporated business income (lagged), divided by 10,000.	2.515
Aged (ln)	Proportion of people on an Aged pension, logged.	2.579
DSP (ln)	Proportion of people on a Disability Support pension, logged.	1.475
Newstart	Proportion of people on a Newstart allowance.	3.918

Carer (ln)	Proportion of people on a Carers' pension, logged.	0.370
Single (ln)	Proportion of people on a Single Parent pension, logged.	0.417
Under 15	Proportion of people under the age of 15.	19.933
ATSI	Proportion of Aboriginal and Torres Strait Islander people.	10.204
NESB	Proportion of people of a non-English speaking background.	2.679
Total grants	Total financial assistance grants divided by 1,000.	4,746.78
IPPE (ln)	Total value of Infrastructure, Property, Plant and Equipment as recorded in the audited financial statements.	12.722
Dummy variable: Year	A control for the three respective years analysed.	
Dummy variable: Amalgamated	A control for whether or not a given local government was subject to the 2016 forced amalgamation.	

Multiple regression analysis examines the mean response in a dependent variable (in this case CRS efficiency) with respect to various independent variables that are postulated to be associated with the former. The econometric analysis that follows can be specified as:

$$\mathbf{C} = \alpha + \beta_1\mathbf{S} + \beta_2\mathbf{L} + \boldsymbol{\mu}.$$

In this specification **C** (the dependent variable) is the constant returns to scale efficiency score for each council in each year, **S** is a vector of relevant socio-demographic characteristics of the community, and **L** is a vector of local government characteristics. Mu (**μ**) is an independent identically distributed random error term. Notably natural log transformations were executed where required to correct for skewed distributions as detailed in Table 1. All standard econometric tests were conducted and the residuals were confirmed to be near-normal in distribution (an important assumption for valid statistical reasoning). The regression includes all rural councils in the state for the years 2018 to 2020, inclusive.

Table 2. Multiple Regression Results, All Rural Councils, 2018-2020 inclusive.

Population (ln)	-0.798
	(0.642)
Population Squared (ln)	0.062+
	(0.034)
Density	0.009
	(0.006)
Under 15	-0.011
	(0.008)
Aged Pension (ln)	-0.118
	(0.080)
DSP (ln)	-0.106
	(0.084)
Mean employee income	-0.011
	(0.023)
Mean unincorporated income	-0.019
	(0.021)
IPPE (ln)	-0.149**
	(0.037)
Other Controls	Yes
2019	0.074**
	(0.024)
2020	0.062*
	(0.025)
Amalgamation	-0.074*
	(0.041)
n	171[8]
Coefficient of Determination	0.4110

In Table 2 I list the coefficients for the main regressors of interest. Only one of the socio-demographic variables was statistically significant, and this was only significant at the 10% level. These empirical results clearly show us that rural local governments are quite different to their urban counterparts – socio-demographics

[8] The odd number arises because a few of the rural councils (such as Hilltops) have received an extension for the preparation of their audited financial statements.

are not determinative. Instead, for rural local governments the two most important determinants of technical efficiency are local government characteristics. Both the value of infrastructure, property, plant, and equipment (IPPE) as well as whether or not the local government had been amalgamated were statistically significant (the former at the one percent level of significance, the latter at the five percent level). The coefficient for the natural log of IPPE means that a ten percent increase in the value of IPPE is associated with a 0.01 decrease in CRS efficiency score (recall scores range from 0 through to 1.0). This association between IPPE and efficiency is dwarfed by the association for the amalgamation dummy variable. The amalgamation variable suggests that councils which were forcibly amalgamated in 2016 had a mean reduction to technical efficiency in the order of 0.074.

Thus it seems that the most important determinant of efficiency is whether or not a local government was subject to amalgamation. This evidence is consistent with the intertemporal analysis charts I outlined earlier, as well as the extant scholarly evidence.

We can use the coefficients calculated in our regressions to predict the mean CRS efficiency score expected of a Council with CGRC socio-demographic and local government characteristics. When we do so, we find that the actual score achieved by CGRC in 2020 was just over 6.49% *higher* than the mean response predicted by the model. Exceeding the predicted CRS efficiency score in this way confirms that CGRC is doing better than average at cost containment.

I am not claiming that CGRC is perfectly efficient – indeed I advocated for further efficiencies to be incorporated into the Long Term Financial Plan (which Council agreed to) – however, it certainly suggests that the position it finds itself in with respect to this special rate variation has not been caused by recent inefficiencies.

In the section that follows I present a list of efficiencies that CGRC has either recently executed or plans to execute in the near future. All of these efficiencies have been incorporated into the long term financial plan which was used to inform the proposed SRV.

4. Extant and Planned Efficiency Measures at Cootamundra-Gundagai Regional Council

Item	Effect on Services	Implementation Date	Projected or Actual Saving	Ongoing?
Reduced wages – Round 1	Minimal	July 2020	$470,000 p.a	Yes
Reduced wages – Round 2	Minimal	July 2022	$500,000 p.a.	Yes
Roads	Reduction in maintenance activities	July 2020	$221,000 p.a.	Yes
Roads	Deferred capital renewal projects	July 2020	$1,000,000	No
IT	Process improvements	July 2020	$167,000 p.a.	Yes
Application of user-pays principle to various costs	None	July 2020	$75,000	

5. Conclusion

Technical efficiency can only be expected to have a marginal effect on taxation given that rates are only a small slice of the revenue pie. Nevertheless it is important for ratepayers to be assured that their local government is being run in a manner designed to contain costs as far as practical, especially when they are faced with a large special rate variation proposal.

Accordingly, in this report I investigated the relative technical efficiency of CGRC with respect to other rural local governments in New South Wales. What I found was that technical efficiency reduced significantly following amalgamation – and this is consistent with the scholarly literature. Moreover, my regression analysis establish beyond reasonable doubt that the most determinative factor for efficiency in NSW rural local government is whether or not a Council was subjected to the 2016 forced amalgamation.

Efficiency at CGRC declined significantly following amalgamation – indeed, from the fourth quartile down to the bottom of the second quartile. Since this time CGRC has been working hard to improve its relative technical efficiency. Moreover, recent large efficiency dividends – incorporated into the long term financial plan – have yet to be reflected in the financial statements and are thus not reported on in my analyses. I expect these recent and planned efficiency measures to return CGRC to the bottom of the third quartile in due course (extant diseconomies of scale mean that CGRC will never return to previous levels of technical efficiency).

Notably, whilst CGRC relative efficiency dropped dramatically following the deleterious 2016 forced amalgamation, my modelling suggests that the 2020 CRS efficiency score was, in fact, almost 6.5% higher than predicted. Once again, this confirms the good work that CGRC has done to try to mitigate the ill-effects of the 2016 amalgamations.

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