Valuing the Australian Census

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LateralEconomics

CAPABLE, INNOVATIVE, RIGOROUS

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Glossary

ABS	Australian Bureau of Statistics
AEC	Australian Electoral Commission
AI	Artificial intelligence
ACLD	Australian Census Longitudinal Dataset
ATO	Australian Taxation Office
ANU	Australian National University
ANZSIC	Australian & New Zealand Standard Industrial Classification
ASGS	Australian Statistical Geography Standard
AURIN	Australian Urban Research Infrastructure Network
CGC	Commonwealth Grants Commission
DJSB	Department of Jobs and Small Business
ERP	Estimated Resident Population
FAG	Financial Assistance Grant
GDP	Gross Domestic Product
GST	Goods and Services Tax
HFE	Horizontal Fiscal Equalisation
ISSR	UQ's Institute for Social Science Research
KPI	Key performance indicator
LE	Lateral Economics
LGA	Local Government Area
MADIP	Multi-Agency Data Integration Project
MMM	Modified Monash Model
NGO	Non-government organisation
NZ	New Zealand
ONS	Office for National Statistics (UK)
PHN	Primary Health Network
RAI	Regional Australia Institute
SA2	Statistical Area level 2 (part of the ASGS)
SEIFA	Socio-Economic Index for Areas
SEQ	South-East Queensland
SIH	Survey of Income and Housing
SWF	Social welfare function
TMR	Department of Transport and Main Roads (Queensland)
UCL	Urban Centres and Localities
UK	United Kingdom
UQ	University of Queensland

Overview

Background and Structure

In May 2019, the Australian Bureau of Statistics (ABS) commissioned Lateral Economics to estimate the value of the benefits Australia gained through the use and application of data from the Census of Population and Housing (the Census). The ABS was assiduous in insisting that the work be independent and, while it was extremely helpful to us in our research, made no attempt to influence our judgements.

This report discusses the benefits of the Census in three categories:

1. Major uses of economic value;
2. Minor uses of economic value (what we have called 'the long tail'); and
3. Predominantly non-economic uses.

As with similar studies elsewhere, most of our effort has involved providing an indicative valuation of the first category of benefit. An economic value has been imputed to the second category more summarily.

The value of the third category cannot responsibly be quantified, but is of major significance. The Census provides politically independent informational infrastructure that helps safeguard the integrity of our federal system of government and thus the capacity of Australia's democracy to represent its people fairly.

Our process

Our process has been:

- desktop research (UK and NZ studies on the value of a Census, ABS resources on the Census, websites and reports documenting the uses of Census data, etc.);
- engaging widely within the ABS, including with members of the senior executive;
- speaking with a broad range of stakeholders (45+), in the public, private, and NGO sectors across Australia and internationally (see Appendix A for more detail), including:
    - Federal government policy and program areas,
    - State government policy and program areas,
    - Private sector firms and industry groups,
    - Academics, and
    - Office for National Statistics, UK.
- seeking feedback on key issues in valuing the Census and on the uses of Census data in Australia via four articles in

the public domain that were published on the *Mandarin* website; and

- engaging with Australian National University (ANU) Emeritus Professor Bob Gregory, who provided peer review.

Our framework and methodology

Building on methodologies employed in previous officially commissioned studies in New Zealand and the UK,[1] we calculate the value of the Census by comparing it to a world in which the Census ceases being compiled and as a result, those currently using the Census make use of the next best existing alternative data series obtainable.[2]

This was consistent with the methodology of earlier studies in the UK and New Zealand, so it facilitates comparison. Further, the specification of an alternative scenario in which, over time, alternatives to the Census were developed, would have been a considerable undertaking, only possible in close collaboration with ABS and other stakeholders. Not only was this quite unrealistic given the resources and time available for this project, but the right place for such a project would be in the context of much wider strategic considerations for the ABS and Australia's data services.

It should be recognised that this counterfactual was explored by us as an analytical construct rather than a practical option being considered by us or the ABS. While statistical agencies worldwide are exploring ways in which Census-equivalent data could be generated, the ABS made it clear to us that there are no plans to change the nature of Census taking in Australia by, for example, moving away from the current 5 yearly Census model.

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[1] Bakker, C., 2013, *Valuing the Census: A Report prepared for Statistics New Zealand which quantifies the benefits to New Zealand from the use of Census and population information* and ONS, 2011, *2011 Census benefits evaluation report*.

[2] This might include the ABS's survey-based official statistics, or market research data, or many other sources of administrative or non-official data. Alternatives will obviously vary by issue and use, and not all alternative data will be available to all people (for example, due to commercial or confidentiality restrictions) or be easy for them to understand and/or use.

Major quantifiable benefits

In our analysis, a widely reported benefit of the Census is more accurate Estimated Resident Population (ERP) figures at the small area level. If the Census was terminated, the ABS would continue to produce ERP estimates, but their accuracy would degrade without Census revisions.

As illustrated in Figure 1 below, we group major quantifiable value into five categories, albeit with some cross over between them:

1. Services planning and targeting
2. Infrastructure planning and targeting
3. Improved policy design
4. Other commercial uses
5. Public goods

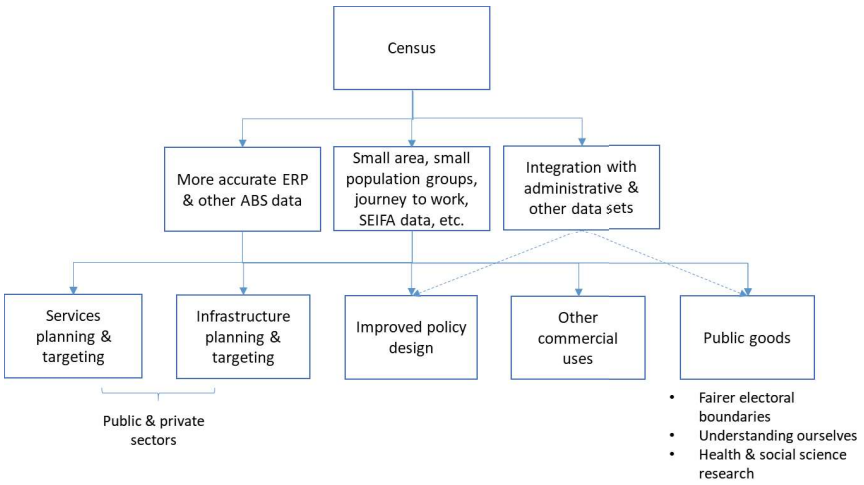
Across these categories, Census data contributes to a vast range of government policy and private sector investment decisions in numerous sectors. Census data is also baked into funding formulas and allocations in government (including funding to States and Territories and subordinate bodies) or in resource planning models and systems.

Public sector agencies – particularly state agencies relying on the Census to understand small areas and disadvantaged groups – have built up a vast array of models to inform their service delivery and infrastructure decisions based on the five-yearly Census data.

Demographers and social researchers have come to rely on the Census as invaluable and very difficult to replace. As one leading social researcher, Mark McCrindle, noted, "It holds up a mirror to our society." Particularly in an age of social media, it helps bust myths about numerous questions of public interest, and hence improves the quality of public debate.

The Census's comprehensiveness and accessibility makes it influential in commercial and other sectors seeking to understand the size and nature of markets. This influences numerous locational and other resource allocation decisions.

Figure 1 – Flow chart of Census value streams



Source: Lateral Economics based on research and consultations

Minor quantifiable benefits

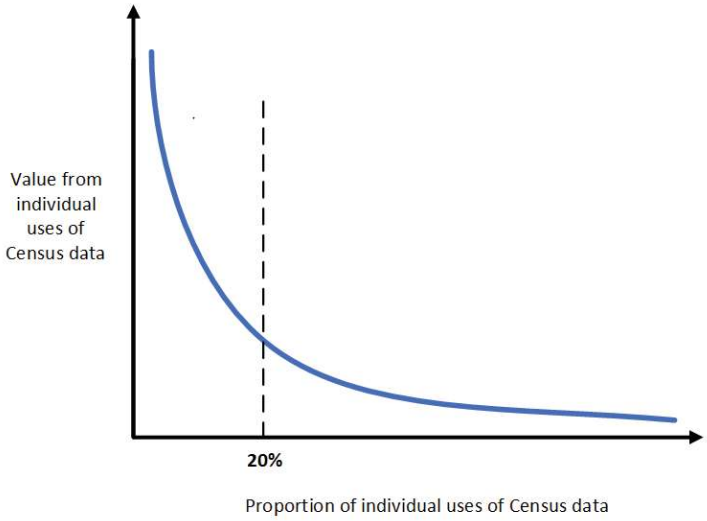
Though it is impracticable to estimate each of the 'long tail' of Census uses directly with any kind of precision, their aggregated benefit could be high for several reasons.

- the Census is highly accessible to non-specialist researchers and users
- Census-related data is used with great frequency whenever anyone seeks to describe or understand aspects of small Australian communities or geographies.
- While many of these uses would be of low and very low value, some would be used in research which could give rise to new knowledge (and/or greater confidence in existing knowledge) of unpredictable and sometimes considerable value.

We assume, somewhat arbitrarily that the long tail generates 25% of the value of other uses, though we think this is conservative. It could easily be several times this figure.[3]

[3] This may be justified by the so-called 80-20 rule first articulated by the Italian economist Vilfredo Pareto who documented his surprising discovery of a range of economic distributions following a power law. As he showed in a range of countries, approximately 80% of the land was owned by 20% of the people. If this relationship holds, the benefits arising from the 80% of (more minor) uses will generate around a quarter of the value generated by the 20% of major uses which we have quantified.

Figure 2 – Stylised illustration of a long tail relationship



Benefits, Costs and Net Benefits

Table 1 presents indicative estimates of the gross annual value of Census-related data according to the methodology described above. We estimate around $666 million of gross annual value in total. Adjusting this by an additional 25% to take account of the 'long tail' provides an annual estimate of over $800 million. It should be considered indicative rather than definitive, given the assumptions that were necessary to generate the results.

Against these estimated benefits, we estimate the Census has an economic cost of around $670 million every five years. This comprises:

- the direct resources utilised measured by the budgetary cost;
- a deadweight loss associated with the ABS' taxpayer-funded costs; (this was not included in either the analyses of the costs of UK or New Zealand Censuses.)
- the time used by Australian households to complete Census forms, whether in paper or online. (The UK study did not appear to account for this cost.)

Our more comprehensive accounting for costs makes our ultimate calculation of the benefits of the Census relative to its costs more conservative than the previous NZ and UK studies. Our methodology of progressive deterioration in the accuracy of ERP estimates based on the declining timeliness of census data is also conservative, as it is based on the data point we have, which is the inaccuracy of five-year-old census data. As it gets older, its quality would deteriorate further.

Conclusion

Our estimates suggest the benefits of running the Census easily outweigh its costs in the order of $6 of economic value for each $1 it costs. On this reckoning, the cost of the Census would have to rise to six times its current cost – to around $3 billion every five years – before it started to become cost ineffective.

This is before accounting for unquantifiable benefits associated with improving the fairness and integrity of our democracy and government.

However, we did encounter some evidence that the value of the Census can be increased further at minimal cost. For example:

- the potential value from linking Census data to administrative data sets is only beginning to be realised and holds immense potential. (In other work for the Population Health Research Network, Lateral Economics concluded that data linkage generated over $16 for every dollar invested).[4]
- though the issue was outside our brief and we did not investigate it, some experienced users argue that there remains substantial room for the ABS to make its data more widely available with negligible increase in the risks to privacy.
- there may be ways to reduce costs associated with the development of Census-equivalent statistics, including relying less on the general public to answer questions every five years.

[4] Lateral Economics, 2017. "The impact of the Population Health Research Network (PHRN), at https://lateraleconomics.com.au/output/the-impact-of-the-population-health-research-network-phrn/

Table 1 – Summary of economic benefits and costs over five years

Category	Sub-category	Indicative annual estimate	Indicative five-year estimate
Value/Benefits			
Services	Health	$34 million	$170 million
	Education	$40 million	$200 million
	Transport services	$4 million	$20 million
	General public services	$49 million	$245 million
	Public order and safety	$22 million	$110 million
	Sub-total	*$149 million*	*$745 million*
Infrastructure	Health	$103 million	$515 million
	Education	$48 million	$240 million
	Transport and utilities	$129 million	$645 million
	Utilities	$82 million	$410 million
	Housing	$54 million	$270 million
	Sub-total	*$417 million*	*$2,085 million*
Locational decisions and market research	Other commercial capital and operating	$100 million	$500 million
Sub-total		*$666 million*	*$3,330 million*
Adjustment for a 'long tail'	Further 25% to take account of additional uses across community	$166 million	$830 million
Total Value		$832 million	$4,160 million
Costs	ABS direct costs		$500 million
	Deadweight loss		$100 million
	Household costs		$70 million
Total Cost			$670 million
Net Benefit			$6 of economic value for each $1 of costs

1. Introduction and Background

1.1 Purpose of this project

The Australian Bureau of Statistics (ABS) commissioned Lateral Economics in May 2019 to estimate the value of the benefits to Australia gained through the use and application of data from the Census of Population and Housing (the Census). These benefits are both economic, for which a dollar value of benefits can be estimated, and non-economic, the value of which may be unquantifiable.

The task requires:

- establishing a framework for the assessment of the overall economic value of Census data for Australia
- developing an economic model to implement this framework and generate a value of Census data through qualitative and quantitative measures
- estimating the value generated for Australia for every dollar spent on implementing the Census

1.2 What is the Australian Census?

The Census of Population and Housing is the largest statistical collection undertaken by the ABS and is easily the ABS's largest single investment. It aims to connect with every person in Australia and collect information about them and the place at which they are staying on Census night.

Conducted every five years, the next Australian Census is planned for August 2021.

The Australian Census generates finely grained data of relevance to issues such as:

- Population
- Sex and gender
- Households and families
- Aboriginal and Torres Strait Islander peoples
- Income and work
- Unpaid work and care
- Education and training
- Disability and carers
- Housing
- Location
- Transport
- Cultural diversity and religion

It complements other ABS surveys and data collection (notwithstanding some general public perception that all ABS data is from the Census).

The results or outputs of the Census are made available in a wide range of products. For the purposes of this project, we think about the scope of the Census through its contribution to a range of direct and indirect ABS data products including but not limited to:

- Census data directly – for example, as available in ABS publications directly derived from Census results and other Census products (Data in Pictures, QuickStats, Community Profiles, DataPacks, TableBuilder online data tool)
- Census data informing ABS products (e.g. Estimated Resident Population, Socio-Economic Indexes for Areas (SEIFA), Remoteness)
- Census within data integration that links multiple data sets together to generate new insights (e.g. The Multi-Agency Data Integration Project (MADIP) across Australian Government agencies, and emerging work to link the Census with State and Territory government administrative data)
- Longitudinal data from Censuses over time

Critically, the Census:

- improves the accuracy of Estimated Resident Population (ERP) figures for the nation, state, regions and small areas;
- provides small area and other data, such as journey-to-work and SEIFA data, which would otherwise be unavailable or of much poorer quality; and
- in combination with administrative data sets, such as Medicare, social security, and tax data, creates an integrated data set forming a critical part of the MADIP.

1.3 Context for assessment of value

The ABS understands that all this information is of substantial value, but no careful estimate of its total value has been made yet. In recent years, a combination of factors has led to renewed scrutiny of the value of the Census, including burgeoning administrative data which could be tapped by national statistical agencies, as well as advances in computing power, data science and artificial intelligence (AI).

Statistical agencies worldwide have come under pressure from ministers to provide greater justification for the hundreds of millions of dollars of costs of a national census. For instance, in 2001, the UK House of Commons Treasury Select Committee called for the national census to be justified in cost-benefit terms. Since then, the UK Office for National Statistics (ONS) produced a Census Benefits Evaluation

Report for the 2011 Census. It was reported that the UK census yields annual benefits in the order of £500 million compared with a reported budgetary expenditure of £480 million.[5]

In 2013, Statistics New Zealand followed ONS' example commissioning an independent valuation of the NZ census, which reported a return on investment (ROI) of around $5 of net benefits for every $1 of budgetary expenditure on the census.[6]

In Australia, too, the issue of the cost of the Census has come under scrutiny. For example, in 1993, a Federal government interdepartmental committee investigated cost reduction opportunities for the Census.[7] However, it recommended maintaining the current Census format. Indeed, comprehensive five-yearly censuses are seen as necessary to ensure fair electoral representation given substantial population growth in newly developed areas, such as Springfield and Yarrabilba in South East Queensland. The requirement for a five-yearly Census was inserted into the *Census and Statistics Act 1905* in 1977 (section 8(1)), following a 1976 High Court decision suggesting the need for more a more frequent Census to ensure fair electoral representation.

Also, the Australian general public is becoming more data-conscious, and in some cases more vocal in questioning some ABS practices. It is not just generally desirable that the community understands and accepts the role of the Census, it is also essential because the Census requires Australians to complete the Census accurately with an expectation that their collective efforts will contribute to a greater good. Providing the Census is understood to be a sound investment – that genuinely independent analysis confirms that its benefits comfortably exceed its costs – can help underpin community collaboration in what is a joint project.

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[5] The benefit estimate is reported in ONS, 2011, *2011 Census benefits evaluation report*, while the cost estimates is taken from the *Financial Times* article Allen, K., 2013, "Researchers in UK count cost of plan to scrap census", *Financial Times*, 2 September 2013.

[6] Bakker, C., 2013, Valuing the Census: A Report prepared for Statistics New Zealand which quantifies the benefits to New Zealand from the use of Census and population information, p. 44.

[7] ABS 2967.0 - Information Paper: Parliamentary Inquiry into the Treatment of Census Forms: Submission from the Australian Bureau of Statistics , 1997, https://www.abs.gov.au/ausstats/abs@.nsf/2f762f95845417aeca25706c00834efa/5F902843116E20B0CA2571250073A398?opendocument

2. Framework for Assessing Value

2.1 What is value, and what generates it?

A road generates value when used to facilitate faster, safer or more convenient travel. Schools generate value when they help educate their pupils. Similarly, data releases its value when it is used and generates new and useful knowledge.

Stakeholders tend to discuss how Census-related data is used (either directly, or mediated through research or other indirect products) in two related ways:

- Knowing more about the situation: Thus, for instance, Census data may tell us something about the size or distribution of the population, or some sub-set of the population – for instance, people of working age living outside the cities and the determinants of changes to this population through time. This can help to identify problems, opportunities and the most promising solutions to them.
- Changing what is done: Thus Census data can help us assess impacts of interventions, guide the allocation of resources and/or reduce uncertainty in decision making.

A critical question for Lateral Economics' analysis is the extent to which the Census is essential for developing high quality estimates of populations at various levels, national, state, regional and for small areas, and for various groups in the population, for instance, Indigenous and culturally and linguistically diverse people or people with experiences such as needing help in daily life or experiencing homelessness.

A second question is to what extent this Census data is used either directly or indirectly in shaping the understanding and decisions of governments, businesses, not-for-profits and others and how much value does access to this data add compared with a situation in which there is no Census.

In general, that value would be highest when use of accurate and reliable data generated through the Census results in better decisions that improve outcomes for the Australian community or parts of it. Improved outcomes can include:

- enhancing Australians' wellbeing, e.g. via better targeting of policies of various kinds and infrastructure investment
- improving perceived fairness, equity and integrity in national institutions and systems, e.g. reducing distortions to fair allocation of monies and representation, fundamental to trust in our political and economic institutions

Such decisions may depend critically on information such as accurate estimates of Indigenous people in a region, or journey-to-work flows between regions, and the Census is a critical source of information to such estimates and for which there are not obvious good substitutes.

In undertaking this project, Lateral Economics is seeking to come to its own independent assessment of the net benefits to the community from running the Australian Census in its current format and frequency. The ABS made no attempt to influence our conclusions and was strongly supportive of our independence.

2.2 Comparing the Census to alternative data or information: What is the right counterfactual?

The value of the Census comes from the extra precision or insight it provides for a given use, compared with the next best alternatives (and their relative costs). These alternatives are counterfactual scenarios. But what are the alternatives to the current Census? Here there are two possible approaches which can be compared to the way economists distinguish between firms' short- and long-run responses to changes in their market.

Thus for instance, if there's a strong increase in demand, in the short run, the firm takes its existing capital assets as given. It can hire more workers, increase the number and/or length of shifts. But these constraints prevent the firm from taking full advantage of the new situation. In the long run, it can invest in new plant and equipment – which itself is likely to embody technology improvements.

Likewise, the ABS is continually investing in new capabilities, but they take time to develop. For example, the ABS' recent utilisation of electronic retail data for the Consumer Price Index took around five years to develop to a standard acceptable for use to inform official statistics.

The counterfactual we use in this report is a 'short-run' one in which the Census simply ceases being compiled and so is not available to its myriad users. In response, users make the best use of whatever alternative data is currently available from ABS or other sources. This saves the Australian Government the whole incremental cost of the Census.

In this scenario, the existing users of the Census will have to make use of the next best alternative data. It might include the ABS's survey-based official statistics, or market research data, or many other administrative or non-official data. Alternatives will obviously vary by issue and use, and not all alternative data will be available to all people (for example, due to commercial or confidentiality restrictions) or be easy for them to understand and/or use.

For example, while there is data – for instance, from existing ABS surveys – that is and would remain available to all, state government administrative data has more restrictions and is not generally available in a form that can be easily used by many users.

A widely reported benefit of the Census is more accurate Estimated Resident Population (ERP) figures at the small area level. Hence, it is important to describe our counterfactual regarding small area ERP estimates, for which the Census is only one input. The counterfactual is that the ABS would continue to produce estimated ERP figures down to the SA2 level as it does now, although without the benefit that comes from rebasing due to the Census every five years. The counterfactual is described in more detail in Appendix B.

The alternative, longer-run, counterfactual would involve a wholesale reconfiguration of the statistical service that is the Census. For example, a Census might be conducted less frequently (for example, every ten years as in the US and numerous other countries). Census data would become less useful as it became more out-of-date, but it would also reduce costs (presumably by around half), some of which savings could be invested in expanded ABS surveys to plug the worst gaps.

More fundamentally, the traditional Census every five years could be replaced with greater use of ongoing large-scale sample surveys (closer to the French rolling census) and integrated administrative data in official statistics. It is possible to imagine more radical possibilities still, in which some link is established between the Census and Australians' online relationship with government – for instance through MyGov.

The short-run counterfactual for our analysis has been chosen for several related reasons. First, the studies in the UK and New Zealand with which this study will be most immediately compared have (with varying degrees of explicitness) used a similarly simple short-run counterfactual.

Second, the specification of even a relatively simple longer-run counterfactual would have been a considerable undertaking, only possible with close collaboration with ABS and other stakeholders. Not only was this quite unrealistic given the resources and time available for this project, but the right place for such a project would be in the context of much wider strategic considerations for the ABS and Australia's data services.

It should be recognised that this counterfactual is an analytical construct rather than a likely practical option. Statistical agencies worldwide are examining different ways in which Census-equivalent data could be generated. Internal preliminary ABS work suggests there is potential to meet some but not all Census information needs with administrative data over the longer-term, although this requires

further research, consultation with the Australian community and testing.[8]

2.3 Categories of value

Census related data – and research and analysis utilising it – is used in a very wide range of circumstances across the Australian community. It is extensively used by all levels of governments, industry, not-for-profits and individuals in decision making and planning.

The Census provides important information on household composition, journey-to-work flows, Indigenous status and languages spoken at home, among other data. It is also used extensively to 'ground-truth' and so assess and improve the representativeness of a wide variety of other data sets.

Stakeholder feedback suggests that Census-related data tends to be most important or influential on issues where small population groups and small geographies matter – in decisions where it is important to understand how much of what kinds of people are located where (e.g. to assist targeting of resources towards certain segments).

As one contributor to our blog posts put it succinctly: "It's the areas of strategically placed 'blur' that often matter much more than what can be seen clearly".[9]

An overview of the wide range of uses to which Census data are applied and major value streams is provided in Figure 3 below. We broadly group types of value into five categories, albeit with some cross over between them:

1. Services planning and targeting
2. Infrastructure planning and targeting
3. Improved policy design
4. Other commercial uses
5. Public goods

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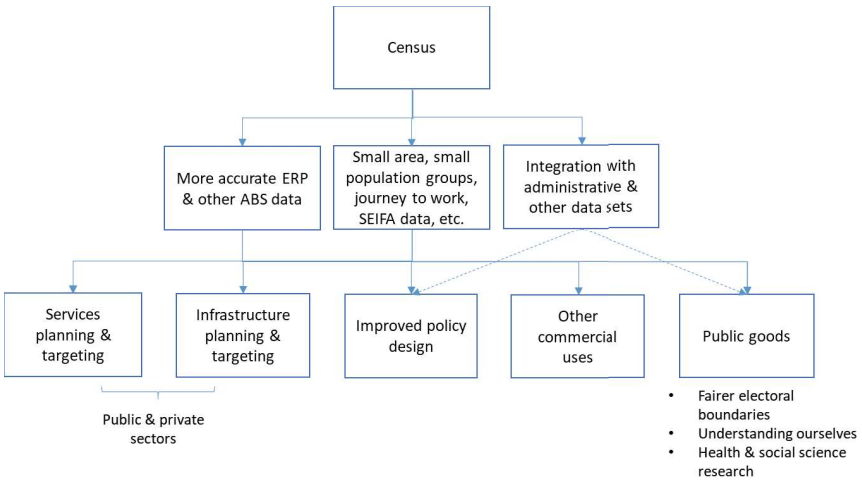
[8] Based on internal ABS paper from 2019, 'Census topics: what is possible with administrative data?' That paper's preliminary review suggests that of the 44 topics collected in the 2016 Census, in the medium-term none is "likely" to be met with administrative data sources, but a third could "possibly" be met. Over the longer-term, perhaps a third of topics are "likely" to be met with administrative data sources.

[9] http://clubtroppo.com.au/2019/06/12/blogging-another-inquiry-valuing-the-australian-census/

Across these different categories, Census data has a contributing role to a wide range of policy decisions and private sector decisions across a range of sectors. Census data can also have a more formal role as a direct input to resource allocation. This includes, for example, funding formulas and allocations in government (such as distributing funding to States and Territories or sub-state bodies) or in resource planning models and systems.

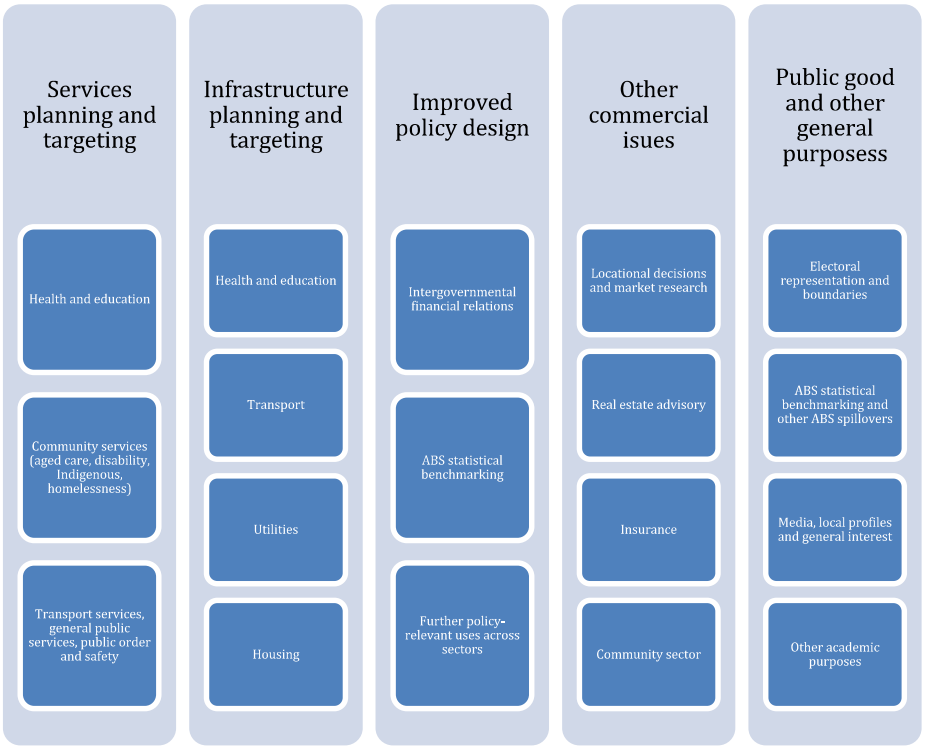
This report identifies and categorises diverse examples of most major impacts of Census data across a wide range of domains, including the logic of where and to what extent it influences end-uses (Figure 4 provides an overview of these). It then makes some broad economic estimates of the value of these uses, where feasible.

Figure 3 – Flow chart of Census value streams



Source: Lateral Economics based on research and consultations.

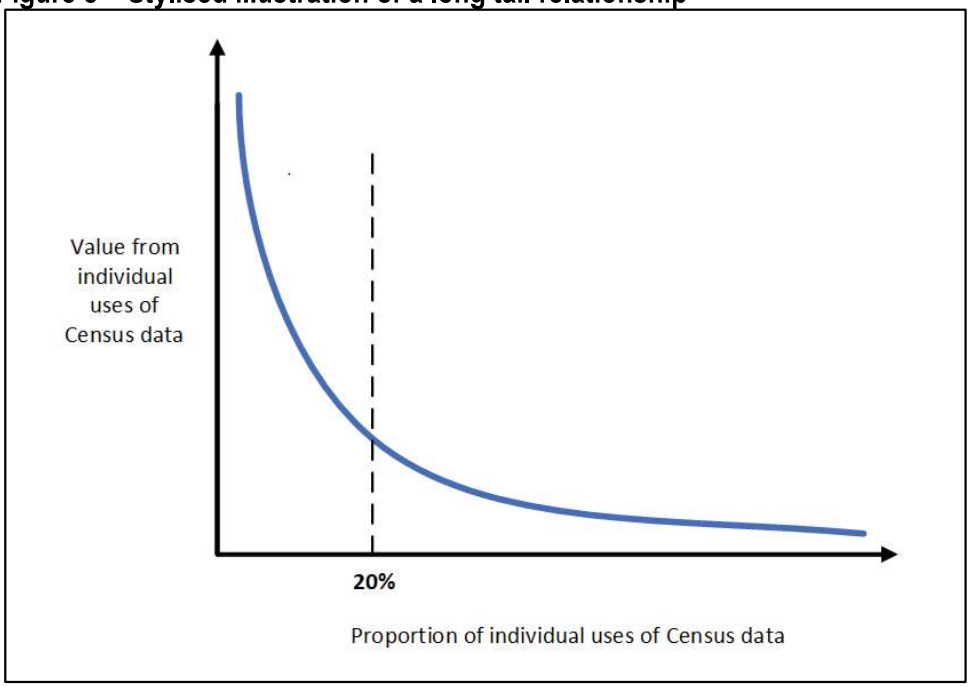
Figure 4 – Overview of simplified categories of value



2.4 The 'long tail'

A significant proportion of the total economic value of the Census derives from a small number of uses that generate high-value. However, there will also be a significant amount of value that results from a very large number of lower-value uses or the 'long tail' of the distribution of applications of the Census (see Figure 5).

Figure 5 – Stylised illustration of a long tail relationship



This report's following sections draw out some of the larger usage types. But even for the 'head' of this long-tailed distribution, it would be impossible to describe it all. As an illustration, a simple Google search for the terms '2016 Census Australia' yields nearly 30 million results, with top results including pages and pages of publications, analyses and commentary from a wide range of entities.[10]

The value generated by the long tail is unable to be estimated with any kind of certainty – but could be high given how accessible the basic outputs of the Census are to non-specialist researchers and users, and how frequently Census-related data appears to be used whenever anyone in Australia wants to describe or understand aspects of small communities or small geographies, either individually or in comparison. While many of these uses would be relatively low value, some would be used in research that could give rise to new knowledge (and/or greater confidence in existing knowledge) of considerable value. Using a well-known rule of thumb first suggested by the economist Pareto over a century ago and known to the business world as the '80:20' rule, we assume, we think conservatively, that this amounts to 25% of the value of other uses, though it could easily be several times this figure.[11]

[10] Based on Google search conducted 3 August 2019

[11] This may be justified by the so-called 80-20 rule. We are adding on the 20% of benefits explained by the 80% long tail of uses: 20/80 = 25%.

2.5 General approach to describing and estimating the size of value

As described above, this report identifies and categorises diverse examples of the most important impacts of Census data across a wide range of topics, including the logic of where and to what extent it influences end-uses. It then makes some broad economic estimates of the value of these uses, where feasible.

Normally, in economic studies, the types of 'impacts' are reasonably clear but the valuation of those impacts is the challenge. However, in the analysis presented in this report, simply describing the impacts is a huge challenge – as they are so diverse, so distributed across different sectors of the economy and society, and often indirect.

Tracking the attribution from source to impact for one application is a challenge, let alone doing that for hundreds of different applications. These applications include the allocation of health and education spending across regions, infrastructure decisions in the private and public sectors, devising fair electoral boundaries and helping us understand the composition of our society, among myriad other uses.

These other uses include a range of incidental benefits that are not easy to model. For instance, several times during stakeholder consultations, it was mentioned that the Census underpins the Australian Statistical Geography Standard (ASGS) boundaries, which are widely used across public and private sectors for defining administrative regions. The ASGS, underpinned by the Census, provides a "common language", in the words of one stakeholder.

To cut through the complexity, we need to focus quantitatively on a few areas that illustrate the greatest value of the Census, while describing in more qualitative terms the benefits that come from a range of other uses revealed in our research and stakeholder consultations.

We are guided, but not limited, by the methodologies employed in previous studies. These methodologies rely largely on estimates of the inaccuracies of resource allocation and capital investment that would occur in the absence of Census data. We also draw on methodologies developed in these studies for estimating the dollar benefits of, among other things, improved public policy development in social policy areas where Census data are important, such as in policies for disadvantaged groups; and higher-quality academic and market research.

Even after the most stringent efforts, as was the case in the analysis of the UK and New Zealand censuses, considerable uncertainties remain. This underlines the importance of consulting widely to develop defensible assumptions to underpin our estimates.

In our research and consultations from late May to early August 2019, we have endeavoured to access diverse experiences, specific examples and stories, to identify and, where feasible, quantify the relative importance of different uses of Census data. This has included exploring users' specific uses of Census data, the benefits they derive from that use, any reflections they have on the next best source of data in the absence of the Census and the potential costs of any reduction in data quality.

Briefly, our process has been:

- desktop research (e.g. UK and NZ studies on the value of a Census, ABS resources on the Census, websites and reports documenting the uses of Census data);
- engaging widely within the ABS, including with members of the senior executive;
- speaking with a broad range of stakeholders (45+), in the public, private, and NGO sectors across Australia and internationally (see Appendix A for more detail), including:
    - Federal government policy and program areas,
    - State government policy and program areas,
    - Private sector firms and industry groups,
    - Academics, and
    - Office for National Statistics UK.
- seeking feedback on key issues in valuing the Census and on the uses of Census data in Australia via four articles in the public domain which were published on the *Mandarin* website; and
- engaging with Australian National University (ANU) Emeritus Professor Bob Gregory who provided peer review.

3. Describing & Estimating the Size of Value

As described in the framework above, this section includes both qualitative descriptions of various uses of Census data, and quantitative estimates associated with that value. It explores what this allows various parties to do that they would not easily be able to otherwise (or with less precision), and why that matters – for example, what decisions or policy approaches require that knowledge to be more effective.

As previously foreshadowed, it is structured as follows:

1. Services planning and targeting
2. Infrastructure planning and targeting
3. Improved policy design
4. Other commercial uses
5. Public goods

As discussed above, the qualitative examples listed below are not exhaustive but point to the diversity of applications.

3.1 Services planning and targeting

We consulted with government stakeholders across a range of different services on how Census or ERP data (the quality of which are improved by the Census) influence the allocation of funding/resources to different regions or groups in the population, including through better understanding of the relative need for the delivery of programs and services and through better targeting of resources towards these relative needs. We then inquired as to the benefits these stakeholders perceived that this better targeting provided to the community.

In this sub-section, we first review the findings from our research and consultations, before moving on to provide quantitative estimates of the benefits of improved government services provision as a result of having Census data.

3.1.1 Health and education

NSW Health relies on the NSW Planning department's population and dwelling projections which depend critically on Census data. Also, for public health analysis, analysts need a denominator (e.g. number of people in a particular segment of the population) and the ABS ERP/Census provides that. The Census is the basis for sub-state estimates of Indigenous populations, and it is important for programs with Indigenous-related key performance indicators (KPIs).

Population projections are relevant for NSW Local Health District service agreements (one year at a time). A range of models are then

used by Health Districts to allocate their funding with the use of Census data.

Additionally, NSW Health uses the Census to weight survey results from its own surveys on risk factors and health behaviours. The Census includes useful data on household characteristics (including composition, number of bedrooms, etc.). For example, NSW Health can then over-sample areas with lots of four-bedroom houses if they are trying to sample children.

According to Queensland Health, ERP, dwelling numbers and SEIFA data which are derived from the Census are key measures in internal models for allocating funding across Queensland's 16 Hospital and Health Services that manage the public hospitals and health services within their designation regions (e.g. Brisbane Metro North, Townsville).

Queensland Health cannot just rely on administrative data, such as presentations at hospitals and health services, as there can be substantial unmet needs if a service is not provided in a particular area – e.g. if specialist service is provided in a region, people will use it; otherwise, local GPs may not refer them to it.

The Australian Government Department of Health orients a range of programs to regional need, variously taking into account issues such as remoteness, age distributions by gender, Aboriginal status and SEIFA – all of which are derived from the Census. For example, these elements are considered in the funding model for 31 Primary Health Networks (PHNs) across Australia and assessing progress and performance. PHNs work with general practitioners, other primary health care providers, secondary care providers and hospitals to facilitate improved outcomes for patients, with a particular focus on mental health, Aboriginal and Torres Strait Islander health, population health, health workforce, digital health, aged care, and alcohol and other drugs. From 2020, Department of Health programs are transitioning to use the Modified Monash Model (MMM) health workforce classification, which involves consideration of a location's remoteness and size in the context of health service delivery. The MMM is directly informed by the Census, and is updated after each Census.

3.1.2 Community services (aged care, disability, Indigenous, homelessness, etc.)

As with health and education services, Census data is utilised by both state and federal governments, and other service providers and groups, to understand the location of people and households of certain characteristics most relevant to the need for community services. This includes understanding both the current population

and its characteristics, and population-based projections to inform service planning. For example, Census data can provide considerable additional insight into the state of over-crowding in housing, including for Aboriginal and Torres Strait Islander people.

The greatest insights into the current situation and areas for priority come from understanding issues at fine geographies: for example, categories of remoteness within states, specific regions, or in some cases specific communities.

The magnitude of government expenditure in this as in other areas means that data used to focus and prioritise expenditure can have a commensurately large efficiency impact. For example, governments across Australia directly spent over $550 million on Indigenous-specific housing activities in 2016-17, with a further $758 million expenditure relating to mainstream housing services used by Indigenous Australians.[12]

The National Aboriginal and Torres Strait Islander Social Survey, carried out every six years, does not allow for this degree of geographic precision. The quality of administrative data on remote and Indigenous social housing varies by state and territory jurisdiction, there can be inconsistencies across jurisdictions and social housing administrative data does not cover private housing.

The small area detail provided by the Census has imperfections, but it allows for a finer consideration of how overcrowding and other housing issues are changing over time and across different parts of Australia.

For example,

- The Australian Government's 2017 Remote Housing Review: A review of the National Partnership Agreement on Remote Indigenous Housing and the Remote Housing Strategy (2008-2018) used Census data extensively to conclude that, based on current and future demand, an additional 5,500 houses are required by 2028.[13]
- Census data underpinned the Australian Institute of Health and Welfare's recent detailed analysis of housing and

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[12] Productivity Commission 2017, Indigenous Expenditure Report 2017, https://www.pc.gov.au/research/ongoing/indigenous-expenditure-report/2017#pivottables

[13] Department of the Prime Minister and Cabinet 2017, Remote Housing Review: A review of the National Partnership Agreement on Remote Indigenous Housing and the Remote Housing Strategy (2008-2018), https://www.pmc.gov.au/sites/default/files/publications/review-of-remote-housing.pdf

homelessness in Aboriginal and Torres Strait Islander people, particularly in the housing profile of Indigenous Australians, housing stress and financial assistance, and homelessness amongst Indigenous Australians.[14] Incidentally, the role of Census data in helping understand the homeless population was stressed by Northern Territory Families, which noted the sizeable number of homeless Indigenous people living around Darwin, a community known locally and to themselves as "long-grassers".[15]

Census data has been used recently in different ways to provide greater insights into the level of overcrowding across locations, particularly at the severest levels that most require response. For example, previous measures have focused on 'severely' crowded dwellings (that is, dwellings which needed four or more extra bedrooms to meet an occupancy standard, given the number of people living there). Recently, Census data has also been used to examine situations where six or eight or more bedrooms would be needed to meet the standard.

3.1.3 Quantitative estimates

The more accurate Estimated Resident Population (ERP) data enabled by the Census rebasing provides benefits to the Australian community via improved resource allocation by governments at all levels. ERP data affects the allocation of funding and services for various portfolios, including health and education, etc. If local area populations are inaccurately estimated, those areas could miss out on the teachers, nurses, doctors or specialists they need, with others ending up with relatively too many.

It is clear from ABS figures on the rebasing of ERP figures for LGAs and SA2 regions following the 2016 Census that significant inaccuracies find their way into ERP figures in between Census years. For example, the North Queensland LGA of Townsville had 4,566 fewer people than expected, while the Sydney City LGA had 11,786 additional people.

The magnitude of recurrent spending by governments in Australia – around $650 billion per annum – means that even relatively small inaccuracies in the data on which such expenditure is based could

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[14] Australian Institute of Health and Welfare 2019. Aboriginal and Torres Strait Islander people: a focus report on housing and homelessness. Cat. no. HOU 301. Canberra: AIHW. https://www.aihw.gov.au/getmedia/1654e011-dccb-49d4-bf5b-09c4607eecc8/aihw-hou-301.pdf.aspx?inline=true

[15] For further information on the "long-grassers" see https://www.abc.net.au/news/2015-06-29/darwins-homeless-longrassers-tell-of-struggle-to-survive/6570440

lead to substantial welfare losses from poor resource allocation. Lateral Economics' estimate of the benefit from improved resource allocation is developed from the methodology applied in the 2013 New Zealand value of the census study.

By using what economists call a social welfare function (SWF), we can estimate the benefit to the community of accurate ERP data by taking into account the fact that the degree of benefit accruing to regions that gain more than their optimal share of funding is smaller than the degree of loss accruing to regions that lose out. That is, where resources are misallocated, each dollar that is misallocated generates less social welfare than it would if its allocation better reflected need which would occur with more accurate data.

A SWF is a way of measuring the social welfare (or utility) associated with the consumption of goods and services, produced by the private and public sectors, by the whole population. The NZ study used a quasi-linear utility function, whereby social welfare is a logarithmic function of public expenditures (implying diminishing marginal utility, inversely proportional to expenditures) and a linear function of consumption of other goods.

These assumptions allow straightforward estimates of the benefit (or avoided welfare loss) from having more accurate ERP data and hence a more efficient and equitable distribution of public expenditures.[16]

The net loss in dollar terms from misallocation between regions based on inadequate data can be estimated. In social welfare terms, the losers lose more than the winners gain, so there is a net loss from inaccurate data.

The SWF used in the NZ study can be solved for the net loss in social welfare that would result from deviations in funding from optimal allocations.[17] The relevant formula, adapted from the NZ study, is:

$$Net\ loss = \sum_i P_i \left\{ ln(P_i) - ln\left(\hat{P}_i\right) \right\}$$

where P_i stands for optimal public expenditure in region *i,* assumed to be informed by Census data, and $\hat{P}_i$ stands for the sub-optimal

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[16] The particular functional form has been chosen to reflect the basic analytical structure of the issues – diminishing returns around the optimum distribution – as well as the need for mathematical tractability. In a more precise piece of modelling it might be appropriate to pause for further reflection on any compromises with realism made for the sake of tractability. However to dwell on this, in an exercise of this kind where only indicative conclusions are possible would be an exercise in spurious precision.

[17] Bakker, 2013, Appendix 2, p. 51.

level of public expenditure in region *i* which would result from inaccurate data.

In estimating the avoided social welfare loss from improved ERP data, we assume that, in the absence of the Census, the ongoing inaccuracy in ERP data at SA2 and LGA levels would be equivalent to that revealed by the rebasing of 2016 population estimates due to the Census. This could be considered a conservative assumption given ERP inaccuracy could be expected to worsen over time, particularly if a Census were never run again and reliance had to be placed solely on ABS surveys and administrative data to estimate future local area ERPs.

We use the revisions from the 2016 Census rebasing at the LGA and SA2 levels to give us the lower and upper bounds respectively of the avoided social welfare loss of having more accurate ERP figures and hence better targeted public expenditures.

There is little publicly available information on regional funding allocation methodologies and models. However, we know from research and consultations that ERP estimates affect funding allocations to a large extent, so we use both the revisions at the LGA and SA2 levels to derive the lower and upper bounds for the social welfare loss from mis-allocated resources. The lower bound welfare loss from inaccurate data is based on assuming that the LGAs are the relevant units over which funding is allocated, while the upper bound is based on assuming funding is allocated at the SA2 level. Proportionately, inaccuracies are going to be greater at the SA2 geographical level, as SA2s tend to be smaller than LGAs and so relative variations and inaccuracies are likely to be larger. If funding formulae need accurate estimates of SA2 (or SA1) populations, the inefficiency and inequity in funding allocations will be larger.

To apply the net social welfare loss formula set out above, we need:

- public expenditure by category estimates; and
- estimated (or assumed) percentages of public expenditures by category which are proportional to ERP (the data-variant parameter).

The relevant estimates and assumptions used by Lateral Economics are provided below. It is important to specify the amounts of public expenditure that are influenced by Census data, so the true social welfare loss of mis-allocated resources is estimated. So, for example, the NZ Census valuation study excluded one-off payments to health districts in NZ, so it only considered funding that would be mis-allocated if there were inaccuracies in population estimates.

In Australia, a number of entitlement programs fund individuals directly, such as the Newstart Allowance and other social security and Medicare benefits, rather than being distributed to regions. Also, there is Commonwealth recurrent funding that goes to universities

which is also not allocated on a regional basis according to the population. We have excluded defence spending for similar reasons.

For our estimates of in-scope public expenditure, LE has used the Government Finance Statistics estimates of expenses by purpose for 2017-18 published by the ABS. We have focused solely on State Government expenses, as it is at the State Government level that funding is allocated by regions, such as to Health and Hospital Services (e.g. Brisbane Metro North) in Queensland. Commonwealth spending is generally provided via individual entitlements (e.g. social security) or is directed towards the States and Territories.[18]

Table 2 – General government recurrent expenses (excluding depreciation) potentially affected by ERP estimates, LE estimates, 2017-18

Purpose	$ billion	Data variant parameter	In scope $ billion
Health	50.2	100%	50.2
Education	59.2	100%	59.2
Transport	32.7	20%*	6.5
General public services	74.0	50%**	37.0
Public order and safety	33.0	50%**	16.5

Source: LE estimates based on expenses data from ABS, Government Finance Statistics, Australia, cat. no. 5521.0.
NB. Commonwealth expenditure is excluded from health and education expenditure estimates.
**It is assumed recurrent transport expenditure is only 20% related to ERP estimates at the small area level due to the fact much of the expenditure relates to infrastructure already in place.*
***In the absence of specific information on how these services are distributed on a regional basis, we have assumed half of the expenditure is potentially affected by ERP estimates.*

For the social welfare loss calculation, each $x billion in different categories is then distributed to local areas (as LGA and SA2 levels) using the percentages of total ERP in those regions according to the un-rebased 2016 estimates (giving the sub-optimal regional funding levels estimates) and the rebased 2016 estimates (giving the optimal regional funding level estimates).

[18] Note that because we deal with capital investment decisions separately, we have adjusted the estimates to remove depreciation expenses.

Based on the data, assumptions and net social welfare loss function presented above, Lateral Economics' estimates of the annual avoided social welfare loss from having more accurate ERP figures (following Census rebasing) informing funding are presented in the table below. The estimated annual benefit is around $149 million, with a range of $74 million to $223 million. This could be considered a very conservative estimate given the large scale of public spending reported above.

Table 3 – Social welfare loss calculations*

Purpose	Lower bound $ million	Upper bound $ million	Mid-point $ million
Health	16.8	50.2	33.5
Education	19.8	59.2	39.5
Transport	2.2	6.5	4.4
General public services	24.7	73.9	49.3
Public order and safety	11.0	33.0	22.0
Total	***74.5***	***222.8***	***148.7***

**Lower bound is based on an assumption funding is distributed according to ERPs at LGA level, while upper bound is based on an assumption this distribution is done at the SA2 level. The mid-point is the mean of the lower and upper bound estimates.*

3.2 Infrastructure planning and targeting

3.2.1 Overview

Public and private entities invest in long-lived infrastructure and capital assets when they build or otherwise invest in hospitals, schools, public transport, roads, utilities (e.g. energy, telecommunications, water infrastructure), commercial buildings and housing.

Investment might involve expansions of existing infrastructure (for example, an extension to an existing school) or new infrastructure (for example, a newly constructed school).

Planners try to align levels and timing of capital investment with expected demand for infrastructure services – to build the right infrastructure in the right place and at the right time. Infrastructure built too early or in the wrong place may be relatively under-utilised. Infrastructure built too late or with the wrong features for needs could lead to congestion, overcrowding or a general shortfall in capacity for

sufficient or appropriate services. Both may result in other expenditure to mitigate these issues.

Therefore, demand forecasting is an important task in infrastructure planning and investment decisions. Various sources of data can inform this, including administrative data about current and historical usage. Census-related data for small areas (including, variously, population size, age, journey to work, etc.) can be an important part of the mix.

For instance, Infrastructure Australia has noted how Census data is a critical resource for many of its functions, including assessing nationally significant infrastructure projects, and research and advice on infrastructure policy and planning. Infrastructure Australia has stated that it is incorporating a stronger data-driven focus in its work in assessing Australia's infrastructure needs, including requiring detailed, high quality spatial data.[19]

The following sections draw out a few illustrations of Census use across infrastructure sectors before some quantitative estimates of value are explored.

3.2.2 Health and education

Those planning social infrastructure, particularly hospitals and schools, must understand the characteristics of populations in small areas, including issues such as age, and where populations are changing.

Accurate ERP projections are very important in school infrastructure decision making. For instance, NSW Education gets LGA level population projections by five-year age groups from the NSW Planning Department. It then splits LGAs into SA1s to project enrolments and demand for school facilities. Under contract to NSW Education, CSIRO's Data61 consultancy has developed a machine learning model for projecting enrolments and demand for school facilities. Historical Census data are essential inputs into the machine learning model so it can understand historical relationships and trends. Data on household income, dwellings, SEIFA and other variables are inputted into the model. Given that it can take 3-5 years to establish a school once the decision is made, there can be a large unmet need in growing areas if population projections prove inaccurate.

[19] https://consult.abs.gov.au/census/census-topics/consultation/view_respondent?sort=excerpt&order=ascending&_b_index=60&uuId=22827549

3.2.3 Transport, energy and water

As with other infrastructure, planning for transport, energy and water requires understanding of current and expected demand, and need across the community.

With respect to investments in road and public transport infrastructure, Census data and particularly small area ERP, journey to work data and spatial distribution of incomes are essential for urban transport models typically developed and utilised by state government transport planners, and which inform investment and service priorities, which stakeholders indicate cannot be easily replaced. These models also draw on household travel surveys and administrative data.

For example, Queensland Transport and Main Roads (TMR) uses Census data across multiple areas and considers it essential in transport network planning and service delivery.[20] Its urban transport models cover major Queensland urban centres, including Brisbane, Gold Coast, Sunshine Coast, Townsville, Cairns, Mackay, Rockhampton, etc.

TMR uses the Remix networking planning tool, which has triggers for network/service augmentations. Census-related data are critical inputs. TMR's models use Queensland Government Statistician's Office population projections and these depend on the Census. Moreover, the Census helps TMR understand trends at occupational and industry levels which are relevant to transport planning, as well as other demographic and economic trends which are making transport use difficult to forecast (e.g. Uber, lower rates of car ownership among younger generations).

TMR notes that, while it has investigated using mobile phone data, such data are imperfect, especially because essential demographic data are not attached to the data, which would help TMR model and project transport use.

The Census data are also used by TMR to:

- weight TMR's South East Queensland (SEQ) household travel survey and to impute missing data;
- calculate KPIs in Queensland Transport Strategy – e.g. the percentage of people living within walking distance from public transport (e.g. bus stop, train station);

[20] ERP data are also used by TransLink, the SEQ metropolitan transport agency, in determining public transport service levels and funding in SEQ.

- calculate its small area mobility disadvantage indicator (data on dependents, motor vehicles, people needing assistance, age);
- inform location and staffing of customer services centres which depend on ERP projections in their business cases (e.g. for new centre at Yarrabilba, a growth area);
- provide denominators in analyses – e.g. in patterns and trends in incidence of driver's licences which are relevant to transport planning, road safety studies, etc.

Finally, TMR noted that population projections are critical for business cases by TMR and other agencies across Australia, including Infrastructure Australia.

Census data is also an input into energy and other utilities. For instance:

- Australian Energy Market Operator (AEMO) forecasts residential electricity connections as part of forecasting annual consumption and maximum and minimum demand in the National Electricity Market (NEM) for use in planning. This includes using ABS population and density forecasts, based on Census data, for longer-term forecasts of households.[21]
- AusNet Services, an energy transmission and distribution business in Victoria, describes its locational modelling of distributed solar generation uptake, which uses Census-based ABS demographic data as well as industry and administrative data like customer growth, photovoltaic connection statistics, billing information, as well as customer growth forecasts.[22]

3.2.4 Quantitative estimates

To calculate a simple estimate of value, we generate an overall estimate of return to the infrastructure investment improved (or reduction avoided) through utilising Census-related data, and apply that to the current level of capital expenditure across various types of infrastructure.

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[21] Electricity Demand Forecasting Methodology Information Paper Draft updates for 2019 Electricity Statement of Opportunities April 2019, http://aemo.com.au/-/media/Files/Stakeholder_Consultation/Consultations/NEM-Consultations/2019/Reliability-Forecasting-Methodology/Electricity-Demand-Forecasting-Methodology-Information-Paper---draft-2019

[22] https://www.ausnetservices.com.au/-/media/Files/AusNet/About-Us/Determining-Revenues/Distribution-Network/Customer-Forum/Week-9-new/181101-Overview-of-Demand-Forecasts-for-CustForum---FINAL.ashx?la=en

Benefit = Annual capital expenditure x Avoided reduction in return (expressed as percentage of capital expenditure)

Capital expenditure figures (covering both the public and private sector, nationally) were sourced for:

- Health – from the Australian Institute of Health and Welfare[23]
- Schools – from the Australian Curriculum, Assessment and Reporting Authority's National Report on Schooling[24]
- Transport, Energy, Telecommunications and Water – from the Bureau of Infrastructure, Transport and Regional Economics based on ABS data[25]
- Housing – approximately $10.9 billion of private gross fixed capital formation in dwellings in 2017-18, according to ABS National Accounts estimates[26]

Stakeholder input and existing analyses were used to broadly estimate a proportion of capital investment reduction in return that is avoided for the above types of infrastructure – ranging from 1% for health and schools through to 0.2% for telecommunications and water. This implicitly takes into account both the share of investment portfolio that would not vary based on data differences (data invariance), and how much Census-related data improves investment targeting where based on data, relative to the counterfactual (Census improvement).

In practice, there would be some lag, as the absence of new Census data would not have an immediate impact on the infrastructure of that year or the years immediately following. The impact would likely accrue over the life of the investment. However, we treat this

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[23] Australian Institute of Health and Welfare 2018, Health expenditure Australian 2016-17, health and welfare expenditure series no 64. https://www.aihw.gov.au/getmedia/64cd1ee5-772d-4f01-ad14-c2fb9c6d6682/aihw-hwe-74-20180928.pdf

[24] See: https://www.acara.edu.au/reporting/national-report-on-schooling-in-australia-data-portal/school-funding/school-income-and-capital-expenditure-for-government-and-non-government-schools-(calendar-year). Consultations revealed Census data is important for infrastructure decision making regarding both public and private schools. Education Geographics noted its micro-simulation work for independent schools is heavily reliant on Census data.

[25] Australian Infrastructure Statistics Yearbook 2018 Part I—Infrastructure and the Economy, https://www.bitre.gov.au/publications/2018/yearbook_2018.aspx. Based on ABS data on engineering construction covering both public sector and private sector construction.

[26] ABS, National Accounts, cat. no. 5202.0. Dwelling investment is included in these calculations due to the important role Census and ERP figures play in population and dwelling projections at state government levels, which in turn influence land release, zoning, and private sector investments.

parameter as a simple summary of the lifetime impact, given there is insufficient information to decompose individual impacts in each year of the asset lifetime.

There is a high degree of uncertainty around these estimates, due to lack of information. However, parameter assumptions used by Lateral Economics are consistent with other analyses, and may be more conservative:

- Based on consultation with local authorities, the UK analysis used an estimate of Census value of 1% of annual capital expenditure for education (in the form of primary schools and pre-primary schools), transport (principally roads, as airports, ports, toll bridges, tunnels, etc. were excluded) and social housing.
- The NZ analysis used capital accuracy impacts due to non-availability of Census data of between 1% and 5% for various infrastructure assets in education, health, transport and energy.

Table 4 – Estimates annual value/benefit of Census data across infrastructure sectors

Infrastructure sector	Annual capital expenditure ($m) (A)	Avoided % reduction on return (B)	Annual benefit (A.B)
Health	$10.3 billion	1.0%	$103 million
Schools	$4.8 billion	1.0%	$48 million
Transport	$25.8 billion	0.5%	$129 million
Energy	$13.6 billion	0.4%	$54 million
Telecomms.	$9.0 billion	0.2%	$18 million
Water	$5.2 billion	0.2%	$10 million
Housing	$10.9 billion	0.5%	$54 million
Total			***$417 million***

3.3 Improved policy design

This section outlines some further areas in which Census data is used to improve policy design and implement public sector functions. There is some cross-over with the issues discussed above.

3.3.1 Intergovernmental financial relations

Census data are extensively used in horizontal fiscal equalisation (HFE) methodologies applied by the Commonwealth Grants Commission (CGC), which advises on the distribution of GST revenue, and those bodies playing a similar role within individual states which advise on the distribution of funding to local governments.

Of the $70 billion in GST revenue, around $6 billion is reallocated each year. Over half the funds reallocated ($3.5 billion) were reallocated on the basis of Census data in one way or another. As the CGC noted, all the statistics are inter-related in a way – for instance, estimates of ERP depend on the Census for accuracy.

Small area/spatial data from the Census are very important to HFE formula as are Indigenous and income data. The CGC brings together administrative and Census data sets in its HFE methodology.

Items in order of importance from the Census for reallocation:

1. remoteness ($2.4 billion)
2. Indigenous (<$2 billion)
3. SEIFA ($700mn) – housing ($230 million) is a sub-set of this
4. Urban Centres and Localities (UCL) data – i.e. proximity/distance of communities to/from each other ($500 million)

The net effect is $3.5 billion of GST revenue re-allocation as a result of Census-related data.

The five-yearly Census is seen by the CGC as absolutely vital to a fair GST redistribution, given that state circumstances change over time. The Australian Government, through the Department of Infrastructure, also provides financial assistance grants to state governments for distribution to local governments, which is partially on a per capita basis. Accurate Census-based ERP figures at the LGA level are needed for this.

We have not attempted to quantify the benefit of the Census in facilitating HFE as there is no direct link to service delivery at the regional level or in making the infrastructure decisions from which the major benefits of the Census derive. Hence, we are assuming that any benefits to the Australian community from more accurate HFE as a result of Census data are picked up in our estimate of

"long tail benefits", the additional 25% we are adding to the quantified benefits.

3.3.2 ABS statistical benchmarking and other ABS spillovers

Another challenge in quantifying the benefit from the Census comes from its role within the ABS in informing weights to apply to survey (for instance the Labour Force Survey) estimates to scale up survey results to regional, state and national estimates. As noted elsewhere, the Census improves the accuracy of ERP estimates (by age, sex and location) and hence allows for more accurate representative sampling leading to some mix of lower costs or more accurate surveys.

We have taken this benefit into account to some extent in our estimates of the benefits from better targeting of government services and improved policymaking. That having been said, there would be substantially wider benefits than those we have already captured. However, we have not developed a methodology for quantifying this additional effect.

3.3.3 Macroeconomic policy

LE has not attempted to estimate the benefit the Census may have in terms of improved macroeconomic policy, although there was such a value estimated for the UK. Such an estimate would be extremely speculative as it would require an assumption that a macroeconomic policy mistake is made that reduces the rate of economic growth for a period. The ONS "assumed there was a 50% chance of a 0.25 percentage point error in interest rates for one year in every 25 years" and used an economic model to determine what that would mean in terms of lost GDP.[27]

Given the Census most influences the levels of variables, rather than growth rates, it is difficult to assess just how significant an influence the Census would have on macroeconomic policy decisions. One stakeholder referred to concerns over the Treasury's forecasting of nominal GDP and Australian Government revenue in the years following the global financial crisis, but that related to challenges in forecasting commodity prices and tax liabilities of major taxpayers, rather than being associated with inaccurate population estimates.

Further, none of the macroeconomic forecasters in the public or private sector with whom we consulted spoke of Census data being important to the macroeconomic forecasting that is instrumental in

[27] ONS, 2011 Census benefits evaluation report, Table 3.

setting short-term fiscal or monetary policy with a view to macroeconomic stabilisation.

3.3.4 Further policy-relevant uses

The examples described above only scratch the surface of the ways in which Census data is utilised within the federal, state and local public sector, think tanks and others to inform policy and improved government functions. Some other examples, which are by no means exhaustive, are discussed in this sub-section.

The Australian Government Department of Jobs and Small Business (DJSB) is a large user of Census data in ministerial briefings, reports, and internal and external presentations. For instance, the head of the department's Employment, Skills, Small and Family Business branch gives around 120 presentations across Australia each year, and these presentations typically include Census data. There is substantial community interest in labour market information, some of which is best obtained from the Census. DJSB presentations are given to a broad range of stakeholders, including employment service providers, state and local government officials, career advisers, and school students, among others.

In DJSB's view, Census data are important in providing labour market data at a fine-grained level. The Census is valuable in providing detailed data for small regions and specific years of age, on a range of topics including educational attainment and employment by industry and occupation.

Economic inclusion is an important policy agenda, particularly for state governments. This issue often has a regional development component with geographic pockets of disadvantage. Different aspects of the Census are used to reflect on this. For example, since 2006, the Census has incorporated information of educational attainment (i.e. highest year of school completed or level of highest non-school qualification). This helps users to investigate the relationship between levels of education and employment outcomes, income and other socio-economic variables. It is often used as a proxy measure of socio-economic status. While various sample surveys also look at this issue, their sample size is too small to give sufficient detail for small population groups and for small regions or localities.

Demographic and socio-economic profiles at the local government, suburb or other small areas typically rely on Census data, as that data is consistent and accessible. These have multiple applications such as local needs assessment for services or infrastructure, strategic planning such as economic development strategies, and are often very important for local governments which have limited access to other data about populations.

For example, around 250-300 local government authorities, covering 80% of the Australian population, are clients of one commercial consultant – .id Consulting – and Census data underpins the majority of its work. In consultation, .id Consulting noted that it adds value to the Census data by producing consistent time series of Census data for LGAs, and making it available in its user-friendly web portals.

Data integration is increasingly being used in both monitoring and evaluation of public sector activities and policy research. Census data is being linked with Australian Government administrative data, and increasingly, data from beyond the Australian Government is being included to provide greater insight into policy-relevant outcomes and their determinants.

For instance, Census data is being linked with government administrative data on permanent migrant settlement, helping to better understand social and economic experience of migrants over time including location, income and family characteristics. Similarly, Census data is being linked with administrative data on temporary entrants (e.g. international students, temporary workers) to build a clearer picture of their social and economic experience in Australia. Both give the Australian Government substantially more visibility about the social effects of migration to inform migration policies.

Non-government users, particularly think tanks such as the Regional Australia Institute (RAI) and the Grattan Institute, are major users of Census data in their research and analysis which they use to contribute to public policy discussions.

The Census is of critical importance for RAI. It has been more or less central to every one of RAI's projects, according to RAI. Census data are critical inputs into the regional competitiveness index produced by RAI. In RAI's view, the Census is very important for understanding inter-regional mobility. It has used Census data to provide evidence regarding what is happening in regions, improving the quality of public discussion –e.g. RAI's finding that 400,000 people left a capital city for a regional area between 2011 and 2016.

RAI also noted the Census underpins the Input Output and Computable General Equilibrium models used by economists (due to the Census's detailed data on employment at four-digit ANZSIC and regional levels). Census data are also widely used by other think tanks, including the Grattan Institute, which emphasised the importance of regional mobility and journey-to-work data which come from the Census.

Census data have underpinned reports on Indigenous disadvantage which has led to a more satisfactory agreement making process between Indigenous Traditional Owners and mining companies, such as Rio Tinto. For instance, in their 2005 monograph, *Indigenous people and the Pilbara mining boom,* ANU academics John Taylor and Ben Scambary noted:

"In profiling the circumstances of Indigenous and non-Indigenous Australians, analysts rely heavily on census data for many key indicators. This has a number of advantages given the comprehensive scope of coverage and the application of standard measures."[28]

Census data are used to formulate Rio Tinto's targets for Indigenous employment and aboriginal business development in the Pilbara. These targets are related to the Indigenous share of the population of the Pilbara, which is estimated using Census data. The Census thus enables two teams within Rio Tinto to work towards their targets: the Indigenous Employment team and the Indigenous Business Development Team. This is important in establishing Rio Tinto as a "partner to operate" in the Pilbara, where it is a major miner of iron ore.

A major non-government user of Census data is the Grattan Institute. Its researchers used the Census in its *Wealth of Generations* report to understand long-term changes in incomes by age, gender and income distribution. While this can be done with the ABS Survey of Income and Housing (SIH), the survey data do not go back as far in time as the Census.

Also, the Grattan Institute's work about the geographic distribution of migrants, presented in its *Regional patterns of Australia's economy and population* report, rested on the Census, and would have been impossible without it, as nothing else picks up ethnic background with a sufficiently large sample size. This work has major implications for Grattan's thesis, presented in its *Crisis of Trust* report, that higher minor party voting in the regions is correlated with concerns about migration, even though there are very few migrants present.

Grattan's *Housing Affordability* report looked at home ownership rates by age by income over time. Again, the Census is more useful than the SIH in this type of analysis, because the time span is

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[28] Taylor, J. and Scambary, B., 2005, *Indigenous people and the Pilbara mining boom: A baseline for regional participation*, Centre for Aboriginal Economic Policy Research, The Australian National University, Canberra, Research Monograph No. 25. 2005 p. 5

longer. Also, Grattan suspects it would have sample size issues for the sub-groups analysed if it used the SIH. According to Grattan, the Census has enabled it to produce "powerful evidence" that the fall in home ownership is a result of economic factors rather than any change in preferences. It used the Census to look at trends in mortgage stress by fine-grained geography, which suggested that mortgage stress was following the development of new suburbs, an analysis which could not be done with the SIH.

Grattan has used Census data to track the shift in shape of the Australian population by age, which it notes "has been an important argument in many policy debates." Also, Grattan Institute Transport and Cities Program Director Marion Terrill has pointed out "the Census is very helpful for tracking shifts in population density and (lack of) urban infill."

The Census's contribution to better understanding and decisions for this broad range of diverse policy issues, where not directly considered in other specific quantification, is valued as part of the 'long tail'.

3.4 Other commercial uses

3.4.1 Locational decisions and market research

Understanding characteristics of locations is also critical in a range of further commercial purposes. A key use of Census data directly is in defining the characteristics of markets and audiences.

Demographic and spatial analysis of populations and forecast populations, using Census-related data, is often used in location decisions, through analysing market size and composition of potential demand. This is through either Census data directly, or products that utilise Census data (e.g. state government or local council population projections), often through specialist commercial consultancies.

Since the Census provides details about demographic characteristics of populations, particularly at small geographies, in a nationally consistent manner, this allows analysis of the characteristics of different areas (including bespoke build-ups of areas) in a relatively easy manner. Census data tends to be a foundation or starting point for a range of analyses, including those that also bring in other datasets or new data.

Market research – often informed by Census data – assists businesses and other organisations to make decisions about focus and how and where to reach consumers or other customers, and

optimise their expenditure. This sort of analysis can help target both capital expenditure and operating expenditure.

In the words of one strategic advisory firm: *"I'm not sure what we would do without it for so many questions."*

For example, one commercial consulting firm, Location IQ, indicates that it provides advice regarding location and property-based decisions. Its research identifies key areas of demand for different types of goods or services, and in doing so, points to the most beneficial locations.

Based largely on Census data, it provides analysis looking at key demographic data such as population, age, income, birthplace and household type around a given site. It also maps "demographic variables across population density, age breakdown, income, birthplace, employment, household type and car ownership at a small area level", allowing different small areas to be combined to build a picture of market segments.

.id Consulting indicated that the Census underpins the majority of its work. According to .id, the age and sex data by region are the most popular data accessed on its publicly available website. The quality of these data at the regional level depends substantially on the Census. Aspects like household composition from the Census cannot be easily replaced.

Sectors identified in consultation as utilising these demographic and economic data products and services based on the Census (SA-1 units and smaller) include education, large retailers such as supermarket chains or fast food brands, property development including shopping centres, health care providers, aged care and retirement living providers, and university student accommodation service providers, and other ASX 200 companies.

For example, McCrindle noted that it advised a fast food chain on correlation between revenue per store and demographic and socio-economic factors using Census data. It seems likely that this analysis would improve store location and marketing decisions – perhaps substantially.

At the level of smaller individual retailers not undertaking substantial capital investment, however, it appears the Census is generally not relevant for location decisions, according to our consultations with the National Retail Association. Retailers typically use foot traffic data at centres and look at what their competitors are doing. However, the National Retail Association acknowledged Census and ERP data may be relevant for location decisions for shopping centre owners.

No direct quantitative evidence is available to estimate the value of the Census contribution to locational decisions and market research in these commercial contexts.

IBISWorld (May 2019) estimates that the size (revenue) of the Australian market research and statistics services sector (including the ABS itself) is $3.1 billion in 2018-19.[29] Excluding the ABS itself (which accounts for around $500 million in 2018-19[30]) would make the sector closer to $2.6 billion.

The size of the sector represents the amount that customers are willing to pay for insights from market research and statistics services, which includes statistical consulting services and analytics services, as well as other types of services that are less directly Census-based, such as survey-based market research. (This figure for market research and statistics services is in the context of IBISWorld's estimate of the Australian management consulting sector having annual revenue ten times this amount, at $30 billion.[31])

Some of this relates to the value that research and statistical analysis adds, and some relates to the underlying data. A simple 1% of this revenue attributable to the Census would be $26 million annually. However, given that other sources of data available to commercial consultancies lack fine detail on small areas, this may well be an under-estimate.

An annual 3-4% attribution would be around $78-104 million. This would be roughly proportionate to the UK analysis, in which relevant commercial uses total to around GBP115 (~$205m) in an economy roughly double the size of Australia's.[32]

It would, however, be larger than the NZ analysis, which suggested from consultation with its sector an annual benefit attributed to the Census of around NZD10 million (consisting of $6.5 million for

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[29] https://www.ibisworld.com.au/industry-trends/market-research-reports/professional-scientific-technical-services/market-research-statistical-services.html.

[30] https://treasury.gov.au/sites/default/files/2019-03/04_Australian-Bureau-of-Statistics-1.pdf

[31] https://www.ibisworld.com.au/industry-trends/market-research-reports/professional-scientific-technical-services/management-consulting.html

[32] Selected commercial uses from the UK analysis total to around GBP115 (~$205m), including an annual GBP10.2 million for advertising planning and targeting, GBP$26.4 million for direct marketing planning and targeting, GBP9.2 million for leisure centre location planning, GBP47.4m for retail location planning, and GBP21.7 million for geodemography products, advice and consultancy.

market research and a further NZD2-4 million from private economic advisory work).

Drawing from the above, we conclude a rough estimate of value of $100 million annually associated with locational decisions and market research across multiple sectors.

3.4.2 Real estate advisory

According to CoreLogic, the Census is used in suburb profiles it provides on its consumer facing website, house.com.au, and also via its RP data, which provides detailed property market data to subscribers. RP Data has 65-70% market share among real estate professionals. CoreLogic's products are used in commercial market analysis and when preparing for listings or pitches. Census data are important in CoreLogic's GeoRisk product, which features a concentration risk variable (e.g. extent of employment in a single industry, whether a centre is a mining town, or has a high concentration of agriculture).

LE also consulted with a leading Brisbane real estate advisory firm, Propertyology, which uses Census data once or twice a week in analysis for clients and for its own use in helping to understand local markets. It typically uses QuickStats to access the data. Propertyology's Managing Director Simon Pressley noted the Census is useful for understanding demographic and economic (including industry and occupational employment) trends at the local level, and he commented:

"It would be a shame to lose it. It is a great tool for making good decisions."

Quantitative valuation of housing issues was taken into account in the infrastructure values described above.

3.4.3 Insurance

According to the Australian Government Actuary, the Census is essential for preparing the official five-yearly Australian Life Tables which are published and made freely available. These are used by insurance companies (private insurers, the National Disability Insurance Agency, workers' compensation insurers, etc.) as a benchmark for determining their own life tables for their own insured populations. The Australian Government Actuary also expects that its life tables also inform population projections made by different organisations.

Considering that, based on IBISWorld estimates, the direct contribution of the insurance industry to the Australian economy is over $17 billion in industry value added (for general, health and life

insurance), it is easy to appreciate that improved life tables as a result of Census data could have substantial value. This value would be even higher if one were to consider the indirect benefits that flow from insurance encouraging a wide range of economic activities.

LE has not attempted to estimate the economic benefit associated with the insurance industry directly, due to the difficulty of estimating the ultimate benefits of more accurate decisions being made by insurance companies and perhaps their clients as a result of better life tables, but it may well be in the order of tens of millions of dollars per annum, as even 1% of $17 billion of value added is $170 million.

3.4.4 Community sector

Like government and business sectors, the community sector's decision making is improved by access to Census data. Thus, for example, the Brotherhood of St Laurence and ANZ used Census-based data, analysed and transformed by consultancy .id Consulting, to assist in the targeting of local communities for their Saver Plus program.[33] The Saver Plus program is aimed at helping people with low incomes build their financial knowledge, skills and confidence and develop healthy saving habits, through matched savings and financial education.

Census data was used to help the Saver Plus managers choose 60 communities across Australia to target, through identifying the location with the highest concentrations of people most relevant to the program, taking into account issues such as income, ethnicity and education. Census data, alongside other data such as participant and penetration rates, is also being used to target and help measure the performance of ongoing promotional activities.

Another market researcher, Circa, described in consultation where they used Census data (in combination with other data sets) to provide advice about the characteristics of communities to assist a community advocacy group to identify where to focus its public communication efforts.

3.5 Public good and other general purposes

3.5.1 Electoral representation and boundaries

For determining electoral boundaries, the Australian Electoral Commission (AEC) uses seven-year population projections for SA1s across Australia, the accuracy of which depends on Census data.

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[33] .id Consulting, 'Delivering community service programs and measuring performance', https://home.id.com.au/case-studies/using-location-analysis-to-effectively-deliver-community-service-programs-and-measure-performance/

The AEC obtains ERP at the SA1 level from the ABS, which does not publish ERP figures at this level.

State and territory equivalents of the AEC also rely on ERP projections informed by Census data in determining electoral boundaries at the state and territory level. They would also be relevant in informing local government wards and in council amalgamations. Hence, Census data can be seen as supporting representative democracy through fair boundaries for electorates and wards across three levels of government.

Additionally, the AEC observed in consultations with LE that the Census is another piece of intelligence informing its service delivery (i.e. where booths should be located and how many staff will be needed on polling days). The economic efficiencies added in this regard are small compared with the efficiencies we have explored in this report, but managing the process of allowing Australians to vote without undue delay is fundamental to our democracy. Long queues on election day, particularly towards the end of polling could lead to some people being unable to vote, and so, to effective disenfranchisement.

3.5.2 Media, local profiles and general interest – 'understanding ourselves'

Comparisons between areas on topical aspects of demography and socio-economic issues are popular in the media and the community, particularly as new Census data is published.

For example,

- SBS's interactive 'How diverse is my suburb?' website which draws in Census data on ancestry, religion, birthplace and age for each suburb across Australia, and provides a simple visual format and rankings.[34]
- ABC's interactive 'How does your income compare to everyone else's?' which compares Census data on income and employment classifications from local regions across Australia[35]

Following the first release of 2016 Census data in late June 2017, the ABS recorded 7,165 news items related to the release, suggesting a high level of media and community interest in the data. The ABS received 370 media queries on the release day, and the number of related Facebook posts reached 40,000.

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[34] https://www.sbs.com.au/news/interactive/how-diverse-is-my-suburb

[35] https://www.abc.net.au/news/2019-05-21/income-calculator-comparison-australia/9301378

Media uses of Census data help create a more informed community. One market and social researcher, Circa Research, stated that Census data "underpins everything we do in market and social research".

Incidentally, Census data are readily accessible from the ABS's website, and many private and public sector users obtain Census data directly from the ABS's website. The ABS has provided data to LE on:

- the number of users who have accessed Census data from its website between June 2017 and January 2019, including 1.0 million unique users for Quickstats, 262,800 for Reflecting Australia, 117,200 for Community Profiles, 98,000 for Australia Revealed, 45,500 for SEIFA, 42,700 for Data in Pictures and 24,500 for Census Data Packs[36]; and
- downloads of tables from TableBuilder from January 2017 to 31 March 2018 – 240,199 tables downloaded by 670 unique users.

These data provide further evidence of the level of community interest in Census data.

3.5.3 Other principal academic purposes

The Census is considered a critical data source by geographers and demographers in Universities. For instance, University of Queensland Professor Jonathan Corcoran commented:

"The Census is one of the most critical data resources with which to make smart decisions and to know about our population."

It is especially important in understanding regional and small area population trends.[37] Professor Corcoran is currently working with the ABS on improving regional estimates of temporary populations, which can fluctuate considerably due to fly-in-fly-out (FIFO) and drive-in-drive-out (DIDO) workers.

Professor Corcoran observed:

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[36] Note these figures cannot be aggregated due to some users accessing multiple products. The ABS was unable to provide an aggregate estimate of unique users across all Census data.

[37] Incidentally, the importance of the Census in providing information on small areas was stressed by the Tasmanian Treasury, too. The Tasmanian Treasury noted that state-level ABS survey estimates for Tasmania typically have too high a level of sampling error to be reliable, and hence Tasmanian policy advisers need to rely heavily on the Census. The Northern Territory and Australian Capital Territory face the same problem.

"The jury's out on whether we'll be able to replace Census information with other sources such as mobile phone data. We're not in a position to replace Census yet."

The University of Queensland's Institute for Social Science Research (ISSR) uses a variety of Census products including the Australian Census Longitudinal Dataset (ACLD). Table Builder and unit record data are also used. It conducts research on Census data and also uses Census data to weight its own survey results to scale up to population estimates. It has also made innovative use of Census data, e.g. getting local area data from Census and connecting with HILDA. ISSR considers that Census data is important for understanding equity issues, e.g. access to higher education of disadvantaged groups.

Most of ISSR's 50-60 researchers would have used Census data at one time, according to its Director, Professor Mark Western. SEIFA, in particular, is used a lot in academic studies as a control variable in statistical models.

ISSR notes Census data is used in teaching, not just research. It is used widely across UQ, in the School of Population Health and Population Research Centre, for example.

Our consultations showed that many academics (and government users) access Census and other ABS data through the Australian Urban Research Infrastructure Network (AURIN), hosted by the University of Melbourne. According to the AURIN website:

"AURIN is a collaborative national network of leading researchers and data providers across the academic, government, and private sectors. We provide a one-stop online workbench with access to thousands of multidisciplinary datasets, from over 100 different data sources."

AURIN is a major way that users are accessing Census data and combining it with other data sets for data analysis and mapping. Over the five years to 30 June 2019, Census data accesses via AURIN were:

- 47,140 by the academic sector;
- 2,265 for the government sector; and
- 49,405 in total.[38]

Via AURIN, Census data has been applied in a wide variety of applications, including many of those discussed above, such as urban transport modelling.

[38] Access data provided by Professor Jane Hunter, University of Melbourne.

Regarding research outputs, the ABS has published a list of publications (not exhaustive) using Census microdata.[39]

LE has also undertaken its own database searches to understand the range of academic studies undertaken using Census data or other ABS data where the sample frame was likely influenced by the Census. Searching for studies in the 12 months to July 2019 in the ProQuest database of academic journal articles yielded the following breakdown of studies by category. Of course, this estimate of 141 published academic studies under-counts the full number of research studies that would rely on Census data, as it excludes so-called grey literature produced by consultants and think tanks.

Table 5 – Academic studies using Census or related ABS survey data over August 2018 to July 2019 referenced in ProQuest database

Category	No. of studies
Disadvantage	3
Education	5
Employment / labour market	14
Health - general	88
Health – Indigenous	7
Housing	3
Indigenous	4
Migration	2
Other issues	11
Transport	3
Waste management	1
Total	**141**

The wide range of uses to which Census data are applied in academia mean that it would be highly speculative to attempt to estimate a singular value to the research produced. Potentially, the

[39] See https://www.abs.gov.au/websitedbs/d3310114.nsf/home/published+research+-+census+of+population+and+housing

benefits are large. For instance, in 2018, London Economics estimated that:

"Australia's Group of Eight universities contributed $66.4 billion to the national economy in a single year through the flow on effects of their research, graduates, international students and employment."

3.6 Summary of indicative quantitative estimates

Table 6 summarises the indicative estimates of the gross annual value of the Census-related data described above. We estimate around $666 million of gross annual value, in total.

Adjusting this by an additional 25% to take account of the 'long tail' provides an annual estimate of over $800 million.

It should be considered indicative rather than definitive, given the forms of estimation able to be used.

Table 6 – Summary of annual gross value where quantified

Category	Sub-category	Estimate of indicative annual gross value
Services	Health	$34 million
	Education	$40 million
	Transport services	$4 million
	General public services	$49 million
	Public order and safety	$22 million
	Sub-total	***$149 million***
Infrastructure	Health	$103 million
	Education	$48 million
	Transport and utilities	$129 million
	Utilities	$82 million
	Housing	$54 million
	Sub-total	***$417 million***
Locational decisions and market research	Other commercial capital and operating	$100 million
Total		***$666 million***
Adjustment for a 'long tail'	Further 25% to take account of diverse additional uses across the community	$166 million
Adjusted Total		***$832 million***

4. Costs and Net Benefits of the Census

4.1 Costs associated with the Census

We estimate the Census has an economic cost to the Australian community of around $670 million every five years. This economic cost comprises:[40]

- the direct resources utilised by the ABS measured by the Census's budgetary cost
- a deadweight loss associated with the ABS' taxpayer-funded costs
- the time used by Australian households to complete Census forms, whether on paper or online.

The 2016 Census involved a direct resource cost to the ABS of around $500 million.[41] The 2021 Census is budgeted to cost a similar amount. We, therefore, assume a direct resource cost of around $500 million every five years.

There is a deadweight loss to the economy associated with the taxation to fund the ABS' direct costs (also called marginal excess burden of taxation). An assumption of 20% of the budgetary cost is made, or a further $100 million every five years, on the basis of recent Treasury estimates of the marginal excess burden on individuals' labour income and GST at 21 cents and 19 cents to the dollar respectively.[42] Applying a deadweight loss in this manner is consistent with the (hypothetical) short-run counterfactual of not conducting the Census, and ABS not replacing it with alternative data collection and reporting also requiring taxpayer-funded resources. That is, in the counterfactual it is assumed the ~$500 million taxation would be returned to taxpayers, rather than being appropriated for other government purposes including plugging the gaps that would open up in Australia's data resources resulting from the loss of the Census.

We also include a value of time taken by households to complete the Census form, calculated as around $70 million every five years. This is estimated as a function of the number of households completing the Census form, household average time to complete the Census form (on paper or online), and a shadow price of this time which we

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[40] Neither the NZ or UK analyses incorporated a deadweight loss. The UK analysis did not appear to cost the time for the public to complete Census forms.

[41] https://www.abs.gov.au/websitedbs/d3310114.nsf/home/Australian%20Statistician%20-%20Speeches%20-%20Census%202016%20Lessons%20Learned

[42] https://treasury.gov.au/sites/default/files/2019-03/TWP2015-01.pdf

assume households could otherwise use for leisure (non-paid) activities.[43]

- There are approximately 9.6 million households in Australia in 2019.[44]
- In 2016, 58.8% of private dwellings submitted Census information using the online form, taking an average of 26 minutes. Paper forms were used by 41.2% of private households, at an average of 26 minutes each.[45]
- This gives an overall average of around 30.5 minutes for a household to complete the 2016 Census. Over time, a higher proportion of people would be expected to submit online (as has been the trend, with online form use growing from 10.6% in 2006 and 34.3% in 2011), leading to less time being taken. We assume 30 minutes per household as a conservative estimate.
- The value of non-paid (leisure) time is subjective, and will vary across the community. We apply a parameter value of $15 per hour as a community-wide average.[46]

This estimate of Census costs does not include the costs of transforming or working with Census data, which are assumed to be not additional to the counterfactual.

4.2 Net benefits from the Census

The indicative quantitative estimates described above indicate that benefits of Census-related data for the Australian community easily outweigh the costs of their generation. We indicatively estimate in the order of $6 of value for every $1 of costs on the basis of assumptions made, including the 25% uplift for the 'long tail' of further widely distributed uses across the Australian community.

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[43] 9.6 million households by 30 minutes per household by $15/hr = ~$72 million

[44] ABS 2019, 3236.0 – Household and Family Projections, Australia, 2016 to 2041, released 14 March 2019 (series II: projected 9,648,665 households as at 30 June 2019)

[45] ABS 2017, 2900.0 – Census of Population and Housing: Understanding the Census and Census Data, Australia , 2016 , released 27 Jun 2017, https://www.abs.gov.au/ausstats/abs@.nsf/Lookup/2900.0main+features22016

[46] This draws from the Australian Transport Assessment and Planning (ATAP) Guidelines, which estimates the value of travel time for the occupants of passenger cars for private purposes being $14.99 per person-hour in June 2013, being 40% of seasonally adjusted average weekly earnings for Australia, see: https://www.atap.gov.au/parameter-values/road-transport/3-travel-time.aspx. By comparison, the NZ Census value assessment applied values of time between $3 and $6 per hour based on that jurisdictions' transport agency economic evaluation guidance.

This simple calculation is made on the basis that the economic cost is incurred every five years, and that Census data has the greatest usefulness until the next Census, so we apply the annual gross value for five years. (Alternatively, it can be done by dividing the economic cost every five years by five to produce a $134 million annual cost and comparing this to the annual gross value). More complex analyses taking into account the time value of money would provide only spurious accuracy given the uncertainty in the underlying quantitative estimates.

Thus, even if the Census had an economic cost of six times its current cost – of $3 billion every five years – it would still provide a net benefit to the Australian community, with respect to the counterfactual of having no Census.

A comparison of inputs and results of benefits and costs across this report and comparable reports in NZ and the UK is provided in Appendix C.

4.3 Looking towards the future

The content in this report describes our assessment of the value of the Census to contemporary Australia currently, based on a counterfactual of the Census ceasing to be conducted.

However, this does not address the counterfactuals we have not explored in which the Census continues but with some changes and with other data being collected to complement it. The ABS actively considers such options as part of its ongoing work.

Further, as we move further into the future, different counterfactuals might easily be imagined for how the ABS and others could generate high-quality, comprehensive statistics about contemporary Australia.

5. Conclusion

The clear conclusion we have reached from our research and consultations across the Australian public and private sectors is that the Australian Census plays a critical role in building evidence and decision making to improve the efficiency, effectiveness, fairness and integrity of Australia's economic and social infrastructure.

Public sector agencies – particularly at the state level which rely on the Census to provide data for small areas and disadvantaged groups – have built up a vast array of models to inform their service delivery and infrastructure decisions based on the five-yearly Census data.

Additionally, demographers and social researchers have come to rely on the Census as providing an in-depth examination of how the Australian population is changing. As one leading social researcher, Mark McCrindle, noted, "It holds up a mirror to our society." It helps bust myths about how our population is changing, and hence improves the quality of public debate.

Because it is comprehensive and accessible, Census data is influential in helping commercial and other sectors understand the size and nature of markets, which influences many locational and other resource allocation decisions.

Taking a high-level view, the Census is widely regarded as an authoritative and credible source of basic facts, applicable in a wide variety of contexts, as described by eminent Australian demographer Professor Peter McDonald:

"The value of the census also lies in enhancing our understanding of ourselves in a highly diverse society. In a world of social media, it is easy for untruths about the nature of Australian society to spread rapidly. The census enables untruths to be revealed for what they are."

This report's quantitative analysis provides an indicative estimate in the order of $6 of value for every $1 of costs, on the basis of assumptions made and taking into account additional value due to the 'long tail' of further widely distributed uses across the Australian community. In general, the Australian community's collective effort every five years to undertake the Census is more than worth it.

This is not to say that the value associated with the Census has yet been fully maximised. Emerging uses, particularly around data integration, can derive greater insights from Census data. For example, the potential value from linking Census data to administrative data sets is only beginning to be realised. Similarly, there may be ways to reduce costs associated with the development of Census-equivalent statistics, including relying less on the general public to answer questions every five years.

The Australian Census exists in a dynamic environment, in which considerations of usefulness, alternatives, costs, reliability, access and privacy are complex and shifting.

This qualitative and quantitative assessment of value is a helpful step towards a long-term exercise in learning about how the Australian community makes use of Census data, and driving the realisation of benefits.

Appendix A – Stakeholders consulted

In developing this report, Lateral Economics engaged with a diverse range of government and non-government stakeholders. These included individuals from the following stakeholders.

Australian Government

Australian Bureau of Statistics

Australian Electoral Commission

Australian Government Actuary

Commonwealth Grants Commission

Department of Jobs and Small Business

Department of Health

Department of Home Affairs

Department of the Prime Minister and Cabinet/National Indigenous Australians Agency

The Treasury

State and Territory Governments

NSW

NSW Health

NSW Education

NSW Department of Planning, Industry and Environment

Victoria

Department of Education and Training

Department of Health and Human Services

Department of Premier and Cabinet (Centre for Data Insights)

Queensland

Queensland Health

Queensland Transport and Main Roads

Department of Local Government, Racing and Multicultural Affairs

Queensland Government Statistician's Office

Western Australia

Department of Local Government, Sport and Cultural Industries

Department of Communities

Tasmania

Tasmanian Treasury

Northern Territory

Department of the Chief Minister

Territory Families

Private sector, NGOs and think tanks

AlphaBeta

ANZ

Brisbane South PHN

Circa Research

CoreLogic

Credit Suisse

Deloitte

Education Geographics

Grattan Institute

.id Consulting

Industry Super Australia

Intelligence Flows (Michael Obrecht)

McCrindle

National Retail Association

Propertyology

Regional Australia Institute

Rio Tinto

Academic users

AURIN

ANU Dr Liz Allen

ANU Emeritus Professor John Taylor

University of Melbourne Professor Peter McDonald

UQ Professor Jonathan Corcoran

UQ Institute of Social Science Research

Appendix B – Regional population estimates counterfactual

A widely reported benefit of the Census is more accurate Estimated Resident Population (ERP) figures at the state and territory and small area levels. Accurate state and territory ERP data are essential in ensuring accurate and fair distributions of GST revenue and parliamentary representation.

Given the importance of Census data in guiding decision making regarding service provision and infrastructure location and timing at the regional or small area level, it is important to describe in some detail our counterfactual regarding small area ERP estimates.

The counterfactual is that the ABS would continue to produce estimated ERP figures down to the SA2 level as it does now, although without the benefit that comes from rebasing due to the Census every five years. The ABS uses a variety of data to estimate regional ERPs. Essentially, it uses the best information it has available on the components of population growth, as described in the explanatory notes for Regional Population Growth, Australia:

SA2 populations are updated in post-Census years (from 2016) by adding to the estimated population at the beginning of each period the components of natural increase (births minus deaths), net internal migration (moves between and within the states) and net overseas migration… Local knowledge, such as that advised by state governments (including peer reviewers) is considered and used to adjust the figures for particular SA2s. Estimates at the SA2 level are constrained so that they add to the relevant state population estimates.

The table below sets out the sources of data for the components of population change at the regional level. It is clear that Census information is very important in estimating the changes to regional populations via internal and overseas migration.

Table 7 – Sources of data for the components of population change at the regional level

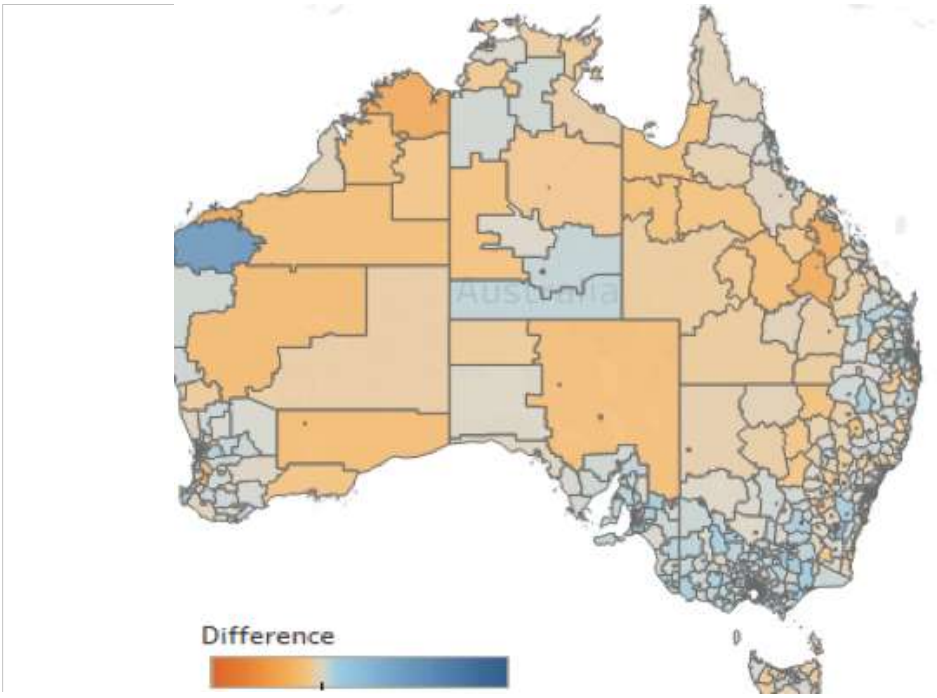
Component	Data sources and methods
Natural increase	State and Territory Registries of Births, Deaths and Marriages, with data coded to ASGS based on place of usual residence of the mother for births, and place of usual residence of deceased for deaths, which is then aggregated to SA2 and LGA levels.
Internal migration	Primarily estimated using de-identified Medicare data on change of address information (with assumed three month lag). Defence force personnel movements data are also used. Expansion factors (based on state/territory estimates) are used to expand the estimates of internal migration to account for the fact that not everyone who moves will show up in Medicare data as having moved in a period. These expansion factors are based on the latest Census.
Overseas migration	Based on breaking down state/territory-level net overseas migration arrivals and departures data into sub-state areas, based on information from the latest Census (i.e. from the Census question regarding where you lived one year ago). Australian Government administrative data on 457 Visas and international students are also used to estimate the distribution of arrivals across regions. Regarding departures, the Census does not directly provide information on the distribution of departures across regions (as people who depart do not fill in the Census). So the ABS estimates regional departures in a model which compares regional population data for the last two Census years. This model takes into account regional population compositions, including the number of recent arrivals and socio-economic characteristics.

Source: ABS 3218.0 Regional Population Growth, Australia, 2017-18, Explanatory Notes.

Lateral Economics assumes that the ongoing errors in ERPs at regional levels will be equal to the errors revealed by the rebasing of ERP estimates following the 2016 Census (e.g. see figure below).

This could be considered a conservative assumption. In the no-Census case, these errors could get much worse after five years, as regional population changes due to internal and overseas migration would be estimated using expansion factors and the distribution of recent overseas arrivals from the 2016 Census. The Census data used to calculate regional ERPs may increasingly become less suitable in the future if the Census were discontinued. For example, 2030 ERP estimates would rely on the 2016 distribution of recent arrivals from overseas by SA2, but the regional pattern of distribution of more recent arrivals could be substantially different. We have no way of projecting how much worse the ERP estimates have become, so we are assuming the errors in ERP revealed five years after the last Census persist into the future and do not get any worse, even though they may well do.

Figure 6 – ERP Revisions following Census rebasing (by SA2 region)



Source: ABS

Appendix C – Comparison with other similar analyses

Throughout this report, in considering overall approach and parameter assumptions, we have drawn on and, where we felt appropriate, adapted similar work undertaken in the UK and New Zealand.

While there are many similarities in approach, there are also some methodological differences given varying data available in each jurisdiction, jurisdictional guidance on best practice and other technical choices. In some cases, the methods have not been fully described in public documents so the analysis cannot be recreated by Lateral Economics. Consequently, we cannot fully document all the deviations between our own method and that of the other two analyses.

For instance, regarding capital investment, the UK report does not have an explicit consideration of cost and considers only the first year of benefit, and the New Zealand study applies a net present value approach over 25 years (with the individual year benefits not explicit) which we have not elected to apply given longer-term uncertainty.

Of the studies, we consider ours to offer the most wide-ranging quantification across uses. Overall, it is also the most conservative, though in some individual categories of value, the Lateral Economics analysis may be less comprehensive given data and other constraints. The following table documents the differences between our methodology and that of the other two studies.

Table 8 – Summary concordance of methods and assumptions between Lateral Economics and other studies of census value

Category(Section of Report)	AU	UK	NZ
Services planning and targeting (§3.1) Improved policy design (§3.3)	Implemented NZ social welfare function methodology but used Australian data. This was done for state health, education, transport (20% of total), general public services (50% of total), and public order and safety (50% of total). It has been assumed that ERP figures are relevant to the regional distribution of this funding, as consultations suggest, but the relationship between Census data and alternative data is not as clear as it is in NZ. Other impacts regarding improved policy design not contained above assessed qualitatively and in 'long tail'	Incorporated impacts across public sector transport, education, health, equity, social security and rural affairs, with methods and assumptions mostly not explicit. Government and government-funded policy research using small area data valued based on its cost – our judgement is that it is likely to generate substantially higher benefits than that. Also attributed small proportions (0.01-0.1%) of expenditure on various local government services.	Social welfare function methodology for social loss from next-best allocation of health services expenditure by region based on difference between Census and primary health organisation enrolment. Also includes an attribution of central government expenditure on policy-making: social (10%), Maori (5%), general (1%)
Infrastructure planning and targeting (§3.2)	Attribution of annual capital expenditure for health and education (1%), transport (0.5%), energy (0.4%) and water/telecomms (0.2%)	Estimates across sectors with assumptions mostly not explicit. Attribution of 1% primary and pre-primary school, local transport and social housing capital expenditure.	Attribution of 1-5% of annual return for investment in various asset classes, with 15%-25% for local govt infrastructure
Improved policy design: Statistical benchmarking (§3.3)	Assessed qualitatively and in 'long tail'	Not explicitly included	20% increased survey costs
Improved policy design:	Based on consultation, we were sceptical of	50% change of 0.25% error in	Not assessed

Macroeconomic policy making (§3.3)	any substantial value being added by the Census to the setting of short run macroeconomic policy.	interest rates for one in 25 years. We are critical of this methodology.	
Other commercial uses: Locational decisions and market research (§3.4)	Attributing 3-4% of revenue of statistical services and market research sector excluding ABS, to reflect willingness-to-pay for value provided by the Census. Additional attribution of 0.5% capital expenditure for housing.	Estimates across sectors of value and attribution with assumptions mostly not explicit. Housing planning based on 15% of housing planning sector value attributable to Census data. Retail based on mid-point of 1% of retail real estate investment and other bottom-up estimate.	Reduction in rate of return on aged care facilities. Also various attributions with assumptions not fully explicit, scaled to industry size.
Public good: Electoral representation and boundaries (§3.5)	Assessed qualitatively and in 'long tail'	Not assessed	5-10% of Electoral Commission spend on maintaining rolls and reviewing arrangements
Public good: Academic research (§3.5)	Reported anecdotally, assessed quantitatively in 'long tail'	Not included, but may be covered partly by policy research funded by public agencies described in 1. Services planning and targeting	May be incorporated into market research estimates
Costs (§4.1)	Economic cost with deadweight loss. Public compliance cost includes $15 non-work hourly rate from standard guidance	Not explicitly assessed	Economic cost with no deadweight loss. Public compliance cost includes NZD3-6 non-work hourly rate from standard guidance
Net Benefits (§4.2)	~5-6:1 benefit to cost ratio with simple comparison over 5 years	Not explicitly stated	~5:1 benefit to cost ratio based on 25-year NPV approach