

Are Indigenous land and sea management programs a pathway to Indigenous economic independence?

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Abstract. This paper focuses on Indigenous business development, an under-researched co-benefit associated with investment in Indigenous land and sea management programs (ILSMPs) in northern Australia. More than 65% of ILSMPs undertake commercial activities that generate revenue and create jobs. In addition to generating environmental benefits, ILSMPs thus also generate economic benefits (co-benefits) that support Indigenous aspirations and help to deliver multiple government objectives. We outline key features of northern Australian economies, identifying factors that differentiate them from Western urbanised economies. We discuss literature highlighting that, if the aim is to stimulate (short-term) economic development in northern Indigenous economies, then the requirement is to stimulate demand for goods and services that are produced by Aboriginal and Torres Strait Islander people (herein referred to as Indigenous people), and which generate benefits that align with the goals and aspirations of Indigenous people. We also discuss literature demonstrating the importance of promoting a socio-cultural environment that stimulates creativity, which is a core driver of innovation, business development and long-term development.

ILSMPs have characteristics suggestive of an ability to kick-start self-sustaining growth cycles, but previous research has not investigated this. Using 8 years of data relating to Indigenous businesses that are registered with the Office of the Registrar of Indigenous Corporations (a subset of all Indigenous businesses), we use statistical tests (Granger causality tests) to check whether ILSMP expenditure in the first year has a positive impact on Indigenous business activity in subsequent years. This analysis (of admittedly imperfect data) produces evidence to support the proposition that expenditure on ILSMPs generates positive spillovers for Indigenous businesses (even those not engaged in land management), albeit with a 3-year lag. ILSMPs have been shown to be an appropriate mechanism for achieving a wide range of short-term benefits; our research suggests they may also work as catalysts for Indigenous business development, fostering sustainable economic independence.

Additional keywords: Closing the gap, Economic development, Indigenous advancement, Indigenous business development, Indigenous land and sea management, Self-sustaining economic growth.

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Introduction

Indigenous northern Australians have diverse development plans consistent with their distinctive aspirations for culture and country, and wish to become economically independent through partnering in development (Armstrong *et al.* 2005; McGaurr *et al.* 2016; Morrison 2017). Indigenous representative groups have actively advanced this agenda by, for example, championing an Indigenous prospectus for northern development (NAILSMA 2013) or calling for changes in the *Native Title Act 1993* (www.legislation.gov.au/Details/C2017C00178) such that traditional owners can become the underlying title-holders of pastoral leases

(NT Country Hour 2018). The Australian Government also has several objectives relevant to northern Australia, including those of: developing the north (Office of Northern Australia 2015); encouraging Indigenous advancement (DPMC 2014); and helping to close the gap of disadvantage between Aboriginal and Torres Strait Islanders (hereafter referred to as Indigenous people) and non-Indigenous Australians (Commonwealth of Australia 2018). Some Government strategies have been designed to contribute to multiple objectives, e.g. the Indigenous Business Sector Strategy (Commonwealth of Australia 2017b), which seeks to encourage the growth of Indigenous-owned and

-led businesses, increase Indigenous employment and foster social and economic empowerment.

Although Indigenous land and sea management programs (ILSMPs) are not generally funded as a policy focused on Indigenous business development, 65% of Indigenous organisations undertake commercial activities that generate revenue and create jobs (including fee-for-service contracts, carbon-abatement projects, pastoralism, the creation of wildlife products, and tourism) (Commonwealth of Australia 2015, 2016). Previous research has found that ILSMPs create important employment opportunities for Indigenous people within remote communities (Altman *et al.* 2007; Smyth 2011). ILSMPs have also been shown to contribute to the northern development agenda and help close the income gap between Indigenous and non-Indigenous Australians (Jarvis *et al.* 2018), as well as generating other social, health, cultural and economic co-benefits (Garnett *et al.* 2009; Roberts Evaluation 2015; Social Ventures Australia 2016; Barber and Jackson 2017; Larson *et al.* 2018).

More recently, researchers have identified a range of business opportunities that can arise from ILSMPs (Weir *et al.* 2011); we focus on these additional business opportunities. Specifically, we set out to determine whether there is empirical evidence to support the proposition that expenditure on ILSMPs generates positive spillovers for other Indigenous businesses not engaged in land management. This is an important issue to investigate because it sheds light on the question of whether ILSMPs are able to help contribute to vital economic development aspirations of Indigenous northern Australian communities (Anderson 1997, 2002).

Our investigation comprises two linked parts. In the first part, we use insights from the literature to conceptualise the problem, describing key features of northern Australian economies and highlighting factors that differentiate them from Western urbanised economies. We also use insights from this review to identify the pre-conditions required to stimulate (short-term) development in northern Indigenous economies, and to identify factors likely to help lay the foundations for longer term self-sustaining economic growth. In the second part, we use 8 years of data (from 2008–09 to 2015–16) relating to Indigenous businesses registered with the Office of the Registrar of Indigenous Corporations (ORIC), from more than 2000 Australian postcodes. We develop statistical models and run tests to check whether ILSMP expenditure in any year (from 2006–07 onwards) has a positive impact on Indigenous business activity (for ORIC-registered businesses) in subsequent years. This allows us to ask whether ILSMPs generate positive spillovers for other Indigenous businesses not engaged in land management, potentially kick-starting a self-sustaining development cycle.

Conceptualising the problem

The Australian ‘northern development paradigm’ is guided by the Commonwealth of Australia White Paper *Our North, Our Future* (Office of Northern Australia 2015), with a vision of government-facilitated growth in the private sector. A ‘sharp increase in the scale and breadth’ of pillar industry sectors (such as agriculture) is expected, supported by rapid population

growth (five million of an estimated total Australian population of ~60 million by 2060; ABS 2013). If these aspirations are achieved, northern populations would comprise 6–8% of Australia’s total population, which is up from recent estimates of ~3%, or ~600 000 (Taylor *et al.* 2011).

The Federal Government proposes to address the challenges to economic development by: making it easier to use natural assets, in close consultation with, and with the support of, Indigenous communities; providing a more welcoming investment environment; investing in infrastructure to lower business and household costs; reducing barriers to employing people; and improving governance. Acknowledging the need to form effective partnerships with the 30% of the northern Australian population who are Indigenous, the White Paper focuses on creating opportunities for Indigenous people through education, job creation and economic development. It thus dovetails into other Federal Government policies such as:

- Indigenous Advancement Strategy, which includes a theme of ‘Jobs, Land and Economy’ and which focuses on workforce participation, fostering Indigenous businesses and assisting Indigenous people to generate economic and social benefits from the effective use of their land (DPMC 2014); and
- Closing the Gap initiative (Commonwealth of Australia 2017a).

Despite these government initiatives, and the desires and initiatives of many Indigenous people towards livelihood security and autonomy, the impact continues from forced acquisition of traditional territories, colonialism and subsequent disruption to Indigenous economies (Hindle 2007). The *Native Title Act 1993* provides for recognition of traditional ownership systems that have endured through the colonial era, and diverse State laws support this recognition with changes to tenure (e.g. see Holmes 2011). The mixture of recognition arrangements has created an institutional context where Traditional Owners have varying abilities to exercise their rights over their traditional lands and waters, and diverse organisations frequently lacking business-ready capacity are involved in holding these rights, which are now critical to realising economic opportunities. Complex right-recognition arrangements confound the persistent and profound impacts of the colonial era in innumerable ways, among them poor mental and physical health outcomes. In this paper, we focus on just one part of a complex problem: that relating to the economy.

Most remote Indigenous economies exhibit the classic signs of economic stagnation and depression, many with all-but-non-existent markets, and very low rates of labour-force participation (Altman 2001). If one were considering a Western urbanised economy, one might seek to understand this economic malaise (and to form policy prescriptions for it) by examining basic economic principles (Fig. 1). However, economic policy prescriptions developed to stimulate urbanised, Western economies do not easily translate to effective prescriptions for stimulating growth in remote Indigenous economies across northern Australia. Some of the key reasons for this inefficacy follow.

First, research in economic geography has highlighted significantly different socioeconomic characteristics between

During the early 1900s the macroeconomic policy prescription (derived for use in Western urbanised centres such as London and New York) was to focus on 'supply side factors', effectively seeking to raise the productive capacity of an economy by improving its factors of production (labour, machinery) and/or by improving technology (Solow 1956; Swan 1956). But as highlighted by Keynes (1936) when writing about the Great Depression, if there are no buyers, then increasing capacity to produce does not automatically mean there will be an increase in actual production and sales: unwanted product will simply go to waste. Supply-side policies, alone, cannot stimulate a depressed economy. A better economic catalyst is to use policies that stimulate both supply and demand, or better still, create a self-sustaining cycle of perpetual growth in both demand and supply (sometimes termed *endogenous growth* - often due to the expansion of human capital (e.g. through education) or simply 'innovation' - see Acemoglu *et al.* (2012), Capello and Nijkamp (2010), and Suri *et al.* (2011)).

Fig. 1. Stereotypic policy prescriptions for depressed (Western) urbanised economies.

the regions known as economic cores and their connected economic peripheries. The consequent economic problem (making economic development in the modern context 'hard' in remote areas) affects Indigenous and non-Indigenous people alike. Economic peripheries such as the Northern Territory (Carson 2008) generally supply the raw natural resources used to fuel the core's secondary and tertiary industries, and are designed to feed the demands of the core's market. Goods and services produced by these industries are then supplied back to the peripheries. In these contexts, the benefits of economic stimulus often accrue (or 'leak') to actors outside the periphery, through both profits and the use of a relatively temporary, external workforce. The local demand for goods and services can thus be somewhat decoupled from mainstream market forces owing to low population densities, high transaction costs and subsequent low levels of market and political power (Stafford Smith 2008).

Regional economic multipliers (simplistically, the total money flowing to a region following an external stimulus, divided by initial expenditure on the stimulus) are almost always small in rural and/or remote areas (Stoeckl 2007). In the case of remote areas, the benefits of investment in some industries that flow to people in urban regions outweigh the benefits flowing to those living in the regions in which production occurs (Rolfe *et al.* 2011). Western Australia's Pilbara region, for example, is characterised by the rapid flow of capital, commodities and labour to serve the mining industry, with the beneficiaries of these transactions located outside of the region in metropolitan and international cores (Argent 2013).

Often, peripheries are also functionally simple in economic terms, having a disproportionately dominant public sector, a monopoly-sized private sector, or a combination of both via regulatory tools that define the rules under which a private-sector project will operate (Horsley 2013). These single sectors are then disproportionately important to a community's economic and social fabric; the private development of 'closed' mining towns by mining companies in the Pilbara region provides an example (see Horsley 2013). A key risk with the dominance of a small number of sectors as both investors and beneficiaries is that these structural issues may retard long-term growth through lack of diversification and over-dependence on external capital and markets (Carson 2010). Economic leakage from peripheries towards cores can also result in a myriad

of undesirable socioeconomic outcomes, including a local population at relative economic disadvantage (Langton 2010).

Second, in peripheries such as northern Australia (also, for example, northern Canada), the local population is largely Indigenous and faces significant socioeconomic disadvantage. For this population, periphery-to-core leakage is exacerbated by local Indigenous-to-non-Indigenous leakage. This is associated with two key structural factors:

- (i) Indigenous economies are not simply smaller, 'under-developed' versions of urban centres; their structure can be fundamentally different to that of Western urbanised economies (described as hybrid economy by Altman 2001).
- (ii) There is a disjuncture between the Indigenous and non-Indigenous economies that share the same geographic space; the mainstream (non-Indigenous) and Indigenous economies operate more or less independently (NAILSMA 2014), with few links between the two (Stoeckl 2010; Stoeckl *et al.* 2013).

Remote Indigenous economies are often characterised by the presence of a strong 'customary' sector, based on productive activities such as hunting, fishing and gathering, land and species management, and the maintenance of socio-cultural and ecological biodiversity (Altman 2001). The activities associated with this type of production are related to, and inseparable from, the broader holistic notion of looking after country, which involves looking after all of the values, places, resources, stories, and cultural obligations associated with that area (Altman *et al.* 2007). Moreover, these goods and services are all but invisible in mainstream economic measures of Gross Domestic Product (GDP) because they are not sold in a local market/store (Kubiszewski *et al.* 2013). As such, customary production does not generally provide Indigenous people with opportunities to earn money (except as part of an ILSMP).

In remote communities, the market is typically very small. There may be only one shop, which also sells fuel, and perhaps a school. Relatively few Indigenous people participate in the 'market' as workers (Hunter 2014) or as business owners (Stoeckl *et al.* 2011); participation rates are particularly low in remote regions. Indigenous interaction with the market is thus predominantly as a consumer/purchaser, with money flowing from Indigenous people to the owners of the shops (who, often,

are non-Indigenous). Attempts to stimulate demand in Indigenous communities by, for example, raising incomes (or lowering taxes, a typical macro-economic policy prescription for depressed economies) will thus generally only serve to stimulate demand for the goods and services that are provided by non-Indigenous people. Very little of any stimulus (provided to either Indigenous or non-Indigenous households/businesses) remains within the Indigenous economy (Stoeckl *et al.* 2013).

Third, economic growth paths are strongly rooted in the historical economic and socio-political structure of the region (p. 261, Neffke *et al.* 2011); the shadows of colonialism thus loom large. Because the past dictates the present and, therefore, future options, regions can get 'locked into' particular growth trajectories, a phenomenon known as 'path dependency' (Kay 2005; Martin and Sunley 2006). In this context, geographical location can be thought of as 'having a memory' that directs the path of subsequent development, with different regions following different development trajectories, contingent upon previous experiences and practices (Kay 2005; Tóth 2011). Path creation through both agency of actors and emergent phenomenon can overcome path dependency (Garud *et al.* 2010). As an example, in a central Australian community, the intermittent injection of significant levels of cash associated with the collection and sale of desert raisin (*Solanum centrale*) has been closely linked with cultural activities such as seasonal burning (Holcombe *et al.* 2011; Walsh and Douglas 2011). However, the mainstreaming of cultivation via larger scale horticultural activities risks decoupling economic activity from cultural co-benefits, potentially reducing Indigenous engagement in that economic activity (Holcombe *et al.* 2011). The agency of many (but not necessarily all) Indigenous Australians is triggered by cultural factors beyond the profit motive, with clear examples of social entrepreneurship where wealth is generated to fund wider social objectives and pathways to economic independence are generated (Anderson *et al.* 2006).

For many Indigenous peoples, regaining ownership and/or control over their traditional lands is a social objective of critical importance. A large part of this reflects a need to right an historical wrong. Some also reflect that for many Indigenous people, their land is inseparable from themselves, their culture and their identity (Anderson *et al.* 2005, 2006). Moreover, land and its related resources are the foundation upon which many Indigenous peoples intend to rebuild the economies of their nations and thereby improve the socioeconomic circumstances of their people—individuals, families, communities and nations (Anderson *et al.* 2005, 2006).

There is much evidence that the realisation of Indigenous rights to land and resources is key to successful Indigenous entrepreneurship (Anderson 1997, 2002; Anderson *et al.* 2003, 2005, 2006; Berkes and Adhikari 2006; Scheyvens *et al.* 2017). Conversely, a lack of land title, and lack of home ownership, can restrict access to debt finance and inhibit entrepreneurial activity (Ord and Mazzarol 2007; Fleming 2015). Delivering land and cultural rights in more streamlined ways, which simplify the current institutional, tenure and organisation complexities, would enable Indigenous people to recognise and capitalise on their particular knowledge and capability to

manage their land while strengthening their community and their identity. Land and cultural knowledge support the establishment of successful businesses that are differentiated from competitors by their Indigenous nature (Anderson *et al.* 2003) and fully capitalise on the comparative advantage provided by their cultural and environmental skills and knowledge (Berkes and Adhikari 2006; Schaper 2007).

Improved and secure land rights are thus an important precondition for successful Indigenous entrepreneurial activity. Some progress towards land rights has been made in recent decades. However, there is a clear distinction between 'land rights' and 'native title', because 'native title' does not usually grant an exclusive use or ownership of land through tenure, hence the need for accompanying tenure-resolution processes (Holmes 2011). Native title essentially recognises a right to 'share' that land (Crumb 2017). This imposes significant complexities on Indigenous communities, particularly in relation to issues around access to land and/or to creating economic opportunities from their land (Schaper 2007). Unless native title is accompanied by tenure and other rights for Indigenous people, it is potentially limited in its capacity to support economic development.

Beyond land rights, other elements found to be key to successful Indigenous entrepreneurship include the following: identification of opportunities for entrepreneurship (Anderson 2002; Anderson *et al.* 2003); formation of alliances, and networking among themselves and with non-Indigenous partners (including government/NGOs) (Anderson 1997, 2002; Anderson *et al.* 2003; Berkes and Adhikari 2006; Foley and O'Connor 2013; Ord and Mazzarol 2007); capacity building through education and social enterprise (Anderson 2002; Anderson *et al.* 2003; Cant 2007; Fleming 2015; Foley 2003; KPMG 2016; Schaper 2007; Social Ventures Australia 2016; Spencer *et al.* 2017); enabling infrastructure (particularly internet) (Fleming 2015; KPMG 2016); institution building (Anderson 2002); culture as a key enabler (Mika *et al.* 2017); and customary activities such as art-based activities as a key stimulator of community development (Congreve and Burgess 2017). More generally, the size of the potential customer base (Cant 2007; Commonwealth of Australia 2017b) and available workforce (Anderson 1997; Fleming 2015; Social Ventures Australia 2016) and the distance from, and access to, markets (Ord and Mazzarol 2007; Fleming 2015; Commonwealth of Australia 2017b) also play an important role.

Fourth, there is a substantive body of literature around the need to create the right social and cultural conditions to support innovation and creativity. These factors are not only associated with occupations traditionally thought of as creative (e.g. art and music) but critically important for entrepreneurship and thus for independent and sustained economic development (Florida 2005, 2014). Developing the North is not only about enticing large enterprises to move to the region, or exclusively about creating physical infrastructure to facilitate the growth of private business. Crucial to growth is innovation, which requires creativity; and for that, one must also create and support 'soft' infrastructure, which some might term environmental, social and cultural capital.

Empirical investigation of ILSMPs and economic development in northern Australia

There is substantial evidence that ILSMPs generate co-benefits considered important to Indigenous people (Hill *et al.* 2013; Larson *et al.* 2018) and that the industries established around ILSMPs within remote areas form a ‘propitious niche’ for Indigenous people, enabled through the preservation of culture, identity, ancestry and the conditions of remoteness (Smyth 2011). Investment in programs designed to support improved conservation and environmental management by Indigenous people thus offers opportunities to improve substantially the wellbeing of Indigenous people (Altman *et al.* 2007) and to create the right conditions for creativity and innovation (Florida 2005, 2014). This occurs by jointly exploiting opportunities for economic development and conservation, embedded within a hybrid of the market and the customary economy (Altman 2001).

By their very nature, ILSMPs facilitate greater access to traditional lands, and facilitate the gaining and sharing of knowledge within Indigenous communities and between Indigenous and non-Indigenous peoples. Critical to some ILSMPs, for example, is ‘The creation of Ranger employment opportunities on country, complemented by training to develop an increasingly skilled Indigenous land management workforce; ... and Investment in management capacity to effectively coordinate Ranger work and leverage [Indigenous Protected Areas] IPAs for mutually beneficial, cross sector partnerships’ (p. 30, Social Ventures Australia 2016). Furthermore, some ILSMPs specifically seek to ‘... increase cultural and conservation economic opportunities in ranger communities. ...’ (p. 10, Roberts Evaluation 2015) by offering the potential for leveraging the ILSMPs to create further opportunities for revenue and employment (Roberts Evaluation 2015). Furthermore, investments in ranger programs, and the relationship between this investment and the growth of Indigenous businesses, appear consistent with the development aspirations of many Indigenous groups (Armstrong *et al.* 2005; McGaurr *et al.* 2016; Morrison 2017). Anecdotal information suggests that in addition to providing an initial boost to Indigenous economies (stimulating demand for goods and services that are supplied by Indigenous people), some types of ILSMPs may also help to lay the foundations for sustained growth and development by creating the right conditions for creativity and innovation. This is largely because ILSMPs foster the businesses that leverage Indigenous skills, interests and aspirations, thus contributing to the development of ‘soft’ infrastructure.

To the best of our knowledge, however, no one has considered this ‘anecdotal’ suggestion empirically, a task to which we now turn.

Data and methods

We collated data from numerous sources to build a statistical panel data model (with data relevant to >2000 postcodes for each of 8 years) that allowed us to run Granger causality tests (described below) for the link between ILSMP expenditure and business growth, while controlling for confounding factors. Details are presented below.

Selection of variables and sources of data

We sourced data on ILSMP expenditure and growth of Indigenous business not engaged in land management, together with data relating to control variables highlighted by the literature discussed above as likely to be important for Indigenous business growth.

As illustrated in Fig. 2, our two key data sources (explained in more detail below) relate to Indigenous business activity (from ORIC), and ILSMP expenditure (from Hill *et al.* 2013). These datasets were collected by different groups for different purposes and thus do not align. Specifically, the ILSMP expenditure data include information about monies paid to all organisations, only some of which are registered with ORIC. Hence, there is not a one-to-one ‘mapping’ between ILSMP funding payments and ORIC registrants. As far as we are aware, there are no alternative sources of data, so our solution is to work with ‘postcode’-level data (e.g. the number of ORIC businesses within a postcode, and the amount of ILSMP expenditure flowing to a postcode). From a purely statistical perspective, it would be better to work with corporation-level data, but our postcode analysis still generates useful insights; it has the added advantage of ensuring complete confidentiality of all information (in that it is not possible for anyone to identify corporation-specific data from our work).

First, ORIC is responsible for corporations registered under the *Corporations (Aboriginal and Torres Strait Islander) Act 2006* (CATSI Act) (ORIC 2016). Importantly, registered native-title bodies corporate determined by the Federal Court of Australia under the *Native Title Act 1993*, and royalty associations under the *Aboriginal Land Rights (Northern Territory) Act 1976*, are required to register under the CATSI Act, and are therefore managed by ORIC. However, other types of Indigenous corporations can choose to register with ORIC or, alternately, to register under the *Corporations Act 2001*, managed by the Australian Securities and Investments Commission (ASIC), whereas unincorporated businesses (sole traders and partnerships) are required to register with neither.

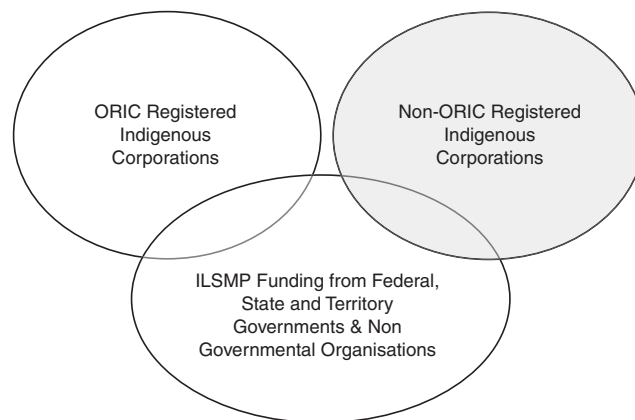


Fig. 2. Relationship between data relating to funding for ILSMPs (Indigenous land and sea management programs) and ORIC (Office of the Registrar of Indigenous Corporations) data demonstrating limitations of our data (shaded areas). Not all ILSMP funding flows to ORIC-registered companies, and not all Indigenous corporations are registered with ORIC.

Thus, ORIC data do not provide a comprehensive dataset of all Indigenous businesses across Australia (Fig. 2).

Data available through ORIC that are relevant to the present research include:

- Annual reported income of registered corporations for 8 years from 2008–2009 to 2015–16.
- The principal activities, reported by each corporation, during 2014–15 and 2015–16. This enabled us to identify whether the corporation included land-management activities within its portfolio of operations, allowing us to differentiate between businesses that do, and do not, participate in land-management activities (identified henceforth as LM or non-LM businesses).
- The postcode in which each corporation was registered.

Second, ILSMP expenditure data were sourced via a pre-existing database (see Hill *et al.* 2013). The largest components of this database relate to IPAs and Indigenous Ranger/Working on Country projects, with most money used to fund various ranger programs. This dataset includes details of the funding recipient and the postal area in which they are located, and the amounts of funding spent by year. The funding recipient is frequently an intermediary organisation, which then passes the money on, rather than all payments being made direct.

Our ‘unit’ of analysis is the postal area, so we counted the number of LM and non-LM ORIC-registered businesses within each postal area, for each year in which we had data. Similarly, we added all ILSMP expenditure received within each postal area, for each year. Ideally, we would have focused our attention entirely on remote communities within northern Australia, an area in which there were 977 ORIC businesses registered for the 2015–16 year; however, this region comprises just 91 postal areas (Appendix 1). Therefore, to ensure that we had sufficient sample sizes to allow for meaningful analysis, our analysis was conducted at the whole-country level.

Recognising that there are notable differences between the economies of northern and southern Australia, and recognising that many postcodes contain no ORIC-registered businesses and/or receive no ILSMP expenditure, we did run alternate specifications of the whole-country models to test the robustness of our results for smaller samples. The results from these alternative specifications were consistent with our results from the full sample, and are also noted below.

Prompted by the literature discussed above, our analysis focuses on the factors identified as likely to affect growth of Indigenous businesses. We selected variables for inclusion as controls within our model based on consideration of (i) their suitability to act as proxies for the factors in the literature and (ii) the availability of suitable data, as set out in Table 1. All of the variables used within this study, including the source of the data and the key descriptive statistics for each, are presented in Appendix 2.

We acknowledge the imperfections of some of the proxies selected as a result of the scarcity of detailed data available relating to remote communities in general and Indigenous communities in particular. Consequently, our models are not perfect and some care is needed when interpreting the results. However, the key findings with regard to the impact of ILSMP

expenditure were found to be robust to model specification, with consistent findings resulting from a wide range of different model specifications tested.

Methods

We set out to determine whether the number of ORIC-registered businesses in each postcode–year (Number_ORIC_ALL) was related to ILSMP expenditure within that same postcode during the same year (ILSMP^{pc}_t) and/or during the previous 2 years (ILSMP^{pc}_{t-1}, ILSMP^{pc}_{t-2}), thus specifically testing for current and lagged impacts. The lags allow us to conduct Granger causality tests (Granger 1969). Formally, a variable (say ILSMP expenditure) is said to ‘Granger-cause’ another variable (say, growth in non-LM businesses) if it predates the other, e.g. if growth in ILSMP expenditure in the first year has a statistically significant impact on business growth in subsequent years. The testing process itself is based upon a definition of causality that ‘evokes the following two fundamental principles (i) the effect does not precede its cause in time (ii) the causal series contains unique information about the series being caused that is not available otherwise’ (p. 4, Eichler 2013).

In the first instance, we did not include any potential confounding or control variables, so our model was:

$$\text{Number_ORIC_ALL}^{\text{pc}}_t = \text{ILSMP}^{\text{pc}}_t + \text{ILSMP}^{\text{pc}}_{t-1} + \text{ILSMP}^{\text{pc}}_{t-2}$$

where, Number_ORIC_ALL^{pc}_t is the number of ORIC-registered businesses in postcode pc (e.g. postcode 481) at time t (e.g. the year 2015–16); ILSMP^{pc}_t is the money spent on ILSMPs in postcode pc at time t; ILSMP^{pc}_{t-1} is the money spent on ILSMPs in postcode pc at time t – 1 (i.e. 1 year ago, or 2016); and ILSMP^{pc}_{t-2} is the money spent on ILSMPs in postcode pc at time t – 2 (i.e. 2 years ago, or 2015).

We estimated this model by using a generalised least-squares random-effects panel-data multiple-regression approach with robust standard errors, and looked at three subsets of data: all ORIC-registered business (Number_ORIC_ALL); only ORIC-registered businesses that listed Land Management as one of their principal activities (Number_ORIC_LM); and only those that did not (Number_ORIC_Non-LM). A random-effects specification was used as indicated by use of the Breusch and Pagan Lagrangian multiplier test, and robust standard errors were used to control for any heterogeneity in the data. Preliminary models indicated a strong positive relationship between current and past ILSMP expenditure and the number of ORIC businesses (considering LM, non-LM and all business types), suggesting that ILSMP expenditure (Granger)-causes growth in the number of ORIC businesses. There was no evidence to suggest that causality runs the other way (i.e. that the number of ORIC businesses (Granger)-causes ILSMP expenditure).

Building on these strong preliminary results, we moved on to develop the more sophisticated models presented here which incorporate a wider range of variables that may impact on the growth of Indigenous businesses as suggested from our review of the literature (Table 2). Our model was thus:

Table 1. Control factors and proxies selected

Factors (identified in literature discussed in the text) likely to influence demand for, or supply of, goods and services that are provided by Indigenous Corporations	Proxies used in our model
Importance of rights to access and use land and other forms of natural capital, including but not limited to recognition of native title and ownership rights, is widely recognised as a key enabler of Indigenous entrepreneurship. Land rights are vital for business enterprise for multiple complex reasons (including the problem that land held under native title is generally not accepted as security for loans). Regions of high conservation value may be better able to attract funding for ILSMPs (Indigenous land and sea management programs) for those purposes, thus contributing to demand.	Proportion of land where Indigenous people had declared rights, in the form of: -Native Title -Indigenous Protected Areas (IPAs)
Natural capital also enhances the productive capacity of a region (the 'supply side'); agriculture is considered in the White Paper to be a key component of future northern Australian development.	Land area Proportion of land that is: -grass and rangelands (suitable for agricultural purposes)-tidal marsh, mangroves land (outside the production process)
On the supply side, education and specialist business/management/technical skills combine to provide a skilled labour force, a crucial contributor to Indigenous enterprise. Some of these factors may also have a role to play on the demand side (e.g. low levels of education or training may indicate a need (demand for) services to enhance).	Proportion of Indigenous people completing year 12
Life expectancy, as an indicator of the health of the population (a key component of human capital), is important for production (supply side); it may also be associated with the demand for some types of goods and services (e.g. if the population is in poor health, there may be high demand for health services).	Life expectancy of the population
Population size and density affect the size of the markets (the 'demand side'). The size of the available workforce (in this case, the Indigenous workforce) is also a key determinant of supply; importantly, regions in which a high percentage of the population is Indigenous may also have low incomes, hence low demand for some types of goods (luxury holidays), and high demand for other goods (particularly relating to health and community services).	Total population size Proportion of the population that is Indigenous (Alternatives considered included population density and/or size of workforce. Because inclusion of highly related variables affects the reliability of regression results, we elected to use these two as our proxies.)
Distance from, and access to, markets is a crucial determinant of demand; it will also affect productivity (supply), because businesses in remote areas will have more complex (and costly) supply chains.	ARIA+ average as a remoteness/accessibility indicator ^A
Technology is a vital contributor to productive capacity. Infrastructure in general and internet access in particular have been noted to be of great relevance to remote communities. Technology also greatly facilitates demand (making it possible to purchase goods and services from a distance).	Proportion of households with internet access
Lack of home ownership can restrict access to finance, thus placing constraints on business development. Home ownership can also indicate greater income/wealth, which will differentially affect demand for different goods and services (as above, postcodes with low home ownership are expected to have lower demand for some goods (luxury holidays), and higher demand for other goods (particularly relating to health and community services).	Proportion of households owning their own home
Social capital can be key for productivity. It is particularly important in Indigenous societies where differing cultural objectives may see people seeking to act for the benefit of their community rather than purely themselves, perhaps through some form of social enterprise.	Proportion of people undertaking unpaid volunteering activities for organisations or groups

^AARIA (Accessibility and Remoteness Index of Australia) underpins the remoteness structure used by the ABS.

$$\text{Number_ORIC}^{\text{pc}}_t = \text{ILSMP}^{\text{pc}}_t + \text{ILSMP}^{\text{pc}}_{t-1} + \text{ILSMP}^{\text{pc}}_{t-2} + \text{control variables}$$

investigate further whether additional/alternative data were available to control for this issue.

We also developed models with the same explanatory variables, but used the average income of ORIC businesses (estimated by dividing the total reported income by the number of businesses):

$$\text{Average_Income_ORIC}^{\text{pc}}_t = \text{ILSMP}^{\text{pc}}_t + \text{ILSMP}^{\text{pc}}_{t-1} + \text{ILSMP}^{\text{pc}}_{t-2} + \text{control variables}$$

We also developed models using the total income of ORIC-registered businesses for each postcode on the left-hand side, but do not report results (they are available on request) because there was evidence of endogeneity which we were unable to control for with existing data. Future research could usefully

Results

The Breusch and Pagan Lagrangian multiplier test suggested use of generalised least-squares random-effects model, with robust standard errors. Results are set out in Table 2, and discussed below. Detailed results of these models can be found in Appendix 3. As can be seen, our findings clearly support our proposition that ILSMP expenditure can have positive spillover effects.

Impact of ILSMPs on number of Indigenous businesses

Expenditure on ILSMPs is associated with an increase in the number of Indigenous businesses in that same year and in each of the following 2 years. In other words, ILSMP expenditure

Table 2. Summary of regression results

ORIC, Office of the Registrar of Indigenous Corporations; ILSMP, Indigenous land and sea management programs; IPA, Indigenous Protected Areas. +, Variable significant at $P=0.1$ and with positive coefficient; -, variable significant at $P=0.1$ and with negative coefficient; otherwise variable not significant ($P>0.1$). Full results including detail on coefficients, robust standard errors, and significance levels are set out in Appendix 3

	Dependent variable: no. of ORIC businesses			Dependent variable: average income of ORIC businesses		
	All	LM	Non-LM	All	LM	Non-LM
ILSMP	+	+	+			
ILSMP.L1	+	+	+			
ILSMP.L2	+	+	+	+	+	+
Native title proportion	+	+	+			
IPA proportion						
Population	+	+	+	+	+	+
Indigenous proportion	+	+	+	+	+	+
Proportion finishing year 12		-				
Grass-rangelands proportion						
Tidal marsh, mangrove proportion						-
SqKm	+	+	+			
ARIA+ average		+				
Internet proportion	+	+	+	+	+	+
Own home proportion	-	-	-	-	-	-
Volunteering proportion	+		+			
Life expectancy				-	-	

Granger-causes growth in Indigenous businesses. This relationship is evident for all datasets: all businesses, only those participating in LM activities, and only those with non-LM activities. Granger causality does not run the other way (i.e. growth in the number of businesses does not Granger-cause increases in ILSMP expenditure; results available on request).

For LM businesses, our findings support expectations; ORIC LM businesses will be the recipients of the majority of ILSMP funding (although an (unknown) portion of ILSMP expenditure will flow to ASIC-registered Indigenous LM businesses as discussed above).

For non-LM businesses, these results provide evidence supporting the core proposition of this paper. Expenditure on ILSMPs in a particular year contributes to an increase in the number of non-LM businesses in that year and in the subsequent 2 years. Because these businesses specifically do not conduct LM activities, they cannot be the direct recipients of the ILSMP funding; therefore, the observed relationship must reflect some spillover effect.

Not only does ILSMP expenditure impact on non-LM businesses in current and subsequent years, the effect increases as time elapses. Using the coefficients set out in the detailed results provided in Appendix 3 as an example, if we were to spend \$1 million on ILSMPs in the first year, we would see an increase of 0.4 in the number of non-LM businesses in that year. In the following year, we would see a further increase of 0.6, and in the third year, we would see a further increase of 0.8 in the number of such businesses. Thus, the impact appears to be sustained and growing over time, and suggests that ILSMPs are contributing to a self-sustaining growth cycle in the region, and are indeed having positive spillover effects.

We repeated the regressions to test several alternative model specifications, limiting the postcodes included to: (i) only those within northern Australia, (ii) only those across Australia within which ORIC businesses were registered, (iii) only those

across Australia where ILSMP expenditure took place, (iv) only those across Australia that included both ORIC-registered businesses and within which ILSMP expenditure took place. For each model, similar results were found, with ILSMP expenditure contributing to the growth in Indigenous businesses in each of the 2 years following the year the expenditure is incurred. A summary of these alternative model results can be found in Appendix 4, where we present the direction of impact of significant variables but not the actual coefficients (a deliberate tactic to de-emphasise numbers, and instead focus on the robust results). Coefficients on the ILSMP expenditure variables were generally larger in the south, an observation that accords with intuition, due to the larger markets and the generally more developed economies of the south. That said, we urge readers not just to compare northern and southern coefficients. For an Indigenous person living in northern Australia, what matters most is the opportunities associated with ILSMPs compared with other (northern) opportunities. As discussed in the previous section, these can be few and far between.

Impact of ILSMPs on incomes of Indigenous businesses

ILSMP expenditure does not have a significant impact on average incomes during the year in which expenditure occurs or in the one immediately following, but there is a positive impact 2 years later. This finding held true for all businesses, whether considered in aggregate or considering LM and non-LM businesses separately.

These observations are consistent with the proposition that ILSMP funding affects demand and supply approximately equally in early years (simplistically, it is as if one is shifting both the demand curve and the supply curve to the right, with increases in quantity, as per our observed increase in the number of businesses but without having an impact on price).

The observed increases in average income in subsequent years suggest that, eventually, the demand-side effects of ILSMP stimulus start to dominate. This is consistent with our proposition that ILSMP expenditure can generate spillover effects that positively impact on Indigenous businesses with no involvement in LM, and that this spillover may be associated with self-sustaining growth (i.e. it helps to kick-start other businesses, and it stimulates local demand for the goods and services produced by these businesses).

Findings regarding the control variables

Many of the factors suggested by the literature appeared to have little effect, or even have an effect different from that expected. This may have been because of data limitations (several our variables are based on the total population of the postal area rather than purely the Indigenous population) or may reflect that our variables of choice are actually acting as proxies for several (possibly conflicting) factors that affect business growth. Some of the more interesting findings are as follows.

- Native title and IPAs. Land held under native title was found to have a positive effect on the growth of Indigenous businesses, as expected (e.g. Anderson 1997; Berkes and Adhikari 2006). This is despite known problems with our dataset (that not all ORIC businesses are registered in the postcode where they hold native title; and that because native-title bodies corporate are required to register with ORIC, the importance of native title may be inflated by our use of ORIC data). The proportion of land comprising IPAs had no significant effect. Because there is significant overlap between land held under native title and IPAs, it is possible that multicollinearity has affected this result, understating the impacts of these variables.
- Population size. As expected, this had a positive impact; a large population increases both the size of the market and the size of the workforce, reinforcing demand and supply side effects on economic growth.
- Proportion of the population being of Indigenous status. As expected, this also had a positive impact, given our focus on Indigenous business and Indigenous programs.
- Proportion of the Indigenous population completing school. This had an impact in only one model—that looking at the number of LM businesses (with fewer educated people being associated with more businesses). In traditional market-focused businesses, Western education generally has a positive impact on productivity and supply. However, in addition to Western knowledge, ILSM relies upon significant place-based socio-ecological knowledge not gained through formal Western education systems. This variable is thus likely a poor proxy for human capital within Indigenous communities, particularly for enterprises that require traditional knowledge.
- Proportion of households with internet access. This was found to have a positive impact on both the number of businesses and average business income, reflecting the essential nature of good communications within the modern world. This supports the Federal Government's initiatives to improve internet access and capability within Indigenous

communities, as set out in their Indigenous Business Strategy (Commonwealth of Australia 2017b).

- Proportion of households owning their own homes. This had a negative impact. If focusing on non-Indigenous businesses, one would expect increased home ownership to affect mainly the supply side of the market; simplistically, it increases access to business finance by providing security (Ord and Mazzarol 2007). One would also expect it to be associated with higher demand for goods and services (simplistically, wealthier people eat out more often). However, low levels of home ownership may signal poverty, so lower home ownership is likely to be associated with higher demand for goods and services associated with poverty (e.g. health services). Many ORIC businesses supply these types of goods and services, suggesting that this effect dominates other confounding factors. Moreover, the variable measures the proportion of all households owning their own home, rather than being limited to Indigenous households. As such, high home ownership levels are likely to be correlated with a smaller proportion of the population being Indigenous, which would reduce the likelihood of new Indigenous businesses being established.

Although data limitations restrict our ability to draw firm inferences regarding the impact of our control factors, one result was very clear: the ILSMP expenditure coefficients and significance levels proved to be highly robust to different specifications of the models. That is, the inclusion or exclusion of some or all of the control variables had little impact on our findings of the relationship between ILSMPs and growth of Indigenous business numbers and average incomes.

Conclusion

Northern Australian economies are different from Western urbanised economies, and if the aim is to stimulate (short-term) economic development in northern Indigenous economies, then there is a need to stimulate demand for goods and services that are produced by Indigenous people, and which generate benefits that align with the goals and aspirations of Indigenous people. It is also important to create an atmosphere/environment that supports social and cultural values that improve quality of life and promote innovation and creativity, which are core drivers for self-sustaining, long-term economic development. ILSMPs have the characteristics to do all of that (stimulate short-run demand and supply while creating an environment to foster creativity and innovation); however, to the best of our knowledge, our work is the first to test this anecdotal suggestion empirically.

Our analysis (of admittedly imperfect data) produces evidence that supports our initial proposition that expenditure on ILSMPs generates positive spillovers for other Indigenous businesses not engaged in land management, in later years. This finding was found to be highly robust to model specification; all specifications tested provided evidence supporting this proposition, and several other factors were identified with some influence. We can theorise several ways in which this benefit from ILSMPs may be occurring, but at this stage, we are unable to determine which (if any) is having the greatest effect.

- (i) Participating in ILSMPs may improve the skills, knowledge and experience of the local population in LM activities; this improved human capital then facilitates further LM business growth in future years.
- (ii) A multiplier effect may be taking place, whereby Indigenous LM businesses that receive ILSMP funding may then spend more with other Indigenous businesses that supply other (non-LM) goods and services that they need, thus increasing demand within the region.
- (iii) ILSMPs may have contributed to an increase in the productive capacity of the region in general, particularly by improving the level of human capital, thus influencing the productivity of both LM and non-LM businesses.

The growing importance of impact over time (with larger coefficients on the number of businesses, and average-income effects appearing in later years) suggests that something else is happening. Perhaps the close alignment of ILSMPs with Indigenous aspirations is indeed helping to create the right environment for innovation and creativity, sparking a self-sustaining cycle of Indigenous-led growth and economic independence. Although these results are important in themselves, they also have important implications for the monitoring and evaluation of investments in northern Australia; the lag effect and cumulative nature of benefit accrual suggest that policies supporting, funding and monitoring investments over longer periods will be important if key socio-economic benefits are to be properly captured.

We leave the challenge of determining the mechanism behind these relationships for future research.

Conflicts of interest

The authors declare no conflicts of interest.

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Appendix 1. Sample sizes and number of observations available for analysis for 2015–16

ORIC, Office of the Registrar of Indigenous Corporations; ILSMP, Indigenous land and sea management programs

	All Australia	Northern Australia
No. of ORIC businesses ^A	2528	977
No. of these ORIC businesses that do not participate in land-management activities ^A	1888	658
Value of ILSMP funding ^B	\$63 m	\$49 m
No. of postal areas ^C	2513	91
No. of postal areas including ORIC businesses ^A	582	69
No. of postal areas including ORIC businesses that do participate in land-management activities ^A	253	63
No. of postal areas including ORIC businesses that do not participate in land-management activities ^A	501	62
No. of postal areas receiving ILSMP funding ^B	40	25
No. of postal areas both including ORIC businesses and receiving ILSMP funding ^B	33	22

^ASource: ORIC (www.oric.gov.au/).

^BSource: Hill *et al.* (2013).

^CSource: Australian Bureau of Statistics Postal Areas (www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/1270.0.55.003July%202011?OpenDocument).

Appendix 2. Data used within our models: descriptions, sources and descriptive statistics

ORIC, Office of the Registrar of Indigenous Corporations (www.oric.gov.au); ILSMP, Indigenous land and sea management programs; LM, land management; NNTT, National Native Title Tribunal (www.nntt.gov.au/assistance/Geospatial/Pages/DataDownload.aspx); ABS POA, Australian Bureau of Statistics Postal Areas (www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/1270.0.55.003July%202011?OpenDocument); IPA, Indigenous Protected Areas (Declared IPAs, www.pmc.gov.au/indigenous-affairs/environment/indigenous-protected-areas-ipas); ABS Census (www.abs.gov.au/census); ARIA, Accessibility/Remoteness Index of Australia (www.adelaide.edu.au/hugo-centre/spatial_data/aria/); ABS LifeTables (www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/3302.0.55.0012014-2016?OpenDocument)

Variable name	Variable description and source of data	Units	Mean	Standard deviation
<i>Dependent variables</i>				
Q ORIC All	No. of ORIC-registered businesses within postal area (source: ORIC)	Number	0.889	5.733
Q ORIC LM	No. of ORIC-registered businesses within postal area that include LM within their reported activities (source: ORIC)	Number	0.227	1.494
Q ORIC Non-LM	No. of ORIC-registered businesses within postal area that do not include LM within their reported activities (source: ORIC)	Number	0.663	4.481
P ORIC All	Average income of ORIC-registered businesses within postal area (source: ORIC)	\$ (million)	0.086	0.481
P ORIC LM	Average income of ORIC-registered businesses within postal area that include LM within their reported activities (source: ORIC)	\$ (million)	0.031	0.338
P ORIC Non-LM	Average income of ORIC-registered businesses within postal area that do not include LM within their reported activities (source: ORIC)	\$ (million)	0.091	0.609
<i>Explanatory variables</i>				
ILSMP	ILSMP funding, current year (source: Hill <i>et al.</i> 2013)	\$ (million)	0.026	0.406
ILSMP.L1	ILSMP funding, 1 year previous (source: Hill <i>et al.</i> 2013)	\$ (million)	0.024	0.392
ILSMP.L2	ILSMP funding, 2 years previous (source: Hill <i>et al.</i> 2013)	\$ (million)	0.021	0.370
Native title proportion	Proportion of land in postal area held under Native Title (calculated from intersecting spatial files for Native Title declarations (source: NNTT) and postal areas (source: ABS POA))	Proportion	0.013	0.078
IPA proportion	Proportion of land in postal area covered by IPAs (calculated from intersecting spatial files for IPAs (source: Declared IPAs) and postal areas (source: ABS POA))	Proportion	0.002	0.036
Population	Total population of postal area (census data obtained for 2006, 2011 and 2016 (source: ABS Census); years between infilled by interpolation assuming the changes between census periods were equally spread)	Thousand	8.767	11.821
Indigenous proportion	Indigenous population as proportion of total population within postal area (census data obtained for 2006, 2011 and 2016 (source: ABS Census); years between infilled by interpolation assuming the changes between census periods were equally spread)	Proportion	0.037	0.084
Proportion finish year 12	Proportion of Indigenous population in postal area who have completed year 12 schooling (census data obtained for 2006, 2011 and 2016 (source: ABS Census); years between infilled by interpolation assuming the changes between census periods were equally spread)	Proportion	0.314	0.205
Grass-rangelands proportion	Proportion of land in postal area covered by grass or rangelands (calculated from intersecting spatial files for land use of this type (source: GlobCOV 2009) and postal areas (source: ABS POA))	Proportion	0.123	0.226
Tidal marsh, mangrove proportion	Proportion of land in postal area covered by tidal marshes or mangroves (calculated from intersecting spatial files for land use of this type (source: GlobCOV 2009) and postal areas (source: ABS POA))	Proportion	0.001	0.006
SqKm	Square kilometres of land within postal area (source: ABS POA)	km ² (million)	0.003	0.029
ARIA+ average	Average ARIA within postal area (2011 data (ARIA+ 2011) purchased from Hugo Centre for Migration and Population); data used to indicate the remoteness of each postal area for each year)	Index value	2.429	3.225
Internet proportion	Proportion of households within postal area with internet connection (census data obtained for 2006, 2011 and 2016 (source: ABS Census); years between infilled by interpolation assuming the changes between census periods were equally spread)	Proportion	0.760	0.124

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Appendix 2. (continued)

Variable name	Variable description and source of data	Units	Mean	Standard deviation
Own home proportion	Proportion of households within postal area that own their own home (census data obtained for 2006, 2011 and 2016 (source: ABS Census); years between infilled by interpolation assuming the changes between census periods were equally spread)	Proportion	0.716	0.141
Volunteering proportion	Proportion of people who volunteer within postal area (census data obtained for 2006, 2011 and 2016 (source: ABS Census); years between infilled by interpolation assuming the changes between census periods were equally spread)	Proportion	0.233	0.085
Life expectancy	Average life expectancy within postal area (calculated from using life expectancy data available at ABS SA4 geographic scale (source: ABS LifeTables), and postal area spatial files (source: ABS POA), enabling calculation of average life expectancy by postal area weighted by the proportion of each SA4 region that fell within each postal area)	Years	81.898	1.627

Appendix 3. Detailed regression results

ORIC, Office of the Registrar of Indigenous Corporations; ILSMP, Indigenous land and sea management programs; LM, land management; IPA, Indigenous Protected Areas. Robust standard errors are in parentheses; * $P < 0.1$, ** $P < 0.05$, *** $P < 0.01$

Dependent variable	No. of ORIC businesses			Average income of ORIC businesses		
	Q ORIC All	Q ORIC LM	Q ORIC Non-LM	P ORIC All	P ORIC LM	P ORIC Non-LM
ILSMP	0.564 (0.127)***	0.173 (0.039)***	0.398 (0.127)***	-0.004 (0.006)	0.035 (0.029)	-0.007 (0.009)
ILSMP.L1	0.815 (0.101)***	0.197 (0.016)***	0.622 (0.102)***	-0.002 (0.014)	-0.001 (0.014)	-0.009 (0.014)
ILSMP.L2	1.092 (0.184)***	0.297 (0.058)***	0.802 (0.183)***	0.024 (0.006)***	0.031 (0.018)*	0.015 (0.009)*
Native title proportion	1.002 (0.416)**	0.426 (0.163)***	0.615 (0.299)**	0.176 (0.110)	0.164 (0.133)	0.170 (0.109)
IPA proportion	2.221 (1.607)	0.570 (0.435)	1.628 (1.539)	-0.301 (0.268)	0.282 (0.648)	-0.017 (0.103)
Population	0.059 (0.012)***	0.013 (0.004)***	0.046 (0.009)***	0.004 (0.001)***	0.001 (0.000)**	0.004 (0.001)**
Indigenous proportion	7.100 (2.432)***	3.160 (0.996)***	4.098 (1.615)**	0.471 (0.205)**	0.284 (0.152)*	0.497 (0.235)**
Proportion finish year 12	-0.038 (0.026)	-0.022 (0.010)**	-0.016 (0.019)	-0.001 (0.010)	0.015 (0.022)	-0.010 (0.009)
Grass-rangelands proportion	-0.066 (0.630)	0.016 (0.203)	-0.097 (0.469)	0.007 (0.044)	-0.019 (0.024)	0.050 (0.056)
Tidal marsh, mangrove proportion	2.158 (4.288)	1.410 (1.726)	0.621 (2.864)	-0.455 (0.510)	-0.150 (0.471)	-0.824 (0.346)**
SqKm	78.653 (12.663)***	4.017 (1.364)***	74.433 (12.013)***	0.092 (0.307)	-0.254 (0.465)	0.187 (0.380)
ARIA+ average	0.037 (0.050)	0.032 (0.016)*	0.000 (0.038)	0.005 (0.004)	0.001 (0.003)	0.003 (0.004)
Internet proportion	1.149 (0.215)***	0.164 (0.068)**	1.006 (0.176)***	0.180 (0.045)***	0.129 (0.053)**	0.135 (0.050)**
Own home proportion	-0.790 (0.393)**	-0.304 (0.137)**	-0.532 (0.290)*	-0.336 (0.089)***	-0.170 (0.087)**	-0.382 (0.106)***
Volunteering proportion	1.083 (0.572)*	0.294 (0.184)	0.792 (0.435)*	-0.101 (0.102)	0.057 (0.070)	-0.144 (0.133)
Life expectancy	-0.041 (0.056)	-0.003 (0.015)	-0.046 (0.045)	-0.013 (0.005)**	-0.017 (0.007)**	-0.007 (0.005)
Constant	2.413 (4.486)	0.106 (1.232)	2.933 (3.633)	1.171 (0.380)***	1.408 (0.596)**	0.808 (0.391)**
<i>Summary statistics</i>						
No. of groups	2394	2394	2394	2394	2394	2394
No. of observations	18872	18872	18872	18872	18872	18872
ρ	0.922	0.895	0.922	0.809	0.593	0.778
R^2 within	0.383	0.245	0.331	0.005	0.005	0.002
R^2 between	0.514	0.395	0.539	0.079	0.107	0.068
R^2 overall	0.511	0.387	0.535	0.068	0.075	0.055

Appendix 4. Results summary for models where observations were restricted to postcodes within northern Australia

Dependent variable in all cases is the number of ORIC (Office of the Registrar of Indigenous Corporations) registered businesses in the postcode. ILSMP, Indigenous land and sea management programs; LM, land management; IPA, Indigenous Protected Areas. +, Variable significant at $P=0.1$ and with positive coefficient; -, variable significant at $P=0.1$ and with negative coefficient; otherwise variable not significant ($P>0.1$)

Dependent variable	Northern Australian postcodes only			Postcodes within which ORIC businesses are registered			Postcodes where ILSMP spend takes place			Postcodes with ORIC-registered businesses and ILSMP expenditures		
	All	LM	Non-LM	All	LM	Non-LM	All	LM	Non-LM	All	LM	Non-LM
ILSMP	+	+		+	+	+	+	+	+	+	+	+
ILSMP.L1	+	+	+	+	+	+	+	+	+	+	+	+
ILSMP.L2	+	+	+	+	+	+	+	+	+	+	+	+
Native title proportion	+	+		+	+							+
IPA proportion												
Population	+	+	+	+	+	+				+		
Indigenous proportion	+	+	+	+	+							
Proportion finish year 12				-		-						
Grass-rangelands proportion												
Tidal marsh, mangrove proportion												
SqKm	+		+	+		+	+			+	+	+
ARIA+ average			+									
Internet proportion	+	+	+	+	+	+	+	+			+	+
Own home proportion	-	-	-	-	-	-	-	-	-	-	-	-
Volunteering proportion	+	+		+	+	+						
Life expectancy		+										
No. of postcodes included in analysis	80	80	80	557	244	497	98	98	98	66	48	61