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Culture & Economics: Do Māori Cultural Values Affect Firm Performance? Evidence from the Business Operations Survey.

A thesis presented in partial fulfilment of the requirements for the degree of
Masters of Business Studies in Economics.

at Massey University, Manawatū, New Zealand.

Celia Karl

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Disclaimers

Access to the data used in this study was provided by Stats NZ under conditions designed to give effect to the security and confidentiality provisions of the Data and Statistics Act 2022. The results presented in this study are the work of the author, not Stats NZ or individual data suppliers.

These results are not official statistics. They have been created for research purposes from the Longitudinal Business Database (LBD)] which is carefully managed by Stats NZ. For more information about the LBD please visit https://www.stats.govt.nz/integrated-data/

The results are based in part on tax data supplied by Inland Revenue to Stats NZ under the Tax Administration Act 1994 for statistical purposes. Any discussion of data limitations or weaknesses is in the context of using the IDI for statistical purposes, and is not related to the data's ability to support Inland Revenue's core operational requirements.

Abstract

This study utilises microdata from the Longitudinal Business Database (LBD) to examine the relationship between Māori firm ownership and firm performance in Aotearoa New Zealand. It seeks to determine if Māori firms have different economic outcomes to non-Māori firms, and if differences exist, can they be explained by the practice of Māori cultural values and beliefs? Or can they be, at least partially, explained by the relative prevalence of constraints in the external business environment?

To isolate the effect of culture on firm performance, this study uses data from the Business Operations Survey (BOS) to distinguish between firms that employ tikanga Māori and/or Māori management practices. It then uses a two-step approach to estimate the effect of firm ownership on multifactor productivity (MFP). MFP is first estimated via a translog gross output production function, and then regressed on firm type. Logistic regression is used to analyse the relative prevalence of barriers in the external business environment (e.g., access to infrastructure), factors that hamper innovation (e.g., costs) and the relative ease of hiring labour.

The results of this study suggest that Māori firms face significant inequities in accessing physical infrastructure - particularly in transport and water and waste services - and that Māori firms are more likely to report costs as a significant barrier to innovation. Contrary to existing literature, this study finds no statistically significant difference in MFP between Māori and non-Māori firms. It also finds that firms that employ tikanga Māori and/or Māori management practices find it relatively easier to recruit workers from certain occupational groups. This suggests that there are benefits from the use of tikanga Māori and/or Māori management practices in recruitment. Additionally, these results highlight the need for researchers to consider the particular definition of a Māori firm employed in research but to also consider consistency of self-identification.

This research contributes to our understanding of how indigenous cultural values influence business operations and it challenges assumptions about the inverse relationship between collectivist cultures and economic performance. It adds to the literature on the Māori economy, Māori firms and productivity in Aotearoa New Zealand.

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Equations

Abbreviations

ANZSIC	The Australian and New Zealand Standard Industrial Classification
BOS	Business Operations Survey
FTE	Full-time employees
GLM	Generalized Linear Model
ICT	Information Communication Technology
IDI	Integrated Database Infrastructure
LBD	The Longitudinal Business Database
LBF	Longitudinal Business Frame
LEED	Linked Employer-Employee Data
MBIE	The Ministry of Business and Innovation
MFP	Multifactor productivity
N	Observations
NA	Non-applicable
NSW	New South Wales
NZBN	The New Zealand Business Number
PBN	Permanent Business Number
PENT	Permanent Enterprise Number
RBNZ	Reserve Bank of New Zealand
RME	Rolling mean employment
SE	Standard errors
TPK	Te Puni Kōkiri

Glossary of Terms

These interpretations are used for the purpose of this thesis and should not be considered universal definitions. Te reo Māori is a metaphorical language, not all words can be succinctly nor completely translated into English.

Aotearoa	The Māori kupu for New Zealand, commonly translated as 'The land of the long white cloud'.
Hau	Vital essence or vitality of a person, place or object (Moorfield, 2024), or the spirit of the gift (Henare, 2018; Nicholson, 2019)
Iwi	Tribe, often refers to a large group of people descended from a common ancestor and associated with a distinct territory (Moorfield, 2024). The primary Māori political unit post colonisation.
Kaitiaki/tanga	Guardian / guardianship (Moorfield, 2024).
Kaimoana	Seafood.
Kaupapa	Topic, policy, matter for discussion or similar (Moorfield, 2024).
Kaupapa Māori	Māori approach, incorporating the knowledge, skills, attitudes and values of Māori society (Moorfield, 2024).
Kawa	Marae protocol/s (Moorfield, 2024).
Koha	Gift, offering or donation(Moorfield, 2024).
Kupu	Word.
Mana	Prestige, authority, control and is symbiotic with tapu (Moorfield, 2024), and in the context of the Māori economy the importance of spiritually sanctioned authority and the limits on Māori leadership (Jones, 2016).
Manaakitanga	Hospitality and generosity (Moorfield, 2024) when used in the broad sense, or in the context of the Māori economy it encompasses the nurturing of relationships, looking after people, and being very careful about how others are treated (Jones, 2016).
Noa	To be free from the extensions of tapu, to be ordinary (Moorfield, 2024).
Pākeha	A New Zealander of European descent.
Rangatira	Leader, chief.

Reo	Language.
Rohe	Boundary, district, region or territory (Moorfield, 2024). Often used to describe the area of land over which an iwi has responsibility or authority.
Tapu	To be sacred, prohibited, restricted or similar (Moorfield, 2024) and refers to respect for the spiritual character of all things when viewed alongside noa (Jones, 2016).
Tikanga	The customary system of practices that have developed over time, the correct procedure (Moorfield, 2024).
Utu	Compensation, recompense or reparation (Moorfield, 2024) in a broad sense, or in the context of the Māori economy refers to the principle of balance and reciprocity (Jones, 2016).
Whanaungatanga	Kinship, and relationships formed through shared experiences and working together which provides people with a sense of belonging (Moorfield, 2024), and also used more broadly to describe the centrality of relationships to Māori life and society (Jones, 2016).
Whenua	Land.

Chapter 1 Introduction

There are consistent and persistent gaps in economic and wellbeing outcomes between Māori and non-Māori in Aotearoa New Zealand. At the individual level, the literature largely focuses on educational attainment as the key driver of inequality between Māori and non-Māori (Coleman et al., 2005; Sin et al., 2022; The Treasury, 2018). In comparison, the literature examining the relative performance of Māori and non-Maori firms is more likely to assume that relative performance is driven - at least in part - by the practice of Māori cultural values and beliefs (Chen, 2023; Haar & Delaney, 2009; Haar et al., 2021; Mika et al., 2022).

International research provides evidence that culture has an effect on individuals' preferences, and through preferences, on economic outcomes (Alesina & Giuliano, 2015; Guiso et al., 2006, 2009; Tabellini, 2010). Bloom et al. (2012) show that culture has an effect on firm organisation and size, and Ek (2019) constructs firm-level production functions to argue that the culture of a firm's employees has a causal effect on firm productivity. In the Aotearoa New Zealand context, there is evidence that Māori hold systematically different preferences to non-Māori (Grimes et al., 2015), however there is not yet evidence linking preferences to economic outcomes. Qualitative research suggests that the business practices of Māori firms are informed by the practice of Māori values and beliefs (Haar & Delaney, 2009; Mika, 2015; Mika et al., 2022; Mika et al., 2019). However, the literature also acknowledges that Māori firms operate within the broader Aotearoa New Zealand and global economy which is likely to moderate the extent to which cultural practices can influence business practices (Haar, 2020; Mika, 2015).

There is a widely acknowledged dearth of empirical data and research on the Māori economy (Ministry of Business Innovation & Employment, 2021; Reserve Bank of New Zealand, 2022) and limited research on the distinctiveness of Māori firms (Haar et al., 2021). The varying definitions of what constitutes a 'Māori business' is cited as a key contributor to this (Mika et al., 2019; Reserve Bank of New Zealand, 2022; Stats NZ, 2022c). There are differing definitions of a 'Māori business' employed within and between government departments and agencies, meaning that research projects employ varying definitions based on data availability.

By way of illustration, Te Puni Kōkiri (TPK) and the Ministry of Business and Innovation (MBIE) for the purposes of the progressive procurement programme define a Māori business as a business that has a minimum of 50% Māori ownership, or is classified by Inland Revenue (IR) as a Māori authority (Te

Puni Kōkiri, 2023). The current Stats NZ data standard states that "a Māori business is a business that is fully or partly owned by a person or people who have Māori whakapapa, and a representative of that business identifies the business as Māori" (Stats NZ, 2023b). This is different to the definition employed by Stats NZ between 2015 and 2022 in the Business Operations Survey (BOS), where firms could self-identify as a Māori business based on a range of non-ownership factors. The non-ownership factors included but are not limited to the ethnicity of employees, practice of tikanga or use of marketing and branding material, and there was no Māori ownership requirement (Stats NZ, 2015). This broader definition is currently used by MBIE in the administration of The New Zealand Business Number (NZBN) (Ministry of Business Innovation & Employment, 2023).

Existing empirical research suggests that the productivity of Māori firms lags that of non-Māori firms (Chen, 2023; Fabling & Maré, 2024), however this research has not sought to isolate the effect of Māori culture on firm performance. Barriers to productivity and innovation in Aotearoa New Zealand have been widely discussed in the literature (Conway, 2016, 2018; Hong et al., 2016; Nolan et al., 2018), however, there is little research on the relative prevalence of barriers between firms, including between Māori and non-Māori firms. It is also reasonable to assume that underlying socioeconomic factors[1] may have an effect on relative firm-level productivity.

This study seeks to contribute to the literature on cultural economics, productivity and the Māori economy by answering the following research questions:

A. Do Māori firms have different economic outcomes to non-Māori firms?
B. If differences in firm performance exist, can they be explained by the practice of Māori cultural values and beliefs? Or can they, at least partially, be explained by the relative prevalence of constraints in the external business environment?

This study argues that the current definitions of a 'Māori business' in public policy are necessary but not sufficient, to assume that firm organisation and operations are influenced by the practice of Māori cultural values and beliefs. To address this limitation, this study isolates the effect of culture by employing a novel method to identify *Kaupapa Māori*[2] firms using responses to the BOS. It then compares relative levels of multifactor productivity (MFP) between Māori firms, Kaupapa Māori firms

[1] Māori have lower educational attainment in comparison with non-Māori and earn on average 82% of the Pākeha wage (The Treasury, 2018), which translates into lower levels of home ownership and wealth inequality (BERL, 2021).
[2] Kaupapa Māori is commonly translated as a Māori approach, which incorporates the knowledge, skills, attitudes and values of Māori society (Moorfield, 2024)

and non-Māori firms. It also examines the prevalence of barriers in the external business environment (e.g., access to physical infrastructure), factors that hamper innovation (e.g., costs or personnel) and the relative ease of hiring labour.

This research contributes to our understanding of how indigenous cultural values influence business operations and it challenges assumptions about the inverse relationship between collectivist cultures and economic performance. It adds to the literature on the Māori economy, Māori firms and productivity in Aotearoa New Zealand.

This thesis is structured as follows; Chapter 2 provides a review of related literature. It starts with presenting the evidence for a causal relationship between culture and economic outcomes (2.1), followed by a review of studies that establish the divergent values and beliefs held by Māori and non-Māori in Aotearoa New Zealand (2.2) and then an overview of the Māori economy, what it is, how it's measured and how to define a Māori firm (2.3). Chapter 2 concludes with a review of the literature on productivity in Aotearoa New Zealand, including literature that establishes a productivity gap between Māori and non-Māori firms. Chapter 3 describes the features and limitations of the available data and the construction of the samples before it provides a description and rationale for the empirical strategy employed in this study. Chapter 4 presents the results from this study and Chapter 5 discusses the results and implications of this study, including limitations and suggestions for future work. This thesis concludes with Chapter 6 which provides a summary of this study and its conclusions.

Chapter 2 Literature Review

2.1 Culture and Economic Outcomes: A Burgeoning Field of Economic Analysis

While it may be intuitive to assume that cultural beliefs and practices have an effect on economic outcomes, it is only relatively recently that economists have produced empirical evidence on this relationship. Guiso et al. (2006) suggest that the reluctance of economists to analyse culture as a determinant of economic outcomes is due to difficulty in designing the robust hypothesis tests that enable researchers to deem a relationship causal. The authors note that with advances in econometric techniques and improved access to data, it is now easier to measure systematic differences in people's preferences and beliefs, to relate these to cultural legacy, and thus, to allow researchers to argue a causal relationship.

Guiso et al. (2006) propose a three-step methodology to enable researchers to argue that culture has a causal effect on economic outcomes. Firstly, researchers must demonstrate the influence of culture on preferences, secondly, they must demonstrate the impact of preferences on economic outcomes before finally determining the direction of causality. To assist in the identification of the direction of causality they provide a purposefully narrow definition of culture as "those customary beliefs and values that ethnic, religious, and social groups transmit fairly unchanged from generation to generation" (Guiso et al., 2006, p. 23). This definition specifically focuses on the parts of culture that are handed down from generation to generation and are considered slow or resistant to change.

The remainder of this paper will adopt the definition of culture proposed by Guiso et al. (2006). The adoption of this definition does not imply that Māori people or Māori culture have not adapted to the extensive social, political and economic changes since the European colonisation of Aotearoa New Zealand. Indeed, we can look to history for many examples of dynamism within Māori culture.

Māori successfully engaged and traded with colonists from first contact until the commencement of the New Zealand Wars. Binney (2004) recounts how rangatira (of high rank (Moorfield, 2024)) from the Bay of Islands and the Hokianga travelled to New South Wales (NSW) for the purposes of cultivating trade from as early as 1805[3]. Merrill (1954) details how from 1840 to the 1860s Māori

[3] Te Pahi and his four sons travelled to NSW in 1805 as guests of Governor King of NSW, however this was not the first recorded visit to NSW by Māori. A Northland chief Tuki Tahua and a companion (either Ngahuruhuru or Te Hurukokoti) had been seized from the Cavalli Islands in April 1793 and taken to NSW. Despite being taken against their will, they were treated with hospitality during their stay in NSW (Binney, 2004).

engaged in trade with colonial settlers and made significant investments in capital equipment. Reid & Rout (2016) describe how Māori took advantage of economic opportunities to adopt new technology and participate in global trade during the same period. It may be considered that the definition of culture employed by Guiso et al. (2006) is analogous with how Māori consider kawa and tikanga on marae; kawa (the underpinning protocols) does not change, but tikanga (how kawa is put into practice) can be adapted as circumstances require (Mead, 2016).

Alesina and Giuliano (2015) provide a comprehensive survey of empirical studies that analyse the influence of culture on economic outcomes and assess the presence of a two-way causal effect between culture and institutions. The vast majority of the studies in the survey adopt the definition of culture proposed by Guiso et al. (2006). Alesina and Giuliano (2015) identify three methods employed in the literature to measure culture; survey responses, data from second-generation immigrants, and experimental evidence.

Survey responses are the most common tool for analysing culture, with the World Values Survey (WVS) being the most popular tool for cross country comparison (Alesina & Giuliano, 2015). Tabellini (2010) uses the WVS to construct a measure of generalised morality and demonstrates that this measurement is relevant in explaining economic development across countries and among regions in Europe. Alesina and Glaeser (2004) use WVS data to compare American and European attitudes toward the poor and argue that beliefs about the poor go a long way toward explaining the significant differences in size of the welfare state between the United States and those in Europe.

Although not discussed by Alesina and Giuliano (2015), the use of international surveys is not without criticism. Hofstede et al. (2010) question the use of international surveys to examine cultural differences within nations, they examine regional cultural differences in Brazil using three studies replicating the national cultures study by Hofstede (1980). The authors present interpretable results that show Brazilian states are more similar to one another than they are to other countries, however they question the use of international surveys as the best strategy to compare regional differences within countries. Hofstede et al. (2010) conclude that future studies of regional cultures within countries should extend global questionnaires with local questions based on familiarity with the country's history and national cultural peculiarities. The authors argue that this would link local differences to an international conceptual framework and make the studies equally useful to international and domestic audiences. This approach is consistent with the construction of the Multi-Dimensional Model of Māori Identity and Cultural Engagement (MMM-ICE) (see Houkamau & Sibley, 2010; Matika et al., 2020; Sibley & Houkamau, 2013).

Shoham (2023) argues that survey-based cultural dimension scores are affected by the socioeconomic environment during survey collection, in other words, survey-based cultural studies suffer from endogeneity. Shoham presents evidence from the WVS that cultural values within countries change over time in a way that contradicts the theoretical notion that cultural values are sticky and passed down relatively unchanged from generation to generation. He argues that this is evidence that responses are influenced by the respondent's socioeconomic environment during the survey collection.

Studies of second-generation immigrants examine the behaviour of second-generation immigrants within a destination country. The economic outcome in the destination country is regressed on the economic outcome from the home country (amongst control variables), holding constant the economic and institutional environment enables the researcher to capture the value of culture via the transmission of cultural traits from parents to their children (Alesina & Giuliano, 2015). Examples include the impact of the strength of family ties on female labour force participation and youth labour mobility (Alesina & Giuliano, 2010), the influence of an immigrant's home country on preferences for income/tax redistribution (Luttmer & Singhal, 2011) and the influence of culture on family living arrangements, specifically adults living in the parental home (Giuliano, 2007).

Experimental evidence typically consists of measuring how people from different cultures respond when playing trust, public good, and ultimatum or dictator games (Alesina & Giuliano, 2015). Gneezy et al. (2016) examine within country values and beliefs by conducting seven experiments with fishermen from several regions in Brazil, contrasting behaviour of lake and coastal fishermen. The experiments included a trust game, an ultimatum game, a donation game, a lottery game, a public-goods game, a coordination game, and a competition game. They find that coastal-based fishermen cooperate and trust more than their inland counterparts, and as a result are better able to coordinate group actions. Henrich et al. (2001) conduct laboratory experiments with a sample from 15 diverse pre-industrialised societies and find that group-level differences in economic organization and the degree of market integration explain much of the behavioural variation across these societies.

Herrmann et al. (2008) conduct a series of public goods games with and without punishment with participants from 16 international cities. They show that anti-social punishment can lead to very strong differences in cooperation levels among comparable social groups acting in identical environments. They conclude that antisocial punishment is negatively correlated with the strength of the rule of law and with cooperation, this suggests that the quality of the formal law enforcement institutions and

informal sanctions are complements, rather than substitutes for informal sanctions (i.e. cultural norms).

Alesina and Giuliano (2015) caution that a significant drawback of the experimental literature is its external validity. Formal rules in experimental games differ from real-world institutions, and in some situations, the authors argue, this gap is insurmountable. Johnson and Mislin (2012), however, provide support for experimental trust literature. They find that trust as measured in the WVS is positively correlated with experimentally measured trust.

Generalised trust is highly researched and has a large literature on its effect over economic outcomes. Alesina and Giuliano (2015) quote – as do many papers on this topic – Nobel Laureate Kenneth J. Arrow (1972, p. 357)

> Virtually every commercial transaction has within itself an element of trust, certainly any transaction conducted over a period of time. It can be plausibly argued that much of the economic backwardness in the world can be explained by the lack of mutual confidence.

Trust is typically measured through laboratory experiments and survey responses. Surveys typically ask respondents a question similar to what appears in the WVS "Generally speaking, would you say that most people can be trusted or that you can't be too careful when dealing with others?" (Alesina & Giuliano, 2015, p. 905). Trust is positively correlated with individual factors such as education and incomes and negatively correlated with recent experiences of misfortune (e.g., trauma) (Alesina & La Ferrara, 2002), belonging to groups who faced historical discrimination (e.g., African Americans) (Alesina & La Ferrara, 2000) and with heterogeneity within communities (Alesina & La Ferrara, 2000, 2002; Kets & Sandroni, 2021; Putnam, 2000). Alesina and Giuliano (2014) provide evidence that close family ties negatively correlates with generalised trust; societies with close family ties tend to place strong emphasis on good conduct within kinship groups but are less concerned with conduct in broader society.

Social capital is a key determinant in the level of generalised trust (Guiso et al., 2004), and researchers have used generalised trust as a proxy for social capital in a number of studies (see Bloom et al., 2012; Guiso et al., 2011; Putnam, 2000). The concept of social capital recognises the importance of social interactions and networks to human wellbeing, and is widely explored in the disciplines of sociology (see Bourdieu et al., 2010; Coleman, 1988; Coleman, 1990) and political science (see Fukuyama, 1995).

Putnam et al. (1993) is widely considered to be the first to examine the role of social capital in the discipline of economics. The authors define social capital as the "features of social organisation, such as trust, norms, and networks, that can improve the efficiency of society by facilitating coordinated actions" (p. 167) and posits that differences in economic performance among Italian regions can be partially explained by persistent differences in social capital originating from the varied presence of free city-states during the late Middle Ages. In related work, Guiso et al. (2016) present evidence that fifth-graders in former free city-states in North Italy exhibit stronger self-efficacy beliefs than those in regions that were not in former free city-states, and further, that these beliefs are correlated with a higher level of civic capital. This evidence supports the findings of Putnam et al. (1993) and argues that historical shocks can generate long-term persistence in economic development.

Since Putnam, a large and growing literature has emerged within the discipline of economics on social capital and trust, and their linkages to economic outcomes. Such linkages include economic development (Knack & Keefer, 1997; Tabellini, 2010), international trade (Guiso et al., 2009), access to institutional credit (Guiso et al., 2004) and firm organisation (Bloom et al., 2012). Whiteley (2000) presents evidence that trust can explain cross-country variations in economic growth and proposes three direct channels through which trust may influence economic growth; transaction costs (i.e. high trust reduces transaction costs), collective problems (i.e. high trust enables actors to solve collective problems) and principal-agent problems (i.e. workers are less likely to shirk in high-trust societies). He proposes three indirect channels; human capital (i.e. societies with higher social capital will have higher returns from investment in education), investment (i.e. high trust reduces risk aversion) and innovation (i.e. technology diffusion is greater in high-trust societies).

While much of the literature on generalised trust examines aggregate trust and aggregate economic outcomes, Butler et al. (2016) examine the relationship between individual trust and individual outcomes to argue a causal relationship between trust and economic outcomes at an individual level. They propose that there is an optimal level of trust; too little trust means that individuals will miss out on opportunities for trade and investment and thus economic advancement, too much trust will leave individuals at risk of being cheated.

The concept of social capital has moved beyond economic theory and into policy making. The World Bank and the Organisation for Economic Cooperation and Development (OECD) have operationalised the concept in frameworks, data collection and policy recommendations (Grootaert, 2004; OECD, 2001).

As an economic concept, social capital is not without its detractors, Kenneth J. Arrow and fellow Nobel Laureate Robert Solow are perhaps the most notable. Arrow (2000) and Solow (1995, 2000) argue that a *capital* is a stock of factors of production (natural or otherwise) that can be crudely measured, flows of investment and depreciation identified, and crucially, that investment in the present time period results in returns in a future time period (i.e. there is a calculable rate of return). They argue that social capital is not akin to human capital, that unlike human capital, the stock, flows and return of social capital cannot be measured.

Guiso et al. (2011) attempt to overcome this criticism through what they define as *civic capital,* "those persistent and shared beliefs and values that help a group overcome the free rider problem in the pursuit of socially valuable activities" (p. 419). They argue that this definition identifies the cultural norms and beliefs that matter to economic development (i.e. avoidance of the free rider problem) and that it therefore has positive benefits (i.e. a calculable rate of return). Further, by virtue of identifying those shared beliefs and values that are persistent (i.e. durable), they argue that this definition allows researchers to differentiate social capital from human capital. While acknowledging that there is further work to be done – specifically on the identification of the mechanisms to measure social capital stock and depreciation – they argue that civic capital is an important omitted factor of production in existing economic analysis. This definition of civic capital is consistent with the definition of culture discussed earlier in this section (see Guiso et al., 2006), where the authors also place emphasis on the requirement of *persistence* to infer a causal relationship.

The commonly used measure for individualism comes from Hofstede (1980), it describes "the relationship between the individual and collectivity which prevails in a given society" (p. 213). It describes the extent to which people believe that they should primarily be responsible for themselves as opposed to the collective (such as an organisation or community) and is reflected in the way people live (e.g., in nuclear or multi-generational families). Hofstede (1980) analysed over 116,000 survey responses about values from a bank of pen and paper survey responses from matched IBM[4] employees in over 40 countries. From this analysis he proposes four main dimensions to culture; Power Distance, Uncertainty Avoidance, Individualism and Masculinity[5].

The conventional logic is that in individualist societies, personal achievements and individual rights are emphasised, whereas in collectivist societies people act predominantly as members of a group. In

[4] In Hofstede (1980) IBM is instead referred to as the HERMES Corporation (Hofstede et al., 2010).
[5] Subsequently extended to six dimensions to include Long Term versus Short Term orientation and Indulgence versus Restraint (Hofstede, 2010).

individualist societies people are rewarded for personal achievements which encourages great personal feats (e.g., discoveries and performances) but that this can make collective action difficult. Whereas in collectivist societies, collective action is easier, but this can lead to conformity, acceptance of the status quo and inhibit innovation (Gorodnichenko & Roland, 2011, 2017).

Greif (1994) models the effect of the individualism–collectivism cleavage on contract enforcement and market expansion in late medieval trade, comparing collectivist Maghribi traders with individualist Genoese traders. Tabellini (2010) suggests that the individualist versus collectivist beliefs can explain differences in institutions (e.g., through requirements for contract enforcement) and that these institutional differences affect current levels of economic development. Gorodnichenko and Roland (2011, 2017) argue that cultures with a tendency toward individualism exhibit higher levels of innovation and higher output per worker, which leads to higher long-term economic growth. They argue that the individualism–collectivism cleavage is more influential on long-term growth than levels of generalised trust.

Several studies have examined the strength of family ties (i.e. kinship) on economic outcomes. Alesina and Giuliano (2010) present evidence from the WVS that households with strong family ties have higher home production of goods and services, and this results in lower female and youth participation in the external labour market. Alesina et al. (2015) also use evidence from the WVS to argue that strong family ties are negatively correlated with labour mobility, and that low labour mobility has led to stronger regulation of labour markets. Bertrand and Schoar (2006) suggest that strength of family ties can explain cross-country variations in the prevalence of 'family businesses', they further suggest that this type of firm organisation may be suboptimal.

Giavazzi et al. (2019) analyse data from four generations of immigrants to the United States to determine the speed of convergence of immigrants' economic preferences to that of the dominant culture. They note that some traits are more persistent than others, for example attitudes towards trust and cooperation converge more quickly than attitudes towards politics and the role of government and sexual morality. The speed of evolution is also heavily influenced by country of origin, specifically by the difficulty of learning English as a subsequent language and the strength of family ties in country of origin.

Within the discipline of economics, there is limited or no empirical evidence on the convergence of economic preferences held by indigenous groups - including Māori – to that of the dominant settler

culture. There is, however, a wide literature outside of economics on the effects of colonisation on indigenous peoples, including the loss of language, culture and way of life, and subsequent efforts of decolonisation[6].

The focus of much of the literature on culture and economic outcomes examines the extent to which culture and human capital can explain inter-country differences in productivity and output, primarily through the interaction between culture and institutions. Alesina and Giuliano (2015) conclude that culture and institutions interact and evolve in a complementary way. They note that while substantial progress has been made in isolating the importance of culture and institutions for economic development, more analysis is required to understand their complementarities and how they jointly affect economic development. There is little research on the interaction between settler institutions and indigenous cultures and economic development within indigenous communities.

Ek (2024) uses a novel method to analyse second-generation migrant data to argue that at an individual level, culture can explain a significant portion of the variation in human capital. This work is analogous to the analysis of Butler et al. (2016). Ek uses Swedish administrative data to match employees to employers and constructs individual firm productivity functions with heterogenous labour. The author proceeds to estimate country-of-origin-specific productivity parameters and interprets these differences as cross-country differences in human capital robust to wage discrimination. Ek finds that country of origin, specifically the degree to which the country of origin places emphasis on autonomy over obedience, is the strongest and most robust predictor of human capital, and argues that this explains a significant portion of firm-level differences in productivity in non-routinised industries.

The international literature presented in this section proposes frameworks through which researchers can examine the relationships between culture, institutions, preferences and economic outcomes. The methodological strategies employed by these studies are deemed sufficient for analysing inter-country differences (e.g., via second generation migrants) or within regions (via historical differences in regional institutions), but have not attempted to isolate the effect of indigenous culture within colonised nations and economies. The analysis of indigenous culture on economic preferences presents unique challenges, a review of the literature of Māori economic preferences follows in the next section.

[6] For further reading on colonisation and its ongoing effects in Aotearoa see Kawharu (2003); Pool (2015)

2.2 Māori and Pākeha Economic Values

The extent to which Māori traditional values and beliefs have an effect on preferences, and through preferences, on economic outcomes is debated in the literature.

Reid and Rout (2016) coin the term 'reactionary traditionalism' which they define as the positioning of indigenous cultures to be diametrically opposed to Western capitalism. The authors argue that when Māori are seen as valuing the spiritual, natural, and social over the technological, material, and economic, that they are seen as passive beneficiaries of commerce and trade rather than active participants. These authors cite examples of Māori economic activity during early European contact as evidence that traditional Māori values are not inherently at odds with capitalist market structures.

Rangatira Māori from the Bay of Islands and the Hokianga travelled to New South Wales (NSW) for the purposes of cultivating trade from as early as 1805 (Binney, 2004). The Waitangi Tribunal (1996) accept that Māori avidly sought access to Western technology upon European arrival in Aotearoa New Zealand, and that access to new technology was part of the quid pro quo for European settlement as per Te Tiriti o Waitangi/The Treaty of Waitangi[7]. Merrill (1954) observes - with surprise - the Māori economy displayed characteristics consistent with economic growth between 1840[8] to 1860[9]. He cites examples where Māori accumulated investment funds to invest in capital goods (e.g., flour mills, ships), implemented new technology (e.g., adoption of plough), conducted industrial-level farming (e.g., maize), organised labour (e.g., to man the ships) and marketed their goods (e.g., Māori produced maize was sold in California).

Houkamau and Sibley (2019) use the Te Rangahau o Te Tuakiri Māori me Ngā Waiaro ā-Pūtea (The Māori Identity and Financial Attitudes Study (MIFAS)), a nationwide study that examines the relationship between Māori identity and economic attitudes and values, to test if traditional Māori values have a relationship with economic values. Houkamau and Sibley (2019) define economic values as the "principles and standards for one's economic life" (p. 119), and they argue that economic values can be revealed through responses to specific economic questions:

[7] Te Tiriti o Waitangi refers to the Māori language text, The Treaty of Waitangi refers to the English language text.
[8] Te Tririti o Waitangi/The Treaty of Waitangi was signed in 1840. Arrivals of Europeans increased dramtically after this date.
[9] Although there is no singular commencement date, 1860 is broadly considered to be the start of the New Zealand Wars where, amongst many other consequences, Māori suffered tremendous land loss.

- Attitudes towards protecting iwi assets for the future versus commercialising and risking them for increased profit, as a proxy for the economic value of kaitiakitanga.
- The extent to which individuals require respect for Māori values and development in the workplace, as a proxy for the economic values of utu (reciprocity), manaakitanga (mutual respect) and whanaungatanga (kinship).
- Individuals' prioritisation of personal performance versus relationships at work, as a proxy for the economic values of manaakitanga (mutual respect) and whanaungatanga (kinship).

The study finds find that Māori who are more strongly oriented towards a traditional Māori belief system are less likely to be individualistic at work, more likely to prefer workplaces that respect Māori development and less likely to support the commercialisation of iwi assets, even if this results in lower individual financial benefits. Houkamau and Sibley (2019) observe marked heterogeneity among respondents, and note that for some Māori, traditional values are incompatible with their personal aspirations. The authors conclude that extent of divergence between Māori and non-Māori economic values and how these are required to be traded off against each other remains a live question. In other words, the authors argue that Māori culture has an effect on preferences - the first step in the framework proposed by Guiso et al. (2006) – but they do not argue that preferences have an effect on economic outcomes, the second step in the framework.

Aotearoa New Zealand is considered to be a high trust country and rates above the OECD average (OECD, 2020). Māori have comparatively lower levels of generalised trust than Pākehā (Hughes, 2022; Roskruge et al., 2010), which is consistent with the international literature that argues that lower trust is common in individuals or groups that have suffered racial discrimination, misplaced government intervention, have lower educational attainment and incomes, and stronger family ties. There is no research on the relationship between generalised trust and relative firm performance in Aotearoa New Zealand.

Grimes et al. (2015) use the WVS to compare economic and social beliefs held by Māori with non-Māori in Aotearoa New Zealand, and it is the first study to use WVS in this context. The authors adopt the definition of culture proposed by Guiso et al. (2006) and controlling for income, gender, work status and education argue that Māori individuals have a significantly different distribution of economic beliefs and values from non-Māori in Aotearoa New Zealand. The study finds that Māori place greater emphasis on the importance of collectivism, non-materialism, the environment and kinship ties, and the authors conclude that, as a consequence, Māori are less inclined towards capitalism. The authors compare the beliefs held by Māori with those of African Americans in the

United States and find that Māori place greater emphasis on the role of luck in success and on the environment over economic activity. It is argued that the comparison with African Americans is evidence that the economic beliefs and values held by indigenous peoples differ systematically from those held by non-indigenous ethnic minorities in comparable socioeconomic positions.

Grimes et al. (2015) find that Māori are 20.4% more likely to place emphasis on tradition over technology, and when this is considered alongside the tendency of Māori toward to collectivism over individualism[10], the authors argue that this is likely to inhibit innovation and entrepreneurship within the Māori economy. International literature has associated individualism with entrepreneurship and innovation (Gorodnichenko & Roland, 2011, 2017), however the relationship between individualism, entrepreneurship and innovation appears to be more nuanced in the Aotearoa New Zealand context.

At a national level Aotearoa New Zealand is considered to tend toward individualism, as do similar English speaking countries such as the United States, Australia, the United Kingdom and Ireland (Fagenson-Eland et al., 2004). There is evidence that Māori tend toward collectivism (see Brougham & Haar, 2013; Grimes et al., 2015; Podsiadlowski & Fox, 2011; Tassell, 2004), however there is no strong evidence that Māori exhibit lower levels of entrepreneurship and innovation.

Frederick and Chittock (2006) identify that Māori are more than twice as likely as non-Māori to state an intention to start a business in the next 3 years. The emphasis here must be on the intention to start a business, as the Reserve Bank of New Zealand (2022) finds that Māori are under-represented as business owners. Haar et al. (2021) in a study of 230 firms find that Māori and non-Māori firms have similar levels of within-firm entrepreneurial culture and innovation. Mill and Millin (2021) in work commissioned by the New Zealand Productivity Commission find that at the domestic frontier, Māori firms are more likely to innovate than non-Māori firms.

There are also rich historical examples of Māori innovation. Tīpuna Māori were skilled navigators, migrating from current day Taiwan sailing across the pacific using their knowledge of the stars, ocean, weather and seasons, before undertaking a series of planned migrations to Aotearoa New Zealand starting in approximately 1250 (Crowe, 2018; Irwin et al., 2023). In his seminal book on the New Zealand wars Belich (2015) describes the system of trenches and bunkers in Māori pā (fortified village (Moorfield, 2024)) during the New Zealand Wars as a forerunner to the systems employed on the

[10] The measure for individualism vs collectivism comes from Hofstede (1980).

Western Front in World War I (WWI)[11]. Pā proved to be an innovative and effective system of warfare given the disparities of artillery and 'boots on the ground'.

Grimes et al. (2015) find that Māori are 8.5% more likely to value te taiao (the environment) over economic growth, which is broadly consistent with work by Houkamau and Sibley (2019) who find that Māori with higher connectedness to their Māoritanga (Māori culture (Moorfield, 2024)) are less in favour of taking risks with iwi land. Houkamau and Sibley posit that this is likely informed by Māori consciousness of land loss during the New Zealand wars, resulting in a desire to hold onto land at whatever the cost.

Marsden and Henare (1992) provide a background on how Māori conceive of culture and traditions with respect to te taiao, and how these conceptions are communicated through pūrākau (myths and legends). The authors argue that pūrākau are not merely fables that embody faith in the supernatural, nor wildly exaggerated anecdotes from the ancient past, but rather are deliberate constructs that communicate the Māori worldview. Pūrākau convey the Māori conception of an interconnected universe – including space, time, the physical world and spirituality - in contrast with conceptions dominant in the West where stark distinctions are drawn between the material and spiritual worlds. For Māori, Papatūanuku - the Earth Mother - and Ranginui - the Sky Father - gave birth to their spiritual children Tawhito (the ancient ones), who became the designated kaitiaki (guardians (Moorfield, 2024)) for our world's natural resources. Humans are able to use the resources provided by Papatūanuku, but are duty bound by tikanga to protect and conserve (Marsden & Henare, 1992).

Grimes et al. (2015) find that Māori are 12.5% more likely to believe that businesses should not be run by owners or their appointed managers alone. They argue that when this is considered alongside the emphasis that Māori place on whanaungatanga (kinship(Moorfield, 2024)), it may explain why comparably more Māori firms are managed collectively. The paper does not cite evidence that private for profit Māori firms are more likely to be managed collectively.

The international literature discussed in the previous section suggests that cultures with stronger family ties have lower labour mobility. Sin and Stillman (2015) propose two distinct experiences for Māori; Māori who don't live in their rohe, or have strong ties to iwi or hapū exhibit stronger labour

[11] Belich (2015) does not claim that the British imitated the Māori pā system and transferred to the Western Front.

mobility when compared with Pākeha, whereas Māori who live within strong iwi and hapū networks have lower labour mobility, and are considered to be almost resistant to economic shocks.

While whanaungatanga is commonly defined as kinship, it is also used more broadly to describe the centrality of relationships to Māori life and society (Jones, 2016). Jones (2016) states that within te ao Māori, relationships define the rights and obligations not only amongst and between people, but amongst and between people and whenua, flora and fauna and the gods. Further that these relationships extend across generations to the past, future and present. Jones's description of Māori obligations to past and future generations is consistent with the findings of Sense Partners (2022), who describe the discounting of costs and benefits to future generations as the antithesis to the economic worldview of Ngāi Tūhoe (Tūhoe).

Houkamau and Sibley (2019) find that Māori who identify with more than one ethnicity do not necessarily have a weaker sense of cultural connectedness when compared with Māori who solely identify as Māori. This is in contrast with Grimes et al. (2015) who considered respondents to be Māori only if they responded 'yes' to the following question "Above all, I am a Māori". There is no literature on how the spectrum of Māori identity is reflected in firm self-identification. This leaves unanswered questions, do respondents self-identify as a Māori business if they identify with more than one ethnicity?

As presented in this section, there is evidence that Māori hold significantly different distribution of economic beliefs and values from non-Māori in Aotearoa New Zealand, but there is not yet evidence that these preferences have an effect on economic outcomes. The literature also suggests that the relationship between culture and economic outcomes may be more nuanced in the Aotearoa context than what is presented in the international literature. The following section considers Māori cultural values at the firm-level within both the historical and contemporary context, and how these values have shaped the definition of a Māori firm in public policy.

2.3 The Māori Economy: What is it, how is it measured and what is a Māori firm?

The Māori economy is not a recent phenomenon. The language of 'economy' may have arrived with European colonialists, however the workings of the Māori economy predate European arrival in Aotearoa New Zealand. Jones (2016) describes five concepts as central to the Māori legal framework (and thus to the workings of the Māori economy). They are:

- *whanaungatanga* - centrality of relationships to Māori life
- *mana* - the importance of spiritually sanctioned authority and the limits on Māori leadership
- *tapu/noa* - respect for the spiritual character of all things
- *utu* - the principle of balance and reciprocity, and
- *manaakitanga* - nurturing relationships, looking after people, and being very careful about how others are treated. (p. 66)

Much of the scholarship on pre-colonial life in Aotearoa New Zealand is based on publications by Pākeha New Zealand ethnographer Elsden Best. Best published his exchanges with those he referred to as 'the old-time Māori', Māori who were well-versed in pre-colonial Māori life and society (Holman, 2006). French sociologist and anthropologist Marcell Mauss (2015) in his seminal book *The Gift* (originally published in 1925) relied on letters exchanged between Best and Tāmiti Ranapiri (Ngāti Raukawa) to explore the Māori concept of hau. Mauss and many subsequent anthropologists consider hau - as described by Ranapiri - to be 'the spirit of the gift'[12] (Henare, 2018; Nicholson, 2019), and have positioned hau outside of the Aotearoa context as underpinning all societies of gift exchange (which he considers the pre-colonial Māori economy to be).

Sir Raymond Firth, a New Zealand economist and ethnographer, added to this debate on hau in what is perhaps the first study of the pre-colonial and early contact Māori economy in his 1929 work *Primitive Economics of the New Zealand Maori* (sic) (Firth, 2011). Firth disputed the spiritual and metaphysical significance of hau, instead focussing on the related concept of utu as underpinning exchange in pre-colonial Māori society[13]. Firth describes extensive patterns of trade or exchange governed by utu between iwi prior to colonisation and in the early years of contact. He provides examples such as the trade of coastal products for inland products (e.g., coastal iwi exchanging dried kōura for potted forest birds, or weaving for specific timber) and the movement of pounamu across Aotearoa New Zealand.

[12] Analysis of hau in the literature is largely disconnected from mātauranga Māori, devoid of Māori voices and sources (see Nicholson, 2019). An in-depth discussion on the Māori concept of hau is not within the scope of this study, but is included to the extent that it has shaped literature on the pre-colonial and early contact Māori economy.

[13] Henare (2018) contends that Mauss's interpretation of hau and its role in gift exchange is not too different from how Māori conceive hau. He argues that Firth's interpretation is only focused on hau within the context of economic exchange and ignores its metaphysical qualities which are central to Māori beliefs.

Merrill (1954), an economist from the University of Chicago, describes the significant changes in Māori economy from 1840 driven by the rapid adoption of new technology. He notes that by 1840 Māori had become skilled in negotiations with European settlers, selling items such as pigs and flax and using the gains from trade to make significant capital investments (e.g., Māori investment in flour mills that produced flour for their own use and for trade). Māori owned and operated sailing vessels (estimated to number 100 vessels in 1858), selling Māori produced goods (including flour) as far away as Europe and returning home with European produced goods.

There was great economic disruption to the Māori economy due to the outbreak of the New Zealand Wars and the individuaisation of Māori land title from circa 1860, by which time Māori had also become the ethnic minority in Aotearoa New Zealand (Knox, 2011; Merrill, 1954; Pool, 2015; Ruwhiu, 2009). Māori suffered significant landloss[14] with devastating economic consequences due to government policies and actions that are now considered to have breached Te Tiriti o Waitangi (Knox, 2011; Ruwhiu, 2009).

Coleman et al. (2005) describe the 1980s and 1990s as having great influence over the trajectory of the Māori economy; the passing of Te Ture Whenua Māori Act 1993 made it more difficult to alienate Māori land, devolution of some government functions to iwi authorities and a number of significant settlements under Te Tiriti o Waitangi resulting in asset transfers from Crown to iwi ($637 million in negotiated settlements had been allocated to iwi and Māori organisations by the end of 2001 (Te Puni Kōkiri, 2002)). Iwi used capital and land transferred from the Crown to establish businesses, and Te Puni Kōkiri (2002) valued the Māori commercial asset base at $5.19 billion as at the end of 2000.

In the current day, the Māori economy is growing in both value and diversity. BERL (2021) estimated the Māori asset base to be worth $68.7 billion as at 2018, up from an estimated $42.6 billion in 2013. Demographic trends will likely influence the trajectory of the Māori economy into the future. The current rate of population growth is higher for Māori than that of other New Zealanders, with the Māori share of population forecast to grow from the current level of 17% to 21% by 2043 (Stats NZ, 2022d).

[14] Thom (2021) finds that confiscated land was disproportionately high-quality arable land and that returned land was disproportionately poor-quality and Marr (1997) reports that Māori land compulsory acquired by the Crown for public works (e.g., roading and train networks) was largely for the benefit of Pākehā colonial settlements.

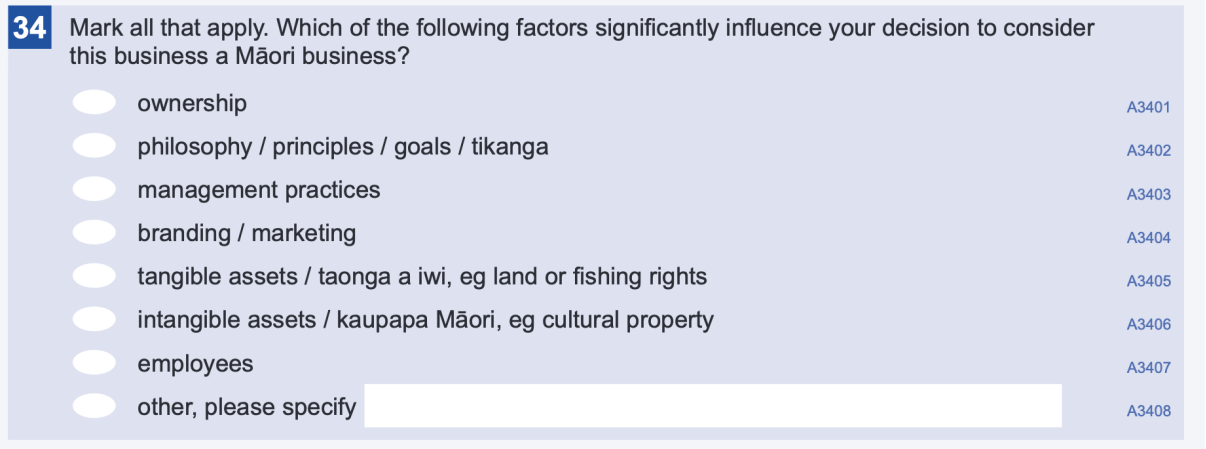
While the success of the Māori economy is certainly cause for optimism, there are consistent and persistent gaps in economic and wellbeing outcomes between Māori and non-Māori. Māori have lower educational attainment and earn 82% of the Pākehā average hourly wage (The Treasury, 2018), this translates into further inequities, including lower rates of homeownership, lower savings, lower educational attainment, and lower life expectancy (BERL, 2021).

There is a widely acknowledged paucity of data and empirical research on the Māori economy (Ministry of Business Innovation & Employment, 2021; Reserve Bank of New Zealand, 2022) and little research on the distinctiveness of Māori firms (Haar et al., 2021). A contributing factor to this is the varying definitions of what constitutes a 'Māori business' (Mika et al., 2019; Reserve Bank of New Zealand, 2022; Stats NZ, 2022c), including within and between government departments and agencies.

TPK and the Ministry of Business and Innovation (MBIE) for the purposes of the progressive procurement programme require that a Māori business has a minimum of 50% Māori ownership, or is classified by the IRD as a Māori authority (Te Puni Kōkiri, 2023). The current Stats NZ data standard states that "a Māori business is a business that is fully or partly owned by a person or people who have Māori whakapapa, and a representative of that business identifies the business as Māori" (Stats NZ, 2023b). Between 2015 and 2022 Stats NZ employed a broader definition of a Māori business in the Business Operations Survey (BOS), where firms could self-identify as a Māori business based on non-ownership factors (see figure 1.0 below). This broader definition is currently used by MBIE for the purposes of The New Zealand Business Number (NZBN) (Ministry of Business Innovation & Employment, 2023).

Figure 1

BOS Māori Business Self-Identification Criteria[15]



Stats NZ (2022c) undertook consultation throughout the development of the data standard, including with Māori businesses and organisations, academia, government agencies and iwi. Themes that emerged from consultation included the importance for a Māori business to demonstrate Māori values or cultural connection, the consideration of a minimum 50% ownership prerequisite and a requirement for whakapapa verification.

These themes are consistent with the literature and research. French (1998) surveyed the Poutama Trust database and found that when defining a Māori business, respondents placed importance on Māori ownership, Māori culture and having aims supportive of Māori economic development. He noted that only one third of respondents felt that identification from one parameter alone was sufficient, and posited that this is suggestive of a continuum of 'Maoriness'. Durie (2013) considers a 'Māori-centred business' as "a business that deliberately revolves around Māori people, Māori assets, and Māori priorities" (p. 228), and argues that it must contribute to Māori development and adopt Māori values in governance and management. Mika (2015) interviewed 21 Māori entrepreneurs about how to define a Māori business and as a result, delineates between a Māori *in* business and a *Māori business,* the latter referring to a business that is both owned by Māori and operates according to Māori values. Mika et al. (2017); Mika (2015); Mika et al. (2019) consider that a Māori business is predominantly owned by Māori and operates according to Māori values.

[15] Source: Stats NZ and licensed by Stats NZ for reuse under the Creative Commons Attribution 4.0 International licence.

There is an emerging literature on how Māori firms conceive of value and how this differs from non-Māori firms. Henare (2011) describes the Māori approach to economics as the weaving together of "spiritual, cultural, environmental and economic wellbeing's into a holistic mode of business" (p. 271), and he refers to the historical purpose of the Māori economy as 'The Economy of Mana'. Mika et al. (2022) build on the concepts of economy of mana proposed by Henare (2011) and hau as understood by Mauss (2015) and Nicholson (2019) to propose the concept of *manahau,* "an axiological agent Māori entrepreneurs employ to synergistically negotiate cultural and commercial imperatives to achieve multidimensional wellbeing, human potential, and relational balance in multiple sites, sectors, and scales" (p. 452). The authors argue that "manahau orients entrepreneurship toward mana-enhancing behaviour, demonstrated by reciprocal exchanges of taonga as valued objects—material and immaterial" (p. 452).

Haar and Delaney (2009) consider the value that Māori entrepreneurs place on whanaungatanga and suggest that while Māori entrepreneurs participate in the broader economy, that profit maximisation may look different for Māori entrepreneurs, due to difficulties translating whanaungatanga and other Māori values into financial terms.

2.4 Productivity in Aotearoa New Zealand and Relative Firm Performance

Productivity refers to the efficiency in which firms convert inputs into outputs (Syverson, 2011). Labour productivity measures the amount of output produced from each unit of labour employed. It is influenced by capital deepening (or capital intensity, that is the amount of capital available per worker) and by multi-factor productivity (MFP). MFP measures how efficiently a 'unit bundle' (a combination of productive inputs, labour and capital) is used to produce a unit of output and can be considered a proxy for broad technological advances. Broadly speaking, productivity growth enables a given quantity of output to be produced using fewer resources, or more and/or better output to be produced from the same resource base (Conway, 2016).

Aotearoa New Zealand has a widely acknowledged problem with productivity (Conway, 2016; Conway & Meehan, 2013; Harris, 2020; New Zealand Productivity Commission, 2021; Nolan et al., 2018). Productivity and income per capita in Aotearoa New Zealand have been significantly below the OECD average for some time, and unlike many countries with low levels of productivity, there is no sign of convergence (Conway & Meehan, 2013). This is despite having what are broadly considered to be business-friendly policy frameworks (OECD, 2008, 2013, 2017, 2019, 2022, 2023). The OECD has described this situation as both the 'productivity paradox' and a conundrum (OECD, 2013).

Conway (2018) places productivity in Aotearoa New Zealand in historical and global context. He describes Aotearoa New Zealand in the 1960s as having some of the highest living standards in the world, with GDP/capita at approximately 125% of the OECD average. Living standards started to slip in the mid 1960s, and by the early 1990s Aotearoa New Zealand's GDP/capita had dropped to approximately 80% of the OECD average. The drop, Conway argues, is largely due to low levels of productivity and slow productivity growth.

There was some growth in labour productivity in the 1990s, which is broadly attributed to the microeconomic reforms the fourth Labour government[16] implemented in the 1980s. This growth, however, was not sufficient for Aotearoa New Zealand to 'catch-up' to OECD peers and proved to be short-term, slowing significantly in the 2000s[17] (Conway & Meehan, 2013). Productivity growth has slowed significantly in nearly all advanced OECD economies since the early 2000s (OECD, 2019). While international comparison provides insight into our performance, Conway (2018) emphasises that Aotearoa New Zealand is not a typical OECD nation, and thus, its economic development trajectory is likely to look different to peer nations.

Aotearoa New Zealand is a narrow mountainous island nation, geographically isolated from its major trading partners and with low population density. There is a growing consensus in the literature that the size and isolation of the Aotearoa New Zealand economy are key contributors to lagging productivity (Harris, 2020; OECD, 2023). Economic geography has an effect on productivity via product markets and labour markets. Economic theory suggests that larger and denser labour markets reduce labour search costs and facilitate greater specialization through finer division of labour. Larger and denser product markets induce stronger competition between producers, encouraging more efficient use of resources and greater innovation activity (Boulhol et al., 2008; Conway, 2016, 2018).

Boulhol et al. (2008) present evidence on the size of the effect of economic geography on GDP/capita and productivity in the OECD. The authors describe productivity in Aotearoa New Zealand as lagging the average OECD country by 25%, however this reduces to 14% when the authors control for proximity to major markets. By means of a comparison, the authors found productivity in Australia to

[16] Also known as the Lange government. The reforms are commonly referred to as 'rogernomics' after the Minister for Finance Roger Douglas who is considered as the architect of the reforms.
[17] The slowing of labour productivity has been attributed to the relatively slower growth of multifactor productivity (MFP) during this time.

be slightly above the average OECD country, but this increased to 13% when controls for economic geography were included.

Conway and Zheng (2014) identify that the dispersion of markets within Aotearoa New Zealand is likely to compound the effects of isolation from major trading partners. Aotearoa New Zealand's domestic markets are relatively small and isolated by international standards, which may limit the potential for agglomeration, competition and the extent to which domestic firms are able to exploit opportunities for scale and specialisation. Conway (2016, 2018) notes that for a small country, Aotearoa New Zealand is not well internationally connected.

Economic geography can partially explain Aotearoa New Zealand's dismal productivity performance, however as the analysis by Boulhol et al. (2008) shows it doesn't explain everything, or in the words of New Zealand Productivity Commission (2021) "Geography is not destiny: New Zealand can do better" (p. 3). The literature points to capital shallowness within the Aotearoa New Zealand economy (Conway, 2016, 2018), low levels of investment in R&D and knowledge based capital (Conway, 2018; Wakeman & Conway, 2017) and poor diffusion of knowledge and technology from the global to the domestic frontier, and from the domestic frontier to laggard firms (Harris, 2020).

In recent decades the availability of business microdata data has enabled a wide range of research into production processes and relative firm performance. Syverson (2011) provides a comprehensive review of the international literature enabled by microdata, canvassing how productivity is defined, measured and sustained, as well as the drivers of differences between firms. The author identifies in the literature a number of internal drivers of firm productivity including managerial practices and capability (Bloom & Van Reenen, 2007); quality of capital - human, physical and intangibles – inputs (Sakellaris & Wilson, 2004); ICT & R&D (Aw et al., 2008; van Ark et al., 2008); learning by doing (Benkard, 2000); product innovation (Bernard et al., 2010) and firm structure (Forbes & Lederman, 2010).

Syverson (2011) also identifies external drivers of differences in productivity between firms including productivity spillovers (Bloom et al., 2013); product market competition (Foster et al., 1998); competition via trade (Bloom et al., 2016); regulation (Jens Matthias et al., 2008) and the flexibility of input markets (Bartelsman et al., 2013).

In the Aotearoa New Zealand context, firm-level research is largely made possible by the availability of business microdata in the Longitudinal Business Database (LBD), a research database managed by StatsNZ and launched in 2003 (Maré et al., 2017; Nolan et al., 2018). The LBD contains de-identified micro-data about firms, including survey data and administrative data from a range of government agencies (Stats NZ, 2022b). Nolan et al. (2018) argue that economic research enabled by the LBD has increased our understanding of productivity in Aotearoa New Zealand to an extent that Aotearoa New Zealand's productivity performance can no longer be described as a 'paradox'.

Meehan and Zheng (2015) use microdata in the LBD to find that firm entry and exit in Aotearoa New Zealand is not unusual when compared with international peers, however there is a relatively larger proportion of firms who survive but do not grow as they age. Meehan (2020) identifies a number of small firms in the Aotearoa New Zealand economy who produce beyond their optimal level of output for a given level of MFP. The author speculates that this occurs due to small markets and the resulting lack of competition in the Aotearoa New Zealand economy. Likewise, Maré and Fabling (2019) suggest that the long-tail of unproductive firms may be truncated in industries where there is greater competition, resulting in increased industry-level productivity due to the exit of low-productivity firms.

LBD research has also shed light on relative firm performance in Aotearoa New Zealand. Fabling (2021) proposes a novel approach to identify the domestic productivity frontier[18] using data from the LBD, and then quantifies the direct contribution of the frontier to aggregate labour productivity growth in Aotearoa New Zealand. The paper then proceeds to utilise data from the Business Operations Survey (BOS) to describe the characteristics of firms at the domestic frontier. Fabling finds that the domestic frontier constitutes only 8% of firm-years, however accounts for 13% of total labour input and 29% of value-added. Firms at the frontier are more likely to employ a more skilled workforce who are concentrated in major urban areas (particularly in Tāmaki Makaurau/Auckland), have superior human resource (HR) management practices, are more export intensive, have up-to-date technology and are more likely to be in markets with no competitors.

This is consistent with earlier work analysing firm performance, such as Fabling and Grimes (2014) who use firm-level microdata and responses to the BOS to analyse the relationship between the adoption of HR management practices and firm productivity. The authors find that a suite of general

[18] The frontier is defined as between the most 5% and 10% firms in a given economy, commonly either the domestic (i.e. local) and global frontier. In this instance the domestic frontier refers to the top 5% of domestic firms.

HR practices (e.g., performance pay, performance reviews, training) has a positive impact on firm labour productivity and MFP.

Fabling and Grimes (2016) find that ultra-fast broadband (UFB) can improve firm productivity, but that productivity increases are contingent on firms making complimentary investments in ICT skills and capability. The importance of internal firm capability noted by Fabling and Grimes (2016) is consistent with the work of Hong et al. (2016) who analyse characteristics of productive firms using responses to the BOS. The authors find that firm-level innovations are highly dependent on a firm's internal ability to develop new technologies and market demand, and less dependent on external factors such as business environment, market structure or geography.

Likewise Harris and Le (2018) measure the absorptive capacity[19] of firms utilising responses to the BOS. The authors find that relative to other influences, absorptive capacity has a substantial effect on a firm's likelihood to export, innovate, and undertake R&D, and by extension, on firm-level productivity. Their results show that larger firms have higher absorptive capacity, as do firms employing higher relative numbers of professional and managerial staff.

There is relatively little empirical work comparing the performance of Māori and non-Māori firms, however there is recent evidence that Māori firms have lower productivity relative to non-Māori firms. Chen (2023) uses data from the BOS (2015 – 2020) to longitudinally match Māori firms with non-Māori firms based on firm age, size, and industry characteristics, and the author compares labour productivity using microdata available in the LBD. Chen utilises the BOS definition of a Māori firm discussed in Chapter 2, that is, a Māori firm is defined as a firm that self-identifies as a Māori business based on a range of ownership and non-ownership factors. The author does not differentiate between those firms that operate in line with Māori cultural values and beliefs (firms that this study refers to as Kaupapa Māori firms), and those that self-identify as a Māori business due to Māori ownership or other non-ownership factors such as branding.

Chen (2023) uses a pooled regression model to estimate that Māori firms have 6.3% lower labour productivity than matched non-Māori firms, and further, that this difference is not fully reflected in the wage and salary bill of firms. There are industry level differences that are even more striking, for example in agriculture, Chen estimates that Māori firms have 21.6% lower labour productivity than matched non-Māori firms but finds no differences in wage and salary earnings per employee. The

[19] Commonly defined as a firm's ability to internalise external knowledge (Harris & Le, 2018)

author suggests that employees receiving a larger share of value added in the form of wages and salaries is evidence for the practice of Māori cultural values, and in particular manaakitanga. Chen acknowledges that barriers to development on whenua Māori (namely access to capital and regulatory constraints) exist but suggests that the relative performance gap could partially be explained by the practice of kaitiakitanga.

A limitation of this work acknowledged by the author is that firms were not matched based on geography. The author makes special mention in regard to agricultural firms, that there may be differences in the quality of land between Māori and non-Māori firms, however geography is likely to have an effect on relative firm performance outside of the agricultural industry for reasons previously discussed (e.g., access to human capital, transportation costs, productivity spillovers and access to larger product markets).

The relative productivity of whenua Māori is examined in a report by the Ministry of Agriculture and Forestry (2011), which finds that up to 80% of whenua Māori is underproductive, of which approximately half is productively employed but underperforming, and the remaining half is not yet productively employed. Grimes et al. (2015) suggest that the tendency of Māori to value te taiao over economic growth may inhibit the commercial exploitation of Māori-owned natural resources relative to that of non-Māori, which is consistent with conclusions drawn by Chen (2023). In contrast, Rout et al. (2020) survey a number of reports analysing the underlying reasons for a lack of productivity on whenua Māori and identify a common set of challenges; legislative constraints, access to finance, a lack of skills and knowledge, problematic relationships, and limited paths to market. Rout et al. (2020) do not report evidence that Māori cultural beliefs and values inhibit the economic performance of whenua Māori.

Fabling and Maré (2024) examine the relationship between earnings of Māori employees and the performance of Māori firms. The authors identify Māori-led firms based on the ethnicity and descent of working proprietors, using tax and other administrative data available in the Integrated Data Infrastructure[20] (IDI) to identify working proprietors and their firms, combined with ethnicity and descent data. The sample used by Fabling and Maré differs from that of Chen (2023) in that firms led by working proprietors tend to have fewer employees, but Māori-led firms comprise between 15% –

[20] The IDI is a large research database managed by StatsNZ that contains de-identified about households and individuals in Aotearoa. Data sources include the cenus and government agencies (Stats NZ, 2022a).

20% of the sample (Fabling & Maré, 2024, p. 8). Māori firms comprised approximately 6% - 7% of Chen's sample (Chen, 2023, p. 27).

Fabling and Maré (2024) find that Māori-led firms have slightly lower than average MFP and wage levels, controlling for firm and employee characteristics. This is consistent with the findings of Chen (2023), however it should be noted that the studies look at different populations with Chen's BOS sample limited to firms with at least 6 employees. Fabling and Maré (2024) do not suggest that the practice of Māori cultural values and beliefs has an effect on firm performance.

As with relative firm performance, there is little empirical research on the relative experience of the external business environment between Māori and non-Māori firms, nor what effect these factors have on firm performance. One area in which empirical evidence exists is access to capital, much of which has been conducted by the Reserve Bank of New Zealand/Te Pūtea Matua (RBNZ). The research was conducted in response to findings in the 2020 Māori Business Survey (BDO, 2020) which found that funding and access to capital are two of the top three challenges faced by Māori firms.

Ball et al. (2022) use administrative and tax data to identify firms with Māori directors, shareholders and working proprietors, a similar approach to that taken by Fabling and Maré (2024). The authors find that on average Māori firms pay a higher implied interest rate compared to non-Māori firms, by a magnitude of 50 basis points. Reserve Bank of New Zealand (2022) state that the characteristics of Māori firms explain a significant portion of the difference in financing costs between Māori and non-Māori firms, and further, that once these characteristics are controlled the difference becomes statistically insignificant. In other words, there is no evidence of systemic discrimination based on ethnicity, but rather Māori firms are more likely to possess characteristics that result in higher borrowing costs.

Mill and Millin (2021) identify that Māori land-based businesses face constraints stemming from the Māori land tenure and compliance requirements of Te Ture Whenua Māori Act 1993. Te Ture Whenua Māori Act 1993 is designed to promote the retention of Māori land in the hands of its owners, and to facilitate the occupation, development and utilisation of that whenua for the benefit of its owners. As previously discussed, the Act provides many benefits to Māori including the prevention of further alienation of Māori land, however there are also drawbacks, including that it is very difficult to sell whenua Māori and to securitise the land with debt finance from banks and other financial institutions (New Zealand Productivity Commission, 2021).

Chapter 3 Data & Method

3.1 Data Sources: Longitudinal Business Database (LBD), Business Operations Survey (BOS) and Integrated Database Infrastructure (IDI)

This study draws on data from the Longitudinal Business Database (LBD), a large research database maintained by Stats NZ that comprises tax and survey-based financial data, employment data, intellectual property data, government programme participation lists, survey responses covering a variety of business practices and merchandise and services trade data. These data sources are linked together through the Longitudinal Business Frame (LBF) – a register of all economically significant businesses in New Zealand (Fabling & Sanderson, 2016). The LBD is in turn linked to the Integrated Database Infrastructure (IDI), Aotearoa New Zealand's national research database that holds de-identified microdata about people, households and businesses and maintained by Stats NZ (Stats NZ, 2015). The LBD houses over 20 years of data, and by bringing together a wide range of survey and administrative data it is a rich source for research pertaining to the practices and performance of firms in Aotearoa New Zealand (Fabling & Sanderson, 2016).

The LBF tracks legal entities, this means that firm identification (enterprise number) continuity can be broken by events that do not imply the exit of a firm (e.g., with changes to the legal structure of a firm). Stats NZ repairs the plant-level IDs using the continuity of location and employees as measured in the Linked Employer-Employee Data (LEED) to generate Permanent Business Numbers (PBNs) (Fabling & Sanderson, 2016). Fabling (2011) provides a method for constructing "permanent" enterprise numbers (PENTs) exploiting the continuity of PBNs. The PENT enables linking of data between the LBD and IDI.

The *mb23_higher_geo_v1* table in the IDI provides information on firm-level geographic location, from Regional Council area through to meshblock . This study uses the Functional Urban Area (FUA23) variable. The OECD (2012) defines a Functional Urban Area (FUA) as a city and its commuting zone, and therefore consists of a densely inhabited city and a less densely populated commuting zone whose labour market is highly integrated with the city. Stats NZ (2022e) use workplace address and usual residence address responses from the 2018 Census of Population and Dwellings to calculate the FUA23 variable in the IDI. In 2023 there were 53 FUAs in Aotearoa, while not all areas are assigned to an FUA.

The Fabling & Maré productivity tables are datasets combining survey and administrative data sources harmonized to provide standardised and longitudinally consistent measures of productivity for the purposes of applied micro-econometric research in Aotearoa New Zealand. The Fabling & Maré productivity tables are used widely in applied productivity analysis, including papers cited earlier in this study (e.g. Chen, 2023; Fabling & Grimes, 2016; Maré & Fabling, 2019). For a full description of the methods used to create the datasets see Fabling (2015); Fabling and Maré (2015, 2019).

The BOS is an annual modular survey run by Stats NZ and its purpose is to collect data about how Aotearoa New Zealand businesses operate. The population for BOS is all private-for-profit firms with a rolling mean employment (RME) of at least six and who have been in operation for at least one year. This results in a population of roughly 48,000 firms[21] from which approximately 9,000 firms are selected to take part (Stats NZ, 2023a). The sample is stratified on industry and firm size, and enhanced with a longitudinal top-up sample (Fabling & Sanderson, 2016). This results in approximately 5,000 – 7,000 usable responses each year. The BOS started in 2005 and Māori firms have been identified since 2015 (Stats NZ, 2023a).

BOS Module A collects annual financial and employment data (including the RME variable used in this study), and qualitative information on firm performance. BOS Module B alternates between collecting innovation statistics in odd years and information and communication technology (ICT) use in even years. Module C and Module D are open to competitive bidding between government agencies. The survey has been relatively consistent since its inception in 2005 (Fabling & Sanderson, 2016).

As discussed in section 2.3, the BOS started identifying Māori firms (i.e. self-identified Māori businesses) in 2015. Between 2015 and 2021 the BOS employed the definition of a Māori business consistent with what is now the current data standard (Stats NZ, 2023b), which supports self-identification based on non-ownership factors (see Figure 1). This study utilises responses to the Māori business self-identification question to identify Māori firms and to construct a novel definition of a Kaupapa Māori firm. This method is discussed in further detail in the following section.

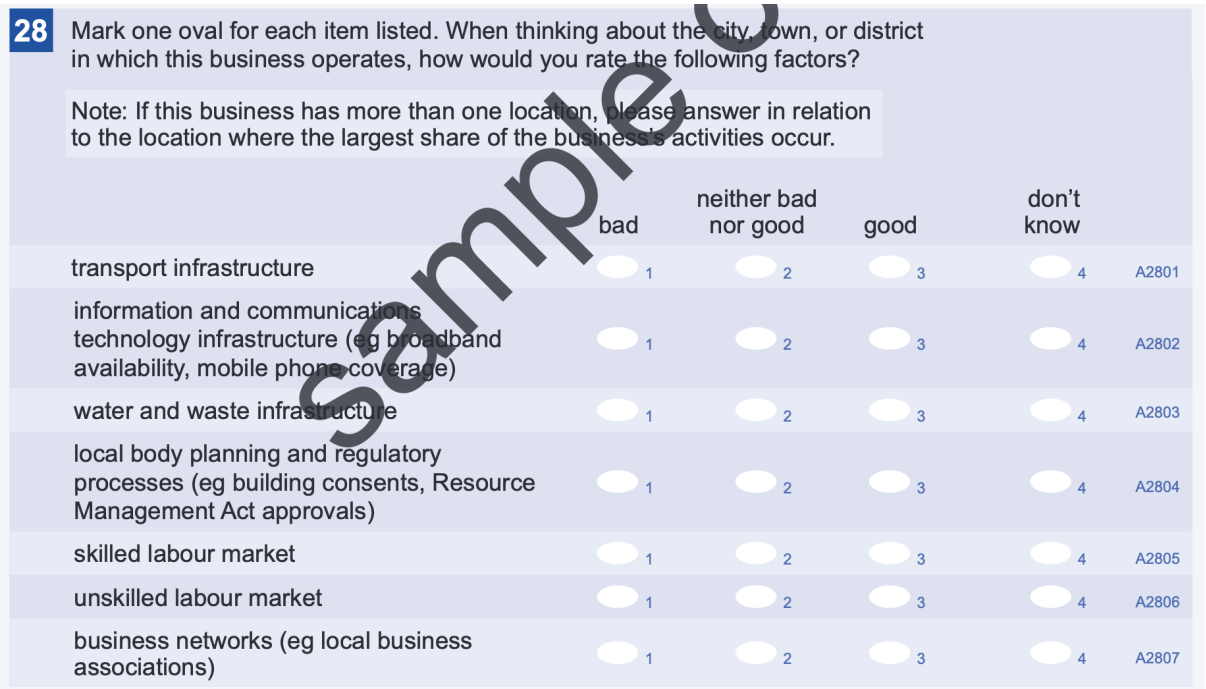
This study uses responses to question 28 in Module A that asks firms to rate factors in their city, town or district that may have an impact on their business operations (Figure 2), responses that rate a specific factor as 'bad' are considered to be an external barrier to firm performance. This approach is consistent with the approach of Hong et al. (2016) who also used the BOS to analyse the relationship between business environment and firm performance. Hong et al. (2016) consider that factors with a

[21] For context, as at February 2023, there were 605,000 enterprises in Aotearoa (Stats NZ, 2023d)

'good' rating represent a favourable external business environment, because this study is concerned with barriers to firm performance it instead uses responses that rate a factor as 'bad'.

Figure 2

BOS Rated Local Factors[22]



28 Mark one oval for each item listed. When thinking about the city, town, or district in which this business operates, how would you rate the following factors?

Note: If this business has more than one location, please answer in relation to the location where the largest share of the business's activities occur.

	bad	neither bad nor good	good	don't know	
transport infrastructure	1	2	3	4	A2801
information and communications technology infrastructure (eg broadband availability, mobile phone coverage)	1	2	3	4	A2802
water and waste infrastructure	1	2	3	4	A2803
local body planning and regulatory processes (eg building consents, Resource Management Act approvals)	1	2	3	4	A2804
skilled labour market	1	2	3	4	A2805
unskilled labour market	1	2	3	4	A2806
business networks (eg local business associations)	1	2	3	4	A2807

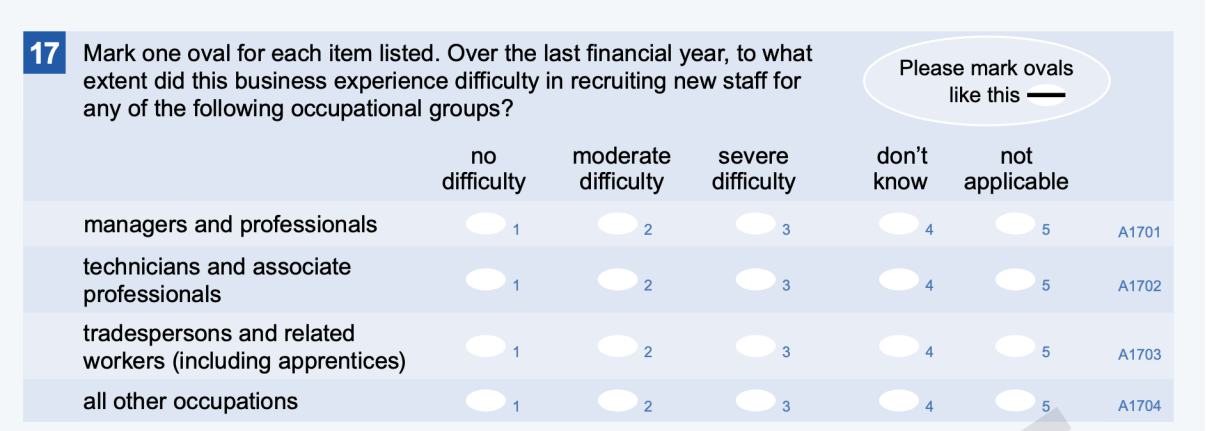
Sample

To assess the relative ease of hiring employees this study uses responses to question 17 from Module A (Figure 3). In this question, firms are asked to indicate the degree of difficulty experienced in recruiting new staff across four occupational groups. This study uses responses where firms report 'severe difficulty'.

[22] Source: Stats NZ and licensed by Stats NZ for reuse under the Creative Commons Attribution 4.0 International licence.

Figure 3

BOS Ease of Recruitment[23]



17 Mark one oval for each item listed. Over the last financial year, to what extent did this business experience difficulty in recruiting new staff for any of the following occupational groups?

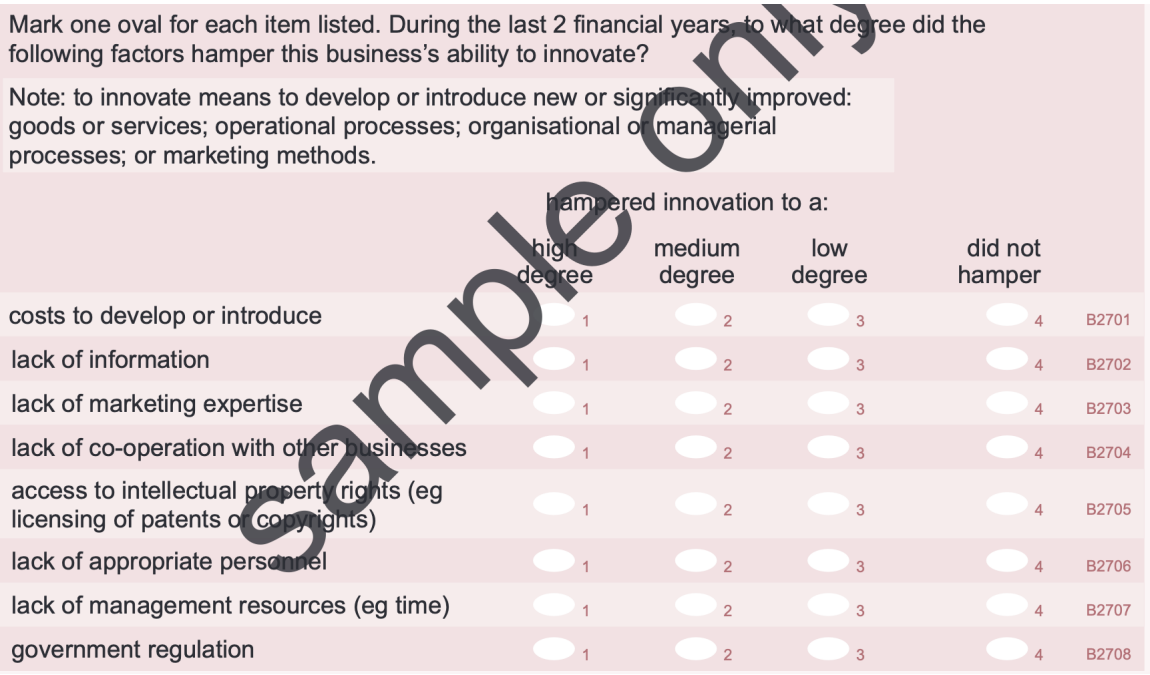
Please mark ovals like this —

	no difficulty	moderate difficulty	severe difficulty	don't know	not applicable	
managers and professionals	1	2	3	4	5	A1701
technicians and associate professionals	1	2	3	4	5	A1702
tradespersons and related workers (including apprentices)	1	2	3	4	5	A1703
all other occupations	1	2	3	4	5	A1704

This study also uses responses to question 27 from Module B Innovation (in odd years only) where firms are asked to indicate to what extent specific factors hampered their ability to innovate (Figure 4). This study uses responses that rate a factor as hampering innovation to a 'high degree'.

Figure 4

BOS Barriers to Innovation[24]



Mark one oval for each item listed. During the last 2 financial years, to what degree did the following factors hamper this business's ability to innovate?

Note: to innovate means to develop or introduce new or significantly improved: goods or services; operational processes; organisational or managerial processes; or marketing methods.

	hampered innovation to a: high degree	medium degree	low degree	did not hamper	
costs to develop or introduce	1	2	3	4	B2701
lack of information	1	2	3	4	B2702
lack of marketing expertise	1	2	3	4	B2703
lack of co-operation with other businesses	1	2	3	4	B2704
access to intellectual property rights (eg licensing of patents or copyrights)	1	2	3	4	B2705
lack of appropriate personnel	1	2	3	4	B2706
lack of management resources (eg time)	1	2	3	4	B2707
government regulation	1	2	3	4	B2708

sample only

[23] Source: Stats NZ and licensed by Stats NZ for reuse under the Creative Commons Attribution 4.0 International licence.

[24] Source: Stats NZ and licensed by Stats NZ for reuse under the Creative Commons Attribution 4.0 International licence.

3.2 Panel Construction, Firm Definition & Sample Descriptive Statistics

The sample for this study is sourced from the BOS in years 2015 – 2021. The time period is restricted to 2015 to 2021 to provide a consistent definition of a Māori firm and to utilise responses that indicate the factors that influenced a firm's decision to identify as a Māori business (Figure 1). There are 54,109 observations during this time period.

The following data cleaning steps are completed to ensure that there are no non-applicable (NA) values relating to firm self-identification

- For a small number of firms, LA3300_01 = NA even though LA3300_02 = 1. In these instances LA3300_01 is updated to = 0 (i.e. if a firm has answered 'no' when asked if they identify as a Māori firm, this response is reflected in both the 'yes' (= 0) and 'no' (= 1) data fields).
- For a small number of firms, when LA3300_02 = 1 questions LA3401 through to LA3408 = NA. These have been updated to = 0 (i.e. when a firm has answered 'no' when asked if they identify as a Māori firm, the reasons for self-identification are updated to = 0).

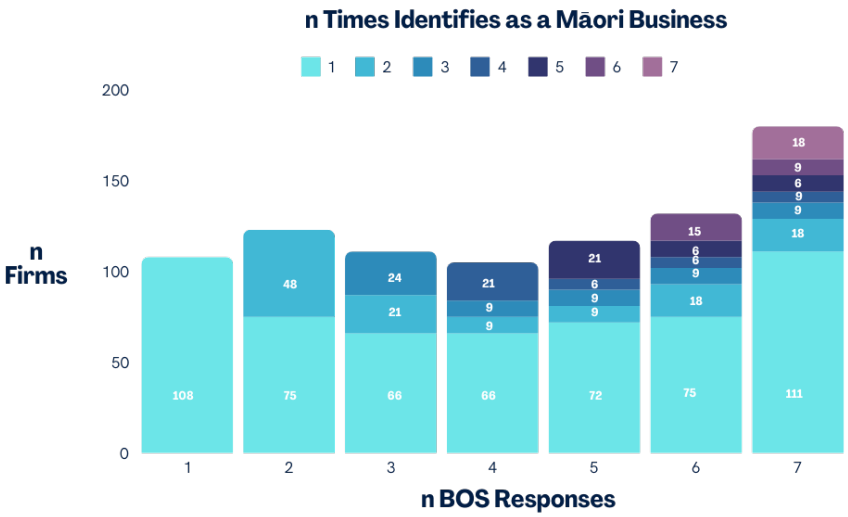
The BOS sample is then joined with the *pent.IDI_202310* table to assign firms with a permanent enterprise number 'PENT' (see Fabling, 2011 for information on compilation of PENTs). This results in zero drop off, however there are a small number of duplicate entries (i.e. a PENT matches 2 *enterprise_nbr* in the same year). It is assumed that this is due to firms merging, in these cases, this study uses the response from the firm that survives (i.e. the firm that is observed in the BOS subsequent years).

The PENT allows for merging with the *mb23_higher_geo_v1* table on the IDI to get location data (*fua23_name*) for each firm in a given year (observations are joined by *dim_year_key* and *PENT)*. As firms may operate at more than one site, each site is termed as a 'plant' in the LBD and assigned a PBN identifier. In instances where a PENT has multiple linked plants and locations, the location of the plant with the greatest number of full-time employees (FTE) is used. The value of FTE comes from the Fabling and Maré productivity tables. Observations missing an associated *fua23_name* variable are dropped.

As reported by Chen (2023), there is significant inconsistency of self-identification as a Māori business. Figure 6 shows the consistency of self-identification in this sample (the number of observations have been randomly rounded to base 3 for confidentiality reasons as per StatsNZ requirements).

Figure 5

Consistency of Self Identification



Note. As per StatsNZ confidentiality requirements, the number of observations and number of unique firms have been randomly rounded to base 3 (RR3).

Some change in firm self-identification is to be expected. This may be due to a change of firm ownership (for firms who self-identified based on firm ownership), or due to a significant change in employee composition (for those firms that identified based on the ethnicity of employees). Responder error may also contribute to the observed inconsistency, particularly when it is considered that there are a high number of firms who identify as a Māori firm only once in as many as 7 BOS responses. This study agrees with the conclusion drawn by Chen (2023) that the level of inconsistency exceeds that which can be reasonably explained by changes in firm structure alone.

To mitigate responder error and general inconsistency, this study constructs a measure of a firm's 'primary classification' which is defined as the classification that a firm selects in at least 50% of responses in two or more years. The primary classification is then applied to responses across all years the firm appears in the BOS.

Firms that self-identify as a Māori business in at least 50% of responses and have responded in two or more years are classified as *Primary Māori* (also referred to as Māori in this study), otherwise firms are classified as *non-Māori.* Firms that have only responded to one BOS survey are assumed to be non-Māori. This is a markedly different approach to that taken by Chen (2023) who defined a Māori firm as those who have ever identified as Māori. Chen also required firms to appear in the BOS at least twice to be considered a Māori firm. This study labels firms that identify as Māori at least once as *Ever Māori* (as per Chen's definition), firms that identify as Māori at least once but are not classified as Primary Māori are classified as *Ever-Māori not Primary*. This is the first study that uses consistency of self-identification to refine the definition of a Māori firm.

As discussed previously, this study assumes that Māori ownership is a necessary but not sufficient condition to assume that a firm's organisation and operations are influenced by the practice of Māori cultural values and beliefs. This assumption is consistent with the literature on Māori business that proposes that in addition to being owned by Māori, Māori businesses should contribute to Māori development and operate according to Māori culture and beliefs (see Durie, 2013; French, 1998 ; Mika, 2015; Mika et al., 2022). To isolate the effect of Māori culture and beliefs on firm performance, this study creates a sub-group of self-identifying Māori firms termed *Kaupapa Māori* firms. These are firms that are:

- are Primary Māori;
- self-identify based on Māori ownership (question LA3401);
- self-identify based on 'philosophy, principles, goals, tikanga' (question LA3402) and/or 'management practices' (question LA3403).

This results in five classifications of firm type; Primary-Māori, Kaupapa-Māori, Primary Māori non-Kaupapa, Ever-Māori and non-Māori. Firm type is then applied as a permanent marker to firms in the sample for further analysis, a summary of which can be seen in Table 1. A firm may belong to more than one group for example all Kaupapa Māori firms are also Primary Māori firms, a non-Māori firm may also be an Ever Māori firm.

Table 1

Descriptive Statistics of Firms in BOS Sample (unweighted)

	Primary Māori	Kaupapa Māori	Primary but not Kaupapa Māori	Ever Māori	Ever Māori – Not Primary	All
Observations	1,467	999	468	4,452	2,985	53,802
Unique Firms	384	243	141	1,032	648	13,086
Mean RME*	65.24	51.75	94.02	96.07	111.22	96.66
Median RME	24.92	25.04	24.33	33.67	37.83	34.08

Note. As per StatsNZ confidentiality requirements, the number of observations and number of unique firms have been randomly rounded to base 3 (RR3). Mean RME has been derived from rounded counts, total RME with graduated random rounding (GRR) applied to base 100 and observations (RR3). Mean RME and median RME have been rounded to 2 decimal places.

Table 2

Stated Reasons for Self-identification as a Māori Firm, by Firm Type (unweighted)

	Owner	Tikanga	Managment	Brand	Tangible	Non Tangible	Employees	Other	No reasons
Primary Māori	66%	54%	31%	26%	13%	20%	46%	4%	13%
Primary but not Kaupapa Māori	35%	21%	12%	10%	3%	4%	35%	8%	23%
Kaupapa Māori	81%	70%	40%	33%	19%	27%	52%	3%	10%
Ever Māori	32%	26%	14%	13%	8%	10%	23%	3%	51%
Ever Māori Not Primary	15%	11%	6%	6%	5%	5%	11%	3%	69%

Note. As per StatsNZ confidentiality requirements, percentages are generated from non-weighted rounded observations, rounded to 0 decimal places.

As observed in Table 2, only 15% of Ever Māori – Not Primary observations cited ownership as a reason for self-identification, with 69% of observations not citing any reasons for self-identification as a Māori business. These observations are treated as Māori firms in the Chen (2023) study but are not treated as Māori firms in this study.

From this point onwards, this study employs two samples:

- Sample A which utilises weighted responses to BOS survey questions
- Sample B which utilises the BOS responses to assign firm type, and then merges with the Fabling and Maré productivity tables to analyse firm-level productivity.

The samples have slightly different same sizes and composition due to Sample A dropping observations that have negative or zero weights. Sample B utilises observations with zero or negative weights, but drops some observations due to missing data in the productivity tables.

3.3.1 Sample A Construction: External Business Environment Analysis

The following observations were removed from the dataset; entries with NA in the weighting cell, entries with 0 or negative weights and non-useable responses (response code = Q). This results in 1,434 unique firms.

Under the The Australian and New Zealand Standard Industrial Classification (ANZSIC), an individual business entity is assigned to an industry based on its predominant activity. The ANZSIC is a hierarchical classification with four levels, namely Divisions (the broadest level), Subdivisions, Groups and Classes (the finest level). The main purpose of the division classification is to provide a limited number of categories which provide a broad overall picture of the economy and are suitable for the publication of summary tables in official statistics. There are 19 divisions and the division is contained within the first letter of a firm's ANZSIC06 number (Australian Bureau of Statistics, 2013). In the BOS data, the first letter of a firm's stratum code corresponds to the first letter of the firm's ANZSIC06 number. This study, for the purpose of descriptive statistics and the analysis of the external business environment, conditions for innovation and ease of recruitment, uses the first letter of a firm's stratum code to assign the ANZSIC division. It is henceforth referred to as 'industry'.

Descriptive Statistics for Sample A for Barriers appear in Table 3 and Table 4.

Table 3

Descriptive Statistics for Sample A

	Primary Māori	Kaupapa Māori	All
Population	6,591 *(551.4497)*	4,179 *(399.5465)*	302,067 *(4721.737)*
Unique Firms	315	192	11,652
Weighted Mean RME	28.07	25.08	32.55
Median RME	32.25	30.96	36.08

Note. Standard Errors (SE) in brackets and italics. Weighted Mean RME is derived from rounded counts, weighted population (RR3) and weighted total RME (GRR 100) and rounded to 2 decimal places. Median is unweighted and rounded to 2 decimal places.

Table 4

Industry Density, by Firm type (Weighted)

	Primary Māori	Non-Maori	All
Agriculture	14.55%	8.36%	8.47%
Mining	0.38%	0.24%	0.24%
Manufacturing	6.82%	12.19%	12.05%
Electricity, gas, water and waste services	0.38%	0.37%	0.36%
Construction	10.76%	12.63%	12.58%
Wholesale Trade	2.88%	7.45%	7.35%
Retail Trade	3.03%	10.97%	10.79%
Accommodation and food services	11.67%	13.68%	13.64%
Transport, postal and warehousing	4.7%	3.66%	3.67%
Information media and telecommunications	1.36%	0.88%	0.86%
Financial and insurance services	1.06%	1.35%	1.36%
Rental hiring and real estate services	1.14%	2.23%	2.22%
Professional, scientific and technical services	11.06%	10.19%	10.20%
Administrative and support services	5.91%	3.86%	3.91%
Education and training	6.97%	2.13%	2.22%
Health care and social assistance	15.15%	5.89%	6.09%
Arts and recreation services	1.67%	1.08%	1.13%
Other services	0.53%	2.91%	2.88%

Note. Percentages derived from rounded counts (GRR 100) and have been rounded to 2 decimal places.

3.3.2 Sample B Productivity Analysis

To create Sample B, firms identified in the BOS (see section 3.2) are joined with the Fabling & Maré productivity tables for all years where productivity data is available (2002 – 2022). This results in 172,047 observations from 11,358 unique firms, which is a drop-off of approximately 1,728 unique firms[25].

Due to the availability of productivity data (2002 – 2022) exceeding the availability of weights (2015-2021), observations in Sample B are not weighted.

Table 5

Productivity Sample Descriptive Statistics (Non-weighted)

	Primary Māori	Kaupapa Māori	Ever Māori	All
Observations	3,564	2,271	11,097	172,047
Unique Firms	267	159	759	11,358
Mean RME	39.76	35.00	62.62	64.25
Median RME	17.62	12.38	18.46	17.62

Note. RR3 has been applied to the number of Observations and Unique Firms. Mean RME is derived from rounded counts, population (RR3) and total RME (GRR 100) and rounded to 2 decimal places. Median is unweighted and rounded to 2 decimal places.

3.4 Empirical Method

3.4.1 External Business Environment Analysis

The intention of this section is to determine if there are relative differences between Māori and non-Maori firms in the prevalence of barriers to firm performance, specifically in the external business environment, the conditions that support innovation and the ease of recruitment. It will also consider

[25] This is significantly less than the 40% drop off reported by Chen (2023). This is due to new data becoming available in the Fabling and Maré datasets.

if tikanga and Māori management practices have an effect on the prevalence of constraints between Māori firms, for example are Kaupapa Māori firms better or less able to mitigate certain constraints?

Logistic regression or logit models are a special case of a Generalized Linear Model (GLM) (Agresti, 2018). Logit models are flexible in that they can simultaneously accommodate both categorical and continuous explanatory variables (Heeringa, 2017) and are typically preferred over linear probability models for the estimation of binary response variables because fitted probabilities are always between zero and one (Wooldridge, 2020). For these reasons, logistic regression is selected as the preferred methodological technique to examine the relative prevalence of barriers to firm performance and operations.

Many common statistical and econometrics techniques apply the method of maximum likelihood to estimate model parameters and associated standard errors, this method assumes that observations are independent and from a known probability distribution (e.g., binomial, multinomial, Poisson, product multinomial or normal). Observations collected via complex surveys (i.e. sample design other than a simple random sampling) do not conform to these assumptions. Failure to account for complex survey design will lead to an underestimation of the variances of the estimated descriptive statistics and model parameters, meaning that confidence intervals based on these variances will be biased and test statistics will be biased upward, resulting in overstated statistical significance (Heeringa et al., 2017).

Lumley and Scott (2014) report that problems with technical analysis are becoming more common in published papers as more applied researchers (i.e. not statisticians) use the increasing publicly available data collected from complex surveys, but fail to account for data being collected with varying selection probabilities and multi-stage sampling. Iparragirre et al. (2023) provide a comparison of weighted and non-weighted logistic regression models to illustrate the importance of using sampling weights in the estimation of the model parameters.

The BOS sample is stratified on industry and firm size, and observations are weighted to indicate the number of units that each sampled observation represents in the population. To account for these attributes, this study weights firm responses using the *final-weight* value provided in the LBD and clusters standard errors (SE) by firm. It is worth noting that the use of fixed effects models is not uncommon in the broader economic literature but have not been used for the survey analysis component of this study. Fixed effects models are of use when predictor variables of interest change

across time (Allison, 2009), in this study, the variable of interest is firm type which is a permanent characteristic.

The general logistic regression model for a binary response variable Y with X predictor variables takes the following form:

Equation 1

General Logistic Regression Model

$$\text{logit}\mathrm{P}[\mathrm{Y}=1] = \alpha + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_P X_P \tag{1}$$

Where the logit function is defined as:

Equation 2

Logit Function

$$\text{logit}(p) = \log\left(\frac{p}{1-p}\right) \tag{2}$$

The logit of *P [Y = 1]* is also the logarithm of the odds *of Y = 1,* where the odds is defined as:

Equation 3

Logit Odds

$$\frac{P[Y=1]}{P[Y=0]} \tag{3}$$

The parametres of β are the average differences in logit $P[Y=1]$ for a one unit difference in X, and therefore, e^{β} is the odds ratio of Y = 1 for a one unit difference in X (Lumley, 2010).

As outlined at the beginning of this section, the factors in the business environment (see Figure 3) , ease of recruitment (see Figure 4) and the factors that hamper innovation (see Figure 5) are binary variables that equal 1 if a factor in the external business environment is considered 'poor', hampered innovation to a 'high degree' or if a firm experienced 'severe difficulty' hiring labour, and 0 otherwise.

The *I Don't Know* responses have been removed from the business environment analysis, due to there being no NA option which would bias the analysis by increasing the relative number of reponses that did not report *poor* access. For example, if a firm does not employ unskilled labour, or did not recruit

unskilled labour in the past year this firm would likely provide a *I Don't Know* response which would otherwise be treated as not *Poor*. The *Not Applicable* responses were removed from the ease of recruitment analysis.

A note on the number of observations (N). The number of observations differs between regressions as a result of removing *I Don't Know* and *Not Applicable* responses from the analysis. There are also some occurrences of perfect prediction due to the small number of Māori firms in certain combinations of FUAs and industries, in these instances the observations have been dropped from analysis.

This study uses two logit models:

Equation 4

Logit Model Primary Māori

$$Y_i = \beta_1 PrimaryMāori_i + \beta_2 Year_i + \beta_3 LnRME_i + \beta_4 Industry_i + \beta_5 FUA_i + \varepsilon \quad (4)$$

Where *i* = firm i, *PrimaryMāori* is a binary variable that equals 1 when a firm is Primary Māori and 0 otherwise, *Year* is a dummy variable equal to dim_year_key and the base year is 2015, *RME* is a continuous variable equal to a firm's rolling mean employment, Industry is a dummy variable equal a firm's industry and FUA is a dummy variable equal to a firm's FUA and the base FUA is Tāmaki Makaurau/Auckland and ε is the error term.

Equation 5

Logit Model Kaupapa Māori

$$Y_i = \beta_1 PrimaryMāori - notKaupapa_i + \beta_2 kaupapa + \beta_3 Year_i + \beta_4 LnRME_i + \beta_5 Industry_i + \beta_6 FUA_i + \varepsilon \quad (5)$$

Where *i* = firm i, *PrimaryMāori-notKaupapa* is a binary variable that equals 1 when a firm is Primary Māori but not kaupapa and 0 otherwise, *kaupapa* is a binary variable that equals when a firm is a kaupapa Maori firm and 0 otherwise, *Year* is a dummy variable equal to dim_year_key and the base year is 2015, *RME* is a continuous variable equal to a firm's rolling mean employment, Industry is a dummy variable equal a firm's industry and FUA is a dummy variable equal to a firm's FUA and the base FUA is Tāmaki Makaurau/Auckland and ε is the error term.

3.4.2 Productivity Analysis

The intention of this analysis is to determine if there are relative differences in MFP[26] between firm types.

This is represented in the general MFP equation below:

Equation 6

General MFP Equation

$$Y_{it} = A_{it} * \mathcal{F}_{it}(Inputs_{it}) \tag{6}$$

Where *i* refers to firm *i* and time *t, Y* refers to a firm's total output and *inputs* is a vector containing a firm's total inputs including Labour (L), Capital (K) and Intermeditaries (M). The function $\mathcal{F}(*)$ captures technology used by a firm and A_{it} captures MFP.

It is assumed that $\mathcal{F}(*)$ is stable over time, and constant within a given industry (*j)* so that $\mathcal{F}_j = \mathcal{F}_{it}$. In this sense, MFP is estimated relative to an industry-specific reference technology, for example, that a firm with high MFP produces more output than other firms in the *same* industry given the inputs used for production.

This study will utilise a two-step approach to estimate the effect of firm type on MFP. In the first stage a general production function is estimated to get an estimate of MFP and in the second stage, MFP is regressed on the variable of interest (firm type) along with controls.

Equation 7

First stage

$$Y_{it} = \alpha_1 + \mathcal{F}_{it}(L, K, M_{,it}; \beta) + e \tag{7}$$

Where Y_{it} equals output for firm *i* at time *t*, α_1 is an intercept and *e* is the residual.

[26] As discussed earlier, MFP describes the efficiency in which a firm bundles together inputs to create outputs.

Equation 8

Second stage

$$\hat{e}_{it} = \alpha_2 + \gamma_2 \mathrm{X}_{it} + \mathrm{Controls} + u \tag{8}$$

Where $\hat{e}$ is estimated MFP, α_2 is the intercept, X is the augmenting variable, Controls is a vector for the control variables and *u* is the residual.

There is an existing literature on production function analysis and model selection (see Greene et al., 2016; Griffin et al., 1987), and in the Aotearoa New Zealand context Fabling and Maré (2015) who consider model selection with specific regard to data in the LBD. Fabling and Maré (2015) find that dispersion of estimated MFP is larger when estimated from a value-added production function compared with estimation via a gross output production function, and that dispersion of MFP from translog specifications is smaller than that from Cobb-Douglas specifications (particularly for gross output production functions because translog specification captures interactions between intermediates and other inputs which would otherwise be picked up in the residual). For these reasons, this study has selected to estimate MFP from a translog gross output production function with firm fixed effects.

Equation 9

General Translog Gross Output Production Function

$$\ln \mathrm{Y} = \beta_0 + \sum_{i=1}^{r} \beta_i \ln x_i + X_1 + \frac{1}{2}\sum_{i=1}^{r} \beta_{ii} (\ln x_i)^2 + \frac{1}{2}\sum_{i=1}^{r} \sum_{j=1, i \neq j}^{r} \beta_{ii} \ln x_i \ln x_j \tag{9}$$

Translog with firm FE (year x ind controls), common producton function across industries.

Equation 10

Translog Gross Output Production Function with Firm Fixed Effects (FE)

$$y_{it} = \beta_j^m m_{it} + \beta_j^l l_{it} + \beta_j^k k_{it} + \beta_j^{mm} m_{it}^2 + \beta_j^{ll} l_{it}^2 + \beta_j^{kk} k_{it}^2 + \beta_j^{ml} m_{it} l_{it} + \beta_j^{mk} m_{it} k_{it} + \beta_j^{lk} l_{it} k_{it} + \eta_i + e_{jt}$$

Where η_i is the firm fixed effect and e_{jt} is the residual. All lowercase variables denote the natural logarithms of the corresponding uppercase variables, representing raw, level values (e.g., l is the logged value of L).

(10)

The *e* is then demeaned to zero, with values below zero indicating below average MFP within a given industry and values above zero indicating above average MFP within a given industry. The residual e is then regressed on the explanatory variable of interest (in this case firm type) along with control variables (as per equation 8) using Ordinary Least Squares (OLS).

Equation 11

Estimated MFP for Primary Māori Firms

$$mfp_{it} = \beta_1 PrimaryMāori_i + \beta_2 Year_i + \beta_3 Industry_i + \beta_4 FUA_i + u \quad (11)$$

Where i = firm i, PrimaryMāori is a dummy variable that equals 1 when a firm self-identified as a Māori business at least 50% of the time and participated in at least 2 BOS waves, Year is a dummy variable equal to dim_year_key, RME is a continuous variable equal to a firm's rolling mean employment, Industry is a dummy variable equal a firm's industry and FUA is a dummy variable equal to a firm's FUA and u is the error term.

Equation 12

Estimated MFP for Primary Māori non-Kaupapa and Kaupapa Maori firms

$$mfp_{it} = \beta_1 PrimaryMāori - notKaupapa_i + \beta_2 kaupapa + \beta_3 Year_i + \beta_4 Industry_i + \beta_5 FUA_i + u \quad (12)$$

PrimaryMāori-notKaupapa is a binary variable that equals 1 when a firm is Primary Māori but not kaupapa and 0 otherwise, *kaupapa* is a binary variable that equals when a firm is a kaupapa Maori firm and 0 otherwise.

3.4.3 Robustness

There are some occurrences of perfect prediction in the logit regressions analysing barriers in the external environment and factors that hamper innovation, in these instances observations have been

dropped from analysis. This occurs due to the small number of Māori firms in certain combinations of FUAs and industries. For robustness, this study used OLS to analyse barriers in the external environment and factors that hamper innovation to confirm the direction and statistical significance of the coefficient of interest as perfect prediction is not encountered in OLS regression. These results are in Appendix 3.

As a robustness check for the assignment of firm type and matched productivity data, this study reproduced the analysis of Chen (2023) using the same time period and defintions of a Māori firm. This achieved comparable results.

Chapter 4 Results

This chapter presents results from the regression models described in Chapter 3: Data & Method. The first section presents results from the analysis of barriers to firm performance and innovation activity, namely to determine if there are relative differences between Māori and non-Māori firms. The second section presents results for the MFP regression models, it seeks to determine if Māori firms in the population of interest have different levels of MFP when compared to non-Māori firms.

4.1 Barriers

Tables 6 through 12 display regression results from equations 4 and 5. The results report the likelihood that a firm will describe their experience of a specific feature in the external business environment as bad. A positive and statistically significant coefficient on the firm-type variable (Primary Māori / Kaupapa Māori / Primary-not-kaupapa) indicates that the firm-type is more likely than the base group (non-Māori) to rate the factor as bad.

Table 6 displays the regression results of the relative experience of transport infrastructure. Of particular interest here is that at the 5% significance level, Māori firms are more likely to perceive transport infrastructure as bad in their local environment. This experience is driven by the experience of Kaupapa Māori firms, where at the sub-group level, Kaupapa Māori firms are more likely to rate transport infrastructure as bad at the 1% significance level whereas there is no statistically significant effect for Primary Māori – not Kaupapa firms. The effect on Kaupapa Māori firms persists with controls for industry, location and firm size. In addition, the coefficient on the firm size variable (*LnRME*) is positive and statistically significant at the 1% level, this indicates that firms are more likely to rate transport infrastructure as bad with a greater number of employees.

Table 6

Results for Transport Infrastructure

Variables	**Transport Infrastructure**	**Transport Infrastructure**	**Transport Infrastructure**	**Transport Infrastructure**	**Transport Infrastructure**
Primary Māori	0.379**	0.461**	0.450**	0.449**	
	(0.179)	*(0.180)*	*(0.184)*	*(0.184)*	
Kaupapa Māori					0.573***
					(0.183)
Primary Māori - not Kaupapa					0.23
					(0.4)
Year	✓	✓	✓	✓	✓
Industry		✓	✓	✓	✓
Location			✓	✓	✓
Ln(RME)				0.233***	0.233***
				(0.026)	*(0.026)*
Constant	-1.260***	-0.789***	-1.099***	-1.027***	-1.185***
	(0.057)	*(0.068)*	*(0.084)*	*(0.121)*	*(0.112)*
Observations	44,331	44,331	44,331	44,331	44,331
Log Likelihood	-165,000	-154,000	-152,000	-152,000	-152,000
Pseudo R^2	0.002	0.067	0.079	0.079	0.079

Note. RR3 has been applied to observations as per StatsNZ confidentiality requirements. Clustered standard errors in parenthesis. *10%, **5%, ***1%.

As can be observed in Table 7, at the 5% significance level Māori firms are more likely to rate ICT infrastructure as bad until control variables are added to the model (at which point significance disappears). In other words, Māori firms are more likely to rate ICT infrastructure as bad, however this experience can be explained by the industry and locations in which Māori firms.

Table 7

Results for ICT Infrastructure

Variables	**ICT Infrastructure**	**ICT Infrastructure**	**ICT Infrastructure**	**ICT Infrastructure**	**ICT Infrastructure**
Primary Māori	0.547**	0.266	0.272	0.275	
	(0.238)	*(0.203)*	*(0.215)*	*(0.214)*	
Kaupapa Māori					0.201
					(-0.255)
Primary Māori - not Kaupapa					0.39
					(-0.337)
Year	✓	✓	✓	✓	✓
Industry		✓	✓	✓	✓
Location			✓	✓	✓
Ln(RME)				-0.05	-0.049
				(0.033)	(0.033)
Constant	-1.808***	-2.397***	-2.424***	-2.275***	-2.276***
	(0.070)	*(0.103)*	*(0.133)*	*(0.171)*	(0.171)
Observations	45,015	45,015	45,015	45,015	45,015
Log Likelihood	-108,000	-94,000	-92,500	-92,500	-92,500
Pseudo R^2	0.002	0.131	0.145	0.145	0.145

Note. RR3 has been applied to observations as per StatsNZ confidentiality requirements. Clustered standard errors in parenthesis. *10%, **5%, ***1%.

The results for the analysis of water and waste infrastructure in Table 8 indicate that Māori firms are more likely to rate water and waste infrastructure as bad at the 5% significance level, and the effect persists when controls for industry, location and firm size are added to the equation. Water and waste infrastructure includes the provision of flooding prevention measures, such as stopbanks and maintenance of rivers. As with transport infrastructure, this effect appears to be driven by the experience of Kaupapa Māori firms, as the coefficient on Primary Māori-not Kaupapa becomes insignificant when Primary Māori firms are sorted into the Kaupapa and non-Kaupapa sub-groups.

Table 8

Results for Water and Waste Infrastructure

Variables	**Water & Waste Infrastructure**	**Water & Waste Infrastructure**	**Water & Waste Infrastructure**	**Water & Waste Infrastructure**	**Water & Waste Infrastructure**
Primary Māori	0.662***	0.552**	0.554**	0.554**	
	(0.240)	*(0.219)*	*(0.217)*	*(0.217)*	
Kaupapa Māori					0.532**
					(0.26)
Primary Māori - not Kaupapa					0.587
					(0.359)
Year	✓	✓	✓	✓	✓
Industry		✓	✓	✓	✓
Location			✓	✓	✓
Ln(RME)				*-0.002*	-0.002
				(0.033)	(0.033)
Constant	-2.527***	-2.781***	-2.822***	-2.815***	-2.816***
	(0.101)	*(0.121)*	*(0.144)*	*(0.183)*	(0.183)
Observations	43,284	43,212	43,212	43,212	43,212
Log Likelihood	-78,900	-74,800	-74,500	-74,500	-74,500
Pseudo R^2	0.011	0.062	0.065	0.065	0.065

Note. RR3 has been applied to observations as per StatsNZ confidentiality requirements. Clustered standard errors in parenthesis. *10%, **5%, ***1%.

The results presented in Tables 9 through 11 report that Māori firms are no more likely than non-Māori firms to rate local body planning and regulation, the skilled labour market and business networks as bad. This is true for both Kaupapa Māori and non-Kaupapa Māori firms.

The coefficient on the firm size variable is positive and statistically significant at the 10% level for the skilled labour market regression (Table 10) which indicates that difficulty accessing skilled labour increases as firm size increases (for all firm types). In comparison, larger firms experience less difficulty in navigating local body planning and regulation (Table 9), and business networks (as Table 11) as

demonstrated by the negative coefficient on the firm size variable which is statistically significant at the 10% level for navigating local body planning and regulation and 1% for business networks.

Table 9

Results for Local Body Planning and Regulation

Variables	**Local Body Planning & Reg**	**Local Body Planning & Reg**	**Local Body Planning & Reg**	**Local Body Planning & Reg**	**Local Body Planning & Reg**
Primary Māori	-0.018 *(0.167)*	-0.097 *(0.168)*	-0.066 *(0.168)*	-0.065 *(0.168)*	
Kaupapa Māori					0.039 *(0.223)*
Primary Māori - not Kaupapa					-0.261 *(0.22)*
Year	✓	✓	✓	✓	✓
Industry		✓	✓	✓	✓
Location			✓	✓	✓
Ln(RME)				-0.040* *(0.024)*	-0.040* (0.024)
Constant	-1.135*** *(0.061)*	-1.124*** *(0.076)*	-1.150*** *(0.091)*	-1.027*** *(0.121)*	-1.026*** (0.121)
Observations	38,778	38,778	38,778	38,778	38,778
Log Likelihood	-140,000	-136,000	-136,000	-136,000	-136,000
Pseudo R^2	0.005	0.032	0.036	0.037	0.037

Note. RR3 has been applied to observations as per StatsNZ confidentiality requirements. Clustered standard errors in parenthesis. *10%, **5%, ***1%.

Table 10

Results for Skilled Labour Market

Variables	**Skilled Labour Market**	**Skilled Labour Market**	**Skilled Labour Market**	**Skilled Labour Market**	**Skilled Labour Market**
Primary Māori	-0.002	-0.111	-0.024	-0.026	
	(0.182)	*(0.162)*	*(0.147)*	*(0.148)*	
Kaupapa Māori					-0.031
					(0.179)
Primary Māori - not Kaupapa					0.018
					(0.25)
Year	✓	✓	✓	✓	✓
Industry		✓	✓	✓	✓
Location			✓	✓	✓
Ln(RME)				0.041*	0.041*
				(0.022)	*(0.022)*
Constant	-1.115***	-1.365***	-1.149***	-1.273***	-1.273***
	(0.058)	*(0.073)*	*(0.085)*	*(0.114)*	(0.114)
Observations	42,999	42,999	42,999	42,999	42,999
Log Likelihood	-171,000	-165,000	-160,000	-160,000	-160,000
Pseudo R^2	0.013	0.048	0.077	0.077	0.077

Note. RR3 has been applied to observations as per StatsNZ confidentiality requirements. Clustered standard errors in parenthesis. *10%, **5%, ***1%.

Table 11

Results for Business Networks

Variables	**Business Networks**	**Business Networks**	**Business Networks**	**Business Networks**	**Business Networks**
Primary Māori	-0.176 *(0.293)*	-0.416 *(0.309)*	-0.404 *(0.385)*	-0.402 *(0.398)*	
Kaupapa Māori					-0.191 *(0.362)*
Primary Māori - not Kaupapa					-0.693 *(0.756)*
Year	✓	✓	✓	✓	✓
Industry		✓	✓	✓	✓
Location			✓	✓	✓
Ln(RME)				-0.245*** *(0.061)*	-0.246*** (0.061)
Constant	-3.193*** *(0.147)*	-3.403*** *(0.187)*	-3.656*** *(0.220)*	-2.927*** *(0.271)*	-2.926*** (0.271)
Observations	40,263	40,263	40,263	40,263	40,263
Log Likelihood	-46,200	-43,600	-41,800	-41,600	-41,600
Pseudo R^2	0.002	0.057	0.096	0.1	0.1

Note. RR3 has been applied to observations as per StatsNZ confidentiality requirements. Clustered standard errors in parenthesis. *10%, **5%, ***1%.

Table 12 shows that in comparison with non-Māori firms, Māori firms are less likely to rate the unskilled labour market as bad, and this effect is persistent with controls for industry, location and firm size at the 5% statistical significance level.

Table 12

Results for Unskilled Labour Market

Variables	**Unskilled Labour Market**	**Unskilled Labour Market**	**Unskilled Labour Market**	**Unskilled Labour Market**	**Unskilled Labour Market**
Primary Māori	-0.316* *(0.168)*	-0.453** *(0.190)*	-0.397** *(0.201)*	-0.398** *(0.201)*	
Kaupapa Māori					-0.16 *(0.215)*
Primary Māori - not Kaupapa					-0.850** *(0.37)*
Year	✓	✓	✓	✓	✓
Industry		✓	✓	✓	✓
Location			✓	✓	✓
Ln(RME)				0.033 *(0.026)*	0.032 *(0.026)*
Constant	-2.113*** *(0.087)*	-2.241*** *(0.096)*	-2.089*** *(0.107)*	-2.191*** *(0.138)*	-2.189*** (0.138)
Observations	38,247	38,247	38,247	38,247	38,247
Log Likelihood	-113,000	-109,000	-107,000	-107,000	-107,000
Pseudo R^2	0.027	0.058	0.079	0.079	0.079

Note. RR3 has been applied to observations as per StatsNZ confidentiality requirements. Clustered standard errors in parenthesis. *10%, **5%, ***1%.

Turning now to the analysis of factors that hamper innovation to a high degree. Tables 13 through 20 display the results from equations 4 and 5 that compare the likelihood that a firm will identify a specific factor as hampering their ability to innovate to a 'high' degree. As per the prior analysis, a positive and statistically significant coefficient on the firm-type variable (e.g., Primary Māori / Kaupapa Māori / Primary Māori - not kaupapa) indicates that the firm type is more likely than the base group (i.e. non-Māori) to rate the factor as hampering innovation to a 'high' degree.

Table 13 shows that Māori firms are more likely than non-Māori firms to report that costs hamper innovation to a high degree. The effect is significant at the 1% level, and persists when controls for industry, location and firm size are included in the equation and for Kaupapa Māori and Primary Māori - not kaupapa firms alike. Of interest is that the coefficient on the firm size control variable is negative

and statistically significant at the 5% level, this indicates that as firms become larger (by number of employees) they are less likely to cite costs as hampering innovation to a high degree.

Table 13

Results for Costs Hampering Innovation

Variables	**Costs**	**Costs**	**Costs**	**Costs**	**Costs**
Primary Māori	0.586***	0.630***	0.627***	0.631***	
	(0.178)	*(0.183)*	*(0.188)*	*(0.187)*	
Kaupapa Māori					0.638***
					(0.247)
Primary Māori - not Kaupapa					0.620**
					(0.267)
Year	✓	✓	✓	✓	✓
Location		✓	✓	✓	✓
Industry			✓	✓	✓
Ln(RME)				-0.067**	-0.067**
				(0.027)	*(0.027)*
Constant	-1.564***	-1.493***	-1.251***	-1.050***	-1.050***
	(0.063)	*(0.078)*	*(0.091)*	*(0.125)*	*(0.125)*
Observations	26,316	26,316	26,316	26,316	26,316
Log Likelihood	-84,000	-82,800	-82,300	-82,300	-82,300
Pseudo R^2	0.003	0.017	0.023	0.024	0.024

Note. RR3 has been applied to observations as per StatsNZ confidentiality requirements. Clustered standard errors in parenthesis. *10%, **5%, ***1%.

Table 14 shows that Māori firms are more likely to cite lack of management resources as hampering innovation to a high degree only once controls for industry and firm size are added to the equation. This effect appears to be due to the experience of Kaupapa Māori firms, as the coefficient on Kaupapa Māori remains positive and statistically significant at the 5% level when Primary Māori firms are analysed at the sub-group level, whereas the effect on Primary Māori – not Kaupapa firms becomes insignificant.

Table 14

Results for Lack of Management Resources Hampering Innovation

Variables	**Lack of management resources**	**Lack of management resources**	**Lack of management resources**	**Lack of management resources**	**Lack of management resources**
Primary Māori	0.291 *(0.182)*	0.306 *(0.192)*	0.348* *(0.189)*	0.354* *(0.189)*	
Kaupapa Māori					0.488** *(0.234)*
Primary Māori - not Kaupapa					0.107 *(0.31)*
Year	✓	✓	✓	✓	✓
Location		✓	✓	✓	✓
Industry			✓	✓	✓
Ln(RME)				-0.114*** *(0.030)*	-0.114*** *(0.030)*
Constant	-1.691*** *(0.068)*	-1.633*** *(0.086)*	-1.544*** *(0.097)*	-1.206*** *(0.136)*	-1.206*** *(0.136)*
Observations	26,319	26,244	26,244	26,244	26,244
Log Likelihood	-79,700	-78,600	-78,000	-77,900	-77,900
Pseudo R^2	0.001	0.014	0.021	0.022	0.023

Note. RR3 has been applied to observations as per StatsNZ confidentiality requirements. Clustered standard errors in parenthesis. *10%, **5%, ***1%.

As presented in Table 15, Māori firms are more likely to describe government regulation as hampering innovation to a high degree when controlling industry and location, however statistical significance disappears once the control for firm size is added to the equation. This effect appears driven by the Primary Māori - not Kaupapa firms, as the coefficient on Kaupapa Māori firms is not statistically significant (interestingly however, it is negative). The coefficient on the firm size control variable is negative and statistically significant at the 1% level, this is consistent with the results presented in Table 9 that larger firms appear better able to navigate government (local or otherwise) bureaucracy.

Table 15

Results for Government Regulation Hampering Innovation

Variables	**Government Regulation**	**Government Regulation**	**Government Regulation**	**Government Regulation**	**Government Regulation**
Primary Māori	0.291 *(0.182)*	0.306 *(0.192)*	0.348* *(0.189)*	0.192 *(0.255)*	
Kaupapa Māori					-0.233 *(0.291)*
Primary Māori - not Kaupapa					0.680* *(0.362)*
Year	✓	✓	✓	✓	✓
Location		✓	✓	✓	✓
Industry			✓	✓	✓
Ln(RME)				-0.012 *(0.038)*	-0.011 *(0.038)*
Constant	-2.685*** *(0.096)*	-2.770*** *(0.114)*	-3.033*** *(0.140)*	-2.997*** *(0.182)*	-3.000*** *(0.182)*
Observations	26,316	26,316	26,316	26,316	26,316
Log Likelihood	-47,600	-46,500	-45,700	-45,700	-45,700
Pseudo R^2	0.004	0.028	0.044	0.044	0.045

Note. RR3 has been applied to observations as per StatsNZ confidentiality requirements. Clustered standard errors in parenthesis. *10%, **5%, ***1%.

The results in Table 16 show that Māori firms are less likely than non-Māori firms to indicate that lack of information hampers their ability to innovate to a high degree, at the 5% statistical significance level. The effect persists when controls for industry, location and firm size are included in the equation.

Table 16

Results for Lack of Information Hampering Innovation

Variables	**Lack of information**	**Lack of information**	**Lack of information**	**Lack of information**	**Lack of information**
Primary Māori	-0.668**	-0.743**	-0.680*	-0.664*	
	(0.304)	*(0.337)*	*(0.361)*	*(0.361)*	
Kaupapa Māori					-0.342
					(0.433)
Primary Māori - not Kaupapa					-1.773***
					(0.639)
Year	✓	✓	✓	✓	✓
Location		✓	✓	✓	✓
Industry			✓	✓	✓
Ln(RME)				-0.230***	-0.231***
				(0.065)	*(0.065)*
Constant	-1.564***	-1.493***	-1.251***	-2.579***	-3.199***
	(0.063)	*(0.078)*	*(0.091)*	*(0.265)*	*(0.165)*
Observations	26,319	25,986	25,986	25,986	25,986
Log Likelihood	-28,000	-27,200	-26,900	-26,800	-26,800
Pseudo R^2	0.002	0.028	0.038	0.042	0.042

Note. RR3 has been applied to observations as per StatsNZ confidentiality requirements. Clustered standard errors in parenthesis. *10%, **5%, ***1%.

Tables 17 through 20 show that Māori firms are no more likely than non-Māori firms to cite lack of marketing, lack of cooperation, access to IP and lack of appropriate personnel as hampering innovation to a high degree. In the case of lack of IP, Māori firms are less likely to cite lack of access to IP as hampering innovation before controls for industry, location and firm size enter the equation (see Table 21). The coefficient on the firm size variable is negative and statistically significant at the 1% level for lack of marketing (Table 17), lack of cooperation (Table 18) and access to IP (Table 19). This indicates that as firms grow, they are less likely to cite these factors as hampering innovation to a high degree.

Table 17

Results for Lack of Marketing Hampering Innovation

Variables	**Lack of marketing**	**Lack of marketing**	**Lack of marketing**	**Lack of marketing**	**Lack of marketing**

Primary Māori	-0.273 *(0.285)*	-0.263 *(0.311)*	-0.23 *(0.331)*	0.21 *(0.148)*	
Kaupapa Māori					-0.088 *(0.407)*
Primary Māori - not Kaupapa					-0.51 *(0.553)*
Year	✓	✓	✓	✓	✓
Location		✓	✓	✓	✓
Industry			✓	✓	✓
Ln(RME)				-0.228*** *(0.054)*	-0.229*** *(0.054)*
Constant	-2.993*** *(0.114)*	-2.880*** *(0.138)*	-2.762*** *(0.156)*	-2.099*** *(0.224)*	-2.098*** *(0.224)*
Observations	26,316	26,061	26,061	26,061	26,061
Log Likelihood	-35,600	-34,800	-34,500	-34,400	-34,400
Pseudo R^2	0.001	0.02	0.03	0.034	0.034

Note. RR3 has been applied to observations as per StatsNZ confidentiality requirements. Clustered standard errors in parenthesis. *10%, **5%, ***1%.

Table 18

Results for Lack of Cooperation Hampering Innovation

Variables	**Lack of cooperation**	**Lack of cooperation**	**Lack of cooperation**	**Lack of cooperation**	**Lack of cooperation**
Primary Māori	-0.273 *(0.285)*	-0.263 *(0.311)*	-0.23 *(0.331)*	0.317 *(0.504)*	
Kaupapa Māori					0.208 *(0.433)*
Primary Māori - not Kaupapa					0.489 *(1.001)*
Year	✓	✓	✓	✓	✓
Location		✓	✓	✓	✓
Industry			✓	✓	✓
Ln(RME)				-0.196*** *(0.072)*	-0.196*** *(0.072)*
Constant	-3.921*** *(0.154)*	-3.656*** *(0.183)*	-3.564*** *(0.222)*	-2.998*** *(0.305)*	-2.999*** *(0.304)*
Observations	26,319	25,791	25,791	25,791	25,791
Log Likelihood	-35,600	-34,800	-34,500	-34,400	-34,400
Pseudo R^2	0.001	0.02	0.03	0.034	0.034

Note. RR3 has been applied to observations as per StatsNZ confidentiality requirements. Clustered standard errors in parenthesis. *10%, **5%, ***1%.

Table 19

Results for Lack of Access to IP Hampering Innovation

Variables	**Lack of access to IP**	**Lack of access to IP**	**Lack of access to IP**	**Lack of access to IP**	**Lack of access to IP**
Primary Māori	-0.829* *(0.473)*	-0.721 *(0.481)*	-0.706 *(0.481)*	-0.696 *(0.481)*	
Kaupapa Māori					-0.481 *(0.53)*
Primary Māori - not Kaupapa					-1.133 *(1.028)*
Year	✓	✓	✓	✓	✓
Location		✓	✓	✓	✓
Industry			✓	✓	✓
Ln(RME)				-0.244*** *(0.085)*	-0.244*** *(0.085)*
Constant	-4.265*** *(0.198)*	-4.035*** *(0.216)*	-4.198*** *(0.276)*	-3.500*** *(0.365)*	-2.999*** *(0.304)*
Observations	26,319	25,209	25,209	25,209	25,209
Log Likelihood	-16,100	-15,500	-15,300	-15,300	-15,300
Pseudo R^2	0.006	0.03	0.044	0.047	0.048

Note. RR3 has been applied to observations as per StatsNZ confidentiality requirements. Clustered standard errors in parenthesis. *10%, **5%, ***1%.

Table 20

Results for Lack of Appropriate Personnel Hampering Innovation

Variables	**Lack of appropriate personnel**	**Lack of appropriate personnel**	**Lack of appropriate personnel**	**Lack of appropriate personnel**	**Lack of appropriate personnel**
Primary Māori	0.172	0.197	0.233	0.235	
	(0.230)	*(0.232)*	*(0.233)*	*(0.233)*	
Kaupapa Māori					0.198
					(0.264)
Primary Māori - not Kaupapa					0.295
					(0.418)
Year	✓	✓	✓	✓	✓
Location		✓	✓	✓	✓
Industry			✓	✓	✓
Ln(RME)				-0.033	-0.033
				(0.032)	*(0.032)*
Constant	-2.336***	-2.270***	-2.262***	-2.165***	-2.165***
	(0.083)	*(0.094)*	*(0.111)*	*(0.150)*	*(0.150)*
Observations	26,319	26,247	26,247	26,247	26,247
Log Likelihood	-62,800	-61,900	-61,600	-61,600	-61,600
Pseudo R^2	0.006	0.018	0.023	0.024	0.024

Note. RR3 has been applied to observations as per StatsNZ confidentiality requirements. Clustered standard errors in parenthesis. *10%, **5%, ***1%.

The following tables display the regression results from equations 4 and 5 that compare the likelihood that a firm experiences 'severe difficulty' recruiting workers from a specific occupational group. A positive and statistically significant coefficient on the firm-type variable (Primary Māori / Kaupapa Māori / Primary-not-kaupapa) indicates that the firm type is more likely than the base group (non-Māori) to experience 'severe difficulty' in recruitment for the specified occupational group.

The results show that Māori firms are no more likely to experience severe difficulty when recruiting managers and professionals (Table 21) or technicians (Table 22). Māori firms are less likely to experience severe difficulty recruiting tradespeople at the 5% significance level (Table 23) and workers from the 'other' occupational group at the 10% level (Table 24). The divergent experience of Māori firms in the recruitment of workers from both the tradespeople and the other occupational groups appears to be driven by Kaupapa Māori firms, who are less likely to report severe difficulty recruiting workers from these occupational groups at the 5% significance level.

Table 21

Results for Recruitment of Managers and Professionals

Variables	**Managers**	**Managers**	**Managers**	**Managers**	**Managers**
Primary Māori	-0.052 *(0.212)*	-0.06 *(0.214)*	-0.117 *(0.237)*	-0.13 *(0.235)*	
Kaupapa Māori					-0.122 *(0.304)*
Primary Māori - not Kaupapa					-0.141 *(0.365)*
Year	✓	✓	✓	✓	✓
Location		✓	✓	✓	✓
Industry			✓	✓	✓
Ln(RME)				0.233*** *(0.026)*	0.233*** *(0.026)*
Constant	-2.484*** *(0.090)*	-2.330*** *(0.104)*	-2.581*** *(0.123)*	-3.304*** *(0.154)*	-3.304*** *(0.154)*
Observations	46,320	46,320	46,320	46,320	46,320
Log Likelihood	-114,000	-112,000	-107,000	-107,000	-107,000
Pseudo R^2	0.017	0.034	0.076	0.082	0.082

Note. RR3 has been applied to observations as per StatsNZ confidentiality requirements. Clustered standard errors in parenthesis. *10%, **5%, ***1%.

Table 22

Results for Recruitment of Technicians

Variables	**Technicians**	**Technicians**	**Technicians**	**Technicians**	**Technicians**
Primary Māori	-0.059	-0.018	0.049	0.045	
	(0.190)	*(0.195)*	*(0.197)*	*(0.197)*	
Kaupapa Māori					-0.122
					(0.304)
Primary Māori - not Kaupapa					-0.141
					(0.365)
Year	✓	✓	✓	✓	✓
Location		✓	✓	✓	✓
Industry			✓	✓	✓
Ln(RME)				0.210***	0.210***
				(0.026)	*(0.026)*
Constant	-2.542***	-2.378***	-2.214***	-2.858***	-2.859***
	(0.089)	*(0.107)*	*(0.117)*	*(0.149)*	*(0.149)*
Observations	46,263	46,263	46,263	46,263	46,263
Log Likelihood	-101,000	-99,800	-98,100	-97,600	-97,600
Pseudo R^2	0.015	0.028	0.044	0.049	0.049

Note. RR3 has been applied to observations as per StatsNZ confidentiality requirements. Clustered standard errors in parenthesis. *10%, **5%, ***1%.

Table 23

Results for Recruitment of Tradespeople

Variables	**Tradespeople**	**Tradespeople**	**Tradespeople**	**Tradespeople**	**Tradespeople**
Primary Māori	-0.568***	-0.565***	-0.382**	-0.393**	
	(0.171)	*(0.176)*	*(0.189)*	*(0.186)*	
Kaupapa Māori					-0.464**
					(0.197)
Primary Māori - not Kaupapa					-0.291
					(0.347)
Year	✓	✓	✓	✓	✓
Location		✓	✓	✓	✓
Industry			✓	✓	✓
Ln(RME)				0.194***	0.194***
				(0.025)	*(0.025)*
Constant	-1.899***	-1.931***	-1.440***	-2.030***	-2.030***
	(0.075)	*(0.092)*	*(0.102)*	*(0.133)*	*(0.133)*
Observations	46,320	46,311	46,311	46,311	46,311
Log Likelihood	-138,000	-137,000	-124,000	-123,000	-123,000
Pseudo R^2	0.011	0.023	0.116	0.12	0.12

Note. RR3 has been applied to observations as per StatsNZ confidentiality requirements. Clustered standard errors in parenthesis. *10%, **5%, ***1%.

Table 24

Results for Recruitment of Other

Variables	**Other**	**Other**	**Other**	**Other**	**Other**
Primary Māori	-0.245 *(0.181)*	-0.346* *(0.191)*	-0.352* *(0.213)*	-0.357* *(0.211)*	
Kaupapa Māori					-0.489** *(0.242)*
Primary Māori - not Kaupapa					-0.172 *(0.372)*
Year	✓	✓	✓	✓	✓
Location		✓	✓	✓	✓
Industry			✓	✓	✓
Ln(RME)				0.123*** *(0.027)*	0.123*** *(0.027)*
Constant	-2.946*** *(0.106)*	-2.901*** *(0.115)*	-2.936*** *(0.130)*	-3.311*** *(0.157)*	-3.311*** *(0.157)*
Observations	46,317	46,317	46,317	46,317	46,317
Log Likelihood	-98,000	-95,600	-92,000	-91,800	-91,800
Pseudo R^2	0.036	0.059	0.096	0.097	0.097

Note. RR3 has been applied to observations as per StatsNZ confidentiality requirements. Clustered standard errors in parenthesis. *10%, **5%, ***1%.

4.2 Productivity

Table 25 reports results from equations 11 and 12, which compare MFP between Māori and non-Māori. The coefficient on firm-type is negative, however it is not statistically significant meaning that these results do not provide evidence of a relative gap in MFP between Māori and non-Māori firms. This is consistent with and without the use of controls in the regression.

Table 25

Results for MFP by Firm-type with Controls.

Variables	**MFP**	**MFP**	**MFP**	**MFP**
Primary Māori	-0.056	-0.05	-0.096	
	(0.074)	*(0.071)*	*(0.069)*	
Kaupapa Māori				-0.055
				(0.077)
Year	✓	✓	✓	✓
Location		✓	✓	✓
Industry			✓	✓
Constant	-0.219***	-0.251***	-0.388***	-0.388***
	(0.012)	*(0.015)*	*(0.040)*	*(0.040)*
Observations	172,047	172,047	172,047	172,047
R^2	0	0.006	0.084	0.084

Note. RR3 has been applied to observations as per StatsNZ confidentiality requirements. Clustered standard errors in parenthesis. *10%, **5%, ***1%.

Chapter 5 Discussion

5.1 Discussion

The results of this study show that relative to non-Māori firms, Māori firms are more likely to face barriers in the external business environment and experience factors that hamper innovation to a high degree. However, the results of this study do not suggest that Māori firms in the population of interest have lower MFP compared with non-Māori firms. This is somewhat in contrast to existing research (Chen, 2023; Fabling & Maré, 2024) that has produced evidence of a productivity gap between Māori and non-Māori firms. Of note is that Māori firms in this study appear to have fewer constraints in the labour market, specifically in the recruitment of workers from the 'tradespeople' and 'other' occupational groups.

This section will first discuss the analysis of the external business environment and factors hampering innovation, followed by the recruitment experience of Māori firms relative to non-Māori firms. It will then turn to a discussion of the MFP analysis before concluding with a consideration of the implications of these results on the literature and to policy makers.

As presented in Tables 8 through 10, Māori firms are more likely to rate access to transport, ICT and water and waste infrastructure as bad and in the case of transport infrastructure and water and waste infrastructure, these differences persist when controlling for industry, location and firm size. In other words, relative differences in access to transport infrastructure and water and waste infrastructure cannot be explained by the locations or industries in which Māori firms operate, and this suggests that Māori firms have inequitable access to stocks of transport and water and waste infrastructure.

These inequities are likely explained by the quality and location of the whenua on which Māori firms operate. Historical events and government policies that have led to intra-regional variation in land quality are described in Chapter 2. For example, Thom (2021) establishes that the confiscation of land during the New Zealand Wars[27] resulted in the disproportionate loss of prime land (e.g., easily accessible, flat fertile land) from Māori control. As a result, the small land holdings retained by Māori consist of a disproportionate amount of poor-quality whenua that is harder to access. The initial design and construction of infrastructure networks are also likely to be a contributing factor. Marr (1997), in a report prepared for the Waitangi Tribunal found that Māori land which was compulsorily acquired for public works (including for the establishment the road and rail networks) was largely done so for

[27] Briefly discussed in Chapter 2, however please see Belich (2015) for a comprehensive discussion.

the benefit of Pākehā settlements and not iwi or hapū Māori. That is, these infrastructure networks were designed to be inequitable, and unless these inequities have been explicitly corrected, it is not unreasonable to assume that Māori communities continue to be underserved by the same infrastructure networks today.

Government decisions on funding for infrastructure projects are typically based on aggregate productivity gains, where decision-makers consider projected productivity gains to a specific industry, region, or to the nation as a whole. That an infrastructure project is estimated to provide productivity gains does not imply that each individual firm benefits from the investment, or that benefits are distributed equally amongst firms. The results presented in this study indicate that recent infrastructure investments have not addressed underlying or historic inequities in access to transport transport and water and waste infrastructure. If Māori firms have not benefited equitably from recent investment in infrastructure this may have further compounded pre-existing inequities.

The literature discussed in Chapter 2 establishes that investment in physical infrastructure – contingent on other factors – can have a positive effect on firm-level productivity (e.g. Fabling & Grimes, 2016). While this study has not sought to analyse the effect of infrastructure on productivity, these results should be of interest to policy makers concerned with productivity in Aotearoa New Zealand as they suggest that inequities in access to productivity-enhancing infrastructure exist at the firm-level. In the case of transport infrastructure, it is reasonable to assume that bad transport infrastructure can lead to higher relative transport costs. Higher transport costs reduce a firm's access to larger and more efficient product and labour markets, and access to larger markets is linked with increased firm productivity via gains from specialisation and scale.

It should also be considered that the Māori worldview may explain some of the difference in the relative experience of water and waste infrastructure. As discussed in Chapter 2, te taiao and relationships between people and the environment through the principles of whanaungatanga and kaitiakitanga are central to the Māori worldview. This may mean that the owners of Māori firms more keenly perceive deficits in water and waste infrastructure when these deficits cause observable harm to te taiao, or prevent Māori from carrying out cultural obligations. For example when the discharge of waste water into the ocean prevents the gathering of kaimoana for significant events. That Kaupapa Māori firms are more likely than other firms to cite water and waste infrastructure as bad (Table 8) could be considered as evidence in support of this hypothesis. Putting aside the relative propensity to perceive water and waste infrastructure as bad, it is important to consider that any environmental

damage due poor water and waste infrastructure is likely to cause cultural harm to owners of Māori firms and to their Māori employees, in addition to the negative effects on firm performance.

The design and construction of the ICT infrastructure network in Aotearoa New Zealand occurred much more recently than that of the transport or water and waste infrastructure networks[28]. For example, the roll out of the UFB network[29] started in 2010 when central governments of all political persuasions had broadly committed to the equitable provision of public services, including explicitly to Māori via obligations from Te Tiriti/The Treaty. As reported in Table 7, the results of this study show that Māori firms are more likely to rate ICT infrastructure as bad, but this experience can be explained by the industries and locations in which Māori firms operate rather than by underlying discrimination. That the inequities in access to ICT infrastructure are not due to discrimination is clearly a good thing, however poor access to ICT technologies is still likely to have an effect on the performance of Māori firms. For instance, virtual meetings and remote work allow firms access to larger labour markets or customer markets and and avenue for firms to reduce or avoid high-travel costs, but this requires firms to have fast, stable and reliable internet connections.

Looking to the future, current inequities in the access to physical infrastructure are likely to be exacerbated by the effects of climate change (e.g., a more fragile roading network due to increased extreme weather events). Climate adaptation measures may present an opportunity to address underlying infrastructure inequities and this should be considered by policy makers.

Now turning the focus of this discussion to the factors that hamper innovation to a high degree, the results presented in Tables 13 through 20 indicate that differences exist between Māori and non-Māori firms. Of particular note are the results in Table 13 that report that Māori firms are more likely to report that 'costs to develop or introduce' hamper innovation to a high degree. The difference is significant at the 1% level and persists with controls for location, industry and firm size, and is true for both Kaupapa and non-Kaupapa Māori firms. That Māori firms are more likely to indicate that cost is a barrier to innovation is consistent with the findings of BDO (2020) that Māori firms face difficulty securing capital and of Ball et al. (2022) that Māori firms pay a higher rate of implied interest on business lending.

[28] The roading and water and waste infrastructure networks were initially established in the early years of colonisation.
[29] UFB was rolled out based on proximity to schools and hospitals. See Fabling and Grimes (2016).

As reported in Table 14, Māori firms are more likely to indicate that lack of management resources hampered innovation to a high degree once controls for industry, location and firm size are included in the regression and this phenomenon appears to be driven by the experience of Kaupapa Māori firms. The adoption of Māori management practices and/or application of tikanga likely requires additional time from managers, reducing the available time that managers can dedicate to innovation related activities. In other words, managers in Kaupapa Māori firms may face increased time scarcity due to the workload associated with the delivery of the cultural components of their roles.

While it may be reasonable to assume that the management resources of Kaupapa Māori firms are constrained due to a smaller pool of managerial talent; potential managers are required to have the required level of management and/or technical skills and experience for the role, as well as strong cultural capability. This assumption is not supported by the results in this study. Table 21 reports that Kaupapa Māori firms and Māori firms more broadly are no more likely to report severe difficulty in the recruitment of managers or professionals. Nor are Māori firms more likely to report access to skilled labour as a constraint, nor that access to appropriate personnel hampered innovation to a high degree as per the results present in Table 20. These results are consistent with the findings of Haar et al. (2021) that Māori firms have similar levels of human capital as non-Māori firms, but it is perhaps surprising when considered with regard to the literature that establishes that Māori individuals are more likely to be employed by Māori firms, and that on average Māori have lower educational attainment. There is no empirical research that examines the relative levels of human capital levels in Māori firms, nor empirical studies on the influence of human capital on firm-level innovation or firm-level productivity in Māori firms. This presents an opportunity for further research.

As presented in Tables 23 and 24, Māori firms are less likely to report severe difficulty hiring labour from the 'tradespeople' and 'other' occupation groups, and this difference appears to be driven by the experience of Kaupapa Māori firms. These results may signal that being recognised as a Kaupapa Māori firm is an advantage for firms in the labour market. For instance, workers may perceive firms who operate in-line with te ao Māori values (e.g., kaitiakitanga and manaakitanga) as providing safer workplaces or better opportunities for employee career advancement. Should Kaupapa Māori firms be outcompeting other types of employers for Māori labour, this phenomenon is consistent with the findings of Houkamau and Sibley (2019) who find that Māori with a strong sense of cultural connectedness prefer employment in firms that support Māori values and development. There may also be parallels between Kaupapa Māori firms and other values-driven firms such as those with certified 'B Corp' or 'living wage' accreditations.

The relative experience of Māori firms in the labour market may also be influenced by strong Māori labour mobility. As previously discussed, international literature suggests that cultures with stronger family ties have lower labour mobility (see Alesina et al., 2015; Alesina & Giuliano, 2014), however Sin and Stillman (2015) identify two distinct experiences for Māori. Māori who don't live in their rohe or have strong ties to iwi or hapū, exhibit comparatively stronger labour mobility when compared with Pākeha, whereas Māori who live within strong local iwi and/or hapū networks exhibit comparatively lower labour mobility. It should be considered that strong Māori labour mobility can partially explain the relative ease at which Māori firms can hire labour from the 'tradespeople' and 'other' occupation groups and access unskilled labour (Table 12). Strong Māori labour mobility may also contribute to the comparable experience in the recruitment of skilled labour despite the Māori population having on average lower education attainment.

The international literature places much emphasis on the influence of social capital on economic outcomes, including on firm performance. While this study has not sought to analyse the influence of social capital on firm performance, the topic is worthy of discussion. Haar and Delaney (2009) hypothesise that whanaungatanga may offer an advantage to Māori firms in the start-up stage where firms can leverage whānau labour for koha[30] (e.g., free or at a lower cost), but could it be that whanaungatanga also increases the efficiency at which Kaupapa Māori firms transact in the labour market? For example, whanaungatanga may make it easier for Kaupapa Māori firms to find and hire appropriate labour, that is whanaungatanga facilitates strong matching between employees and employers. While not explicitly considered by Sin and Stillman (2015), whanaungatanga may also be a driver of the comparatively strong labour mobility observed in the Māori workers, with Māori workers being made aware of employment opportunities through whānau networks. Whanaungatanga may also explain why Māori firms are less likely to cite lack of information as a barrier to innovation (as reported in Table 16). More research is required to develop a comprehensive understanding of the distinctive features of the Māori labour market, including the effects of Māori cultural values and beliefs (including whanaungatanga) and social capital.

The focus of this chapter now turns to the productivity analysis. The results reported in Table 25 do not provide evidence of a statistically significant difference in MFP between Māori and non-Māori firms in the BOS sample, nor is there evidence of a difference between Kaupapa Māori and non-

[30] Koha can be translated in the English language as a gift, present, offering, donation, contribution (Moorfield, 2024) but is more nuanced in te ao Māori and mediated through the practice of utu (see Jones, 2016; Mika et al., 2022)

Kaupapa Maori firms. These findings are somewhat in contrast to the findings of Chen (2023) who concluded that Māori firms in the BOS have lower levels of labour productivity relative to non-Māori firms. In addition to notable differences in empirical strategy and time period[31], this study employs a much stricter definition of a Māori firm, and as a consequence has a much smaller sample size of 384 unique firms compared with 693 unique firms in Chen's study.

There are several possible drivers of this phenomenon. It may be that the higher labour productivity of Non-Māori firms is explained by relatively higher levels of capital intensity, which would be consistent with the difficulties Māori firms experience in access to capital. Or it may be the case that that less productive firms are more likely to make an error in self-identification and are therefore mistakenly included in Chen's study[32]. The lack of statistical significance in this study may also be due to inherent noise in the MFP measurement or the small sample size. Unfortunately due to the change in 2022 as to how StatsNZ defines a Māori firm (as discussed in section 2.3), it will not be possible to increase the sample size used in this study with new waves of the BOS.

Regardless, this study argues that the results reported in Table 25 do not constitute strong evidence of a productivity gap between Māori and non-Māori firms in the BOS. Moreover, these results highlight the need for researchers to actively consider not only the particular definition of a Māori firm used in their research, but to potentially consider consistency of self-identification as well. As demonstrated, these decisions can have a significant influence over the economic analysis, the results and ultimately, the conclusions drawn by a researcher.

The lack of evidence for a productivity gap between Māori and non-Māori firms in this study is also somewhat in contrast with the findings of Fabling and Maré (2024) who find a statistically significant difference in the MFP between Māori and non-Māori WP-led firms. As previously discussed, there are significant differences between the population of interest in this study and that of Fabling and Maré (2024), including the proportionality of Māori firms. Māori-led firms comprise 15-20% of the Fabling and Maré (2024) sample which is broadly inline with the share of population (Māori comprise 17.3% of the Aotearoa population as at June 2023 (Stats NZ, 2023c)), and consistent with literature that Māori are no less entrepreneurial than non-Māori in Aotearoa (see Frederick & Chittock, 2006; Haar et al., 2021). In comparison Māori firms comprise only 3% of firms in this study and between 6% - 7%

[31] Chen (2023) compares labour productivity between patched pairs (matched on industry, age and size) between 2015 – 2020. This study uses productivity data from 2002 – 2022.
[32] As discussed in section 3.2 only 14% of *Ever Māori non-Primary* observations cited ownership as a reason for self-identification as a Māori business and demonstrated highly inconsistent self-identification.

of firms in that of Chen (2023). This raises questions about both the growth trajectory of Māori firms and the methods of identification for Māori firms.

There are several factors that may compound the disproportionality of firm ownership. Firstly, the BOS sample is stratified based on firm size and industry, but is not stratified by firm ownership type and it is therefore possible that Māori firms are undersampled in the BOS. Secondly, it is likely that a number of Māori-owned firms choose not to self-identify as a Māori firm. This issue is not encountered by Fabling and Maré (2024) nor by Ball et al. (2022) who identify Māori firms using ethnicity and descent data of working proprietors and are not reliant on self-identification.

Putting aside these possible compounding factors to assume that Māori firm ownership in the BOS sample is disproportionate to both the Fabling and Maré (2024) WP-led sample and the Aotearoa New Zealand population, this is suggestive of divergent growth trajectories between Māori and non-Māori firms. That is, Māori individuals appear to be starting firms at a comparable rate to non-Māori as observed in the the Fabling and Maré (2024) WP-led sample, but failing to grow into eligibility for the BOS sample (i.e. have >6 employees). This divergent growth trajectory could provide some context to the relative productivity findings in this study.

For instance, is it that only the most highly productive Māori firms are able to overcome the relative disadvantage in the external business environment (e.g., transport infrastructure) and conditions for innovation (e.g., costs) to grow into eligibility for the BOS sample? If this is so, what lessons can be drawn from the experience of these productive Māori firms that may improve productivity performance for firms more broadly? There may also be an opportunity for government and/or iwi to introduce measures that reduce the relative barriers for early-stage or small to medium Māori firms and enable more Māori firms to grow into larger and more productive firms.

It should be considered that the number of Māori-led WP firms may also be influenced by entrepreneurship of necessity. Entrepreneurship of neccessity describes the phenomenon where workers become self-employed or start a business due to labour market conditions (e.g., high levels of unemployment), rather than due to a strong desire to become a founder or business owner. There is anecdotal evidence that Māori are more likely to experience entrepreneurship of necessity (Te Puni Kōkiri, 2009), but there is no empirical evidence supporting this observation.

The international literature argues that cultures that tend toward collectivism have higher risk aversion, and as a result, exhibit lower levels of innovation, whereas Frederick and Chittock (2006) and Haar et al. (2021) have argued that Māori are at least no less innovative or entrepreneurial than non-Māori firms. As previously discussed, this study has reported that Māori firms exhibit apparent advantage in the labour market and the possible influence of whanaungatanga. It is worth considering that whanaungatanga may also play a role in technology and innovation diffusion amongst Māori firms. There is little empirical research on the relative innovation practices of Māori firms, and it is unknown if Māori firms innovate at the same rate as non-Māori firms and are they more or less successful. Further research is required to understand if innovation levels in Māori firms are consistent with the international literature that observes an inverse relationship between collectivism and innovation, or instead if Māori firms buck this trend as argued by Frederick and Chittock (2006) and Haar et al. (2021). Any future work on this topic should account for the inequities in the external business environment and factors that hamper innovation as identified in this study, and possibly consider the role of whanaungatanga.

The existing economic research on the influence of culture on economic outcomes places significant emphasis on persistence of cultural and beliefs, and makes specific regard to the elements of culture that are passed down relatively unchanged from generation to generation. In contrast, the literature on Māori firms suggests that firm owners can 'opt in' to tikanga Māori or Māori management practices. The intent of these literatures are different, so it is not necessarily the case that these perspectives are contrary, but there is nuance to unpack.

The international literature largely assumes a single or at least a dominant culture in a given region, for example north and south Italy in Guiso et al. (2016); Putnam et al. (1993), or in immigrants to isolate the effect of home country for example in Alesina et al. (2015). To satisfy the criterion of persistence, these studies typically examine second generation immigrants (e.g. Giuliano, 2007), with some studies considering up to fourth generation (e.g. Giavazzi et al., 2019). Giavazzi et al. (2019) argue that convergence of cultural values and economic outcomes is influenced by the degree of difficulty experienced by first generation migrants to learn English. In comparison Māori have been the ethnic minority in Aotearoa New Zealand since circa 1860 and have lived alongside Pākeha in Aotearoa New Zealand for up to eight generations. While there is evidence that contemporary Māori have a systemically different distribution of economic values and beliefs from non-Māori (Grimes et al., 2015), and that many of these contemporary economic values and beliefs are consistent with observed economic values and beliefs in pre-colonial Aotearoa New Zealand (such as those outlined

by Jones, 2016). From an economic standpoint, how should we consider persistence when Māori possess (and have done for generations) the ability to 'walk in both worlds'?

When considered within the three step framework proposed by Guiso et al. (2006). There is evidence that Māori have a systematically different distribution of preferences (Grimes et al., 2015) (i.e. step one), but there is not yet evidence that these preferences influence economic outcomes (i.e. step two). Any future research that seeks to isolate the effect of culture on firm performance will need to empirically account for the notion that Māori firm owners and their managers can 'opt in' to tikanga Māori and Māori management practices. This suggests that researchers should exercise caution when assuming that Māori ethnicity is a proxy for Māori cultural values and beliefs, and that this caution may extend to indigenous cultures in colonised populations more broadly.

5.2 Limitations

The number of Māori firms in the sample is small, meaning that this work is vulnerable to a Type II error where a true difference in the variable of interest is not detected due to the constrained statistical power of the regression model. As previously discussed, it is uncertain if the small number of Māori firms is reflective of the proportion of Māori firms in the population of interest or if Māori firms are under-represented in this sample. Any future research that analyses the growth trajectory of Māori firms would improve our understanding of this concern.

As discussed in Chapter 2, Shoham (2023) argues that surveys on cultural dimensions suffer from inherent endogeneity problems due to the influence of socioeconomic effects. It should be considered that the BOS may also suffer from this issue.

This study would have been enriched by interviews with owners of Māori firms - Kaupapa and non-Kaupapa alike - to provide anecdotal evidence as to how Māori culture influences their decision making and on their experience in the labour market. Due to time constraints interviews were out of the scope of this study.

5.3 Areas for future study:

It is widely accepted that there is a dearth of research on the Māori economy and Māori firms, and while this study has sought to contribute in a modest way to addressing this gap, it has perhaps identified more opportunities for further research than it has provided answers.

The disproportionality of firm ownership in the BOS sample relative to WP-led firms identified by Fabling and Maré (2024) and relative to the general population prompts questions around the growth trajectory of Māori firms. This could, at least partially, be explained by issues with firm self-identification, or it may indicate that Māori firms are not growing into medium or large sized enterprises which tend to be more productive. Māori appear to be starting businesses approximately inline with the share of the population, which does not indicate that Māori exhibit lower levels of entrepreneurship or willingness to start businesses. This study has presented evidence that Māori firms face greater disadvantage in the external business environment and in the conditions that foster innovation, could this have an effect on the survival of Māori firms and their likelihood to grow into a medium or large sized enterprise? Does this also influence the productivity distribution of Māori firms? Analysis of the relative capital intensity of Māori and non-Māori firms may provide insight into why Chen (2023) found a gap in labour productivity while this study found no evidence of a gap in MFP. Further studies examining the productivity distribution of Māori firms are required to answer these questions. Any future studies should also account for the influence of the business cycle on Māori entrepreneurship (i.e. consider the phenomenon of entrepreneurship by necessity).

There is no empirical research that examines the relative levels of human capital levels in Māori firms, nor empirical studies on the influence of human capital on firm-level innovation or firm-level productivity in Māori firms. This presents an opportunity for further research.

Future studies could also explore the role that innovation can (and does) play in helping Māori firms overcome the barriers in the external business environment. There is little research on the relative innovation practices of Māori firms, do Māori firms innovate at the same rate as non-Māori firms and are they more or less successful? How does access to capital influence the innovation practices of Māori firms? Does whanaungatanga play a role in the diffusion of technology and innovation amongst Māori firms? This research would be of benefit to policy makers and the owners of Māori firms alike, and would contribute a Māori perspective to the international literature on the relationship between collectivism and innovation.

The literature on the relationship between culture and economic outcomes places a large emphasis on influence of social capital, and while there is a burgeoning field of research on the dynamics of Māori social capital, there is little research on the effect of social capital on Māori firm performance. As discussed, whanaungatanga may have an effect on firm performance, and in particular on

transactions in the labour market. There may also be parallels between Kaupapa Māori firms and other types of values driven firms such as registered 'B Corp' and 'living wage' employers. This provides rich territory for future study.

This study highlights research opportunities concerned with non-Māori indigenous economies and firms. Does culture have a causal effect on the economic outcomes of firms, or like Māori, do other indigenous firms face more prevalent barriers in the external business environment?

Chapter 6 Conclusion

This study has sought to determine if Māori firms have different economic outcomes to non-Māori firms, and if differences exist, can they be explained by the practice of Māori cultural values and beliefs? Or can they, at least partially, be explained by the relative prevalence of constraints in the external business environment? To isolate the effect of culture on firm performance, the analysis used data from the BOS to construct a novel method for the identification of Māori firms in the LBD. This method accounted for consistency of self-identification and the use of tikanga Māori and/or Māori management practices in firm operations.

The results presented indicate that Māori firms are more likely to face barriers in the external business environment and in the conditions that support innovation. In particular, Māori firms are more likely to rate access to transport infrastructure (Table 6) and water and waste infrastructure (Table 8) as bad, and to indicate that costs (Table 13) and management resources (Table 14) hamper innovation to a high degree. These findings are consistent with historical evidence on colonisation, and in particular the confiscation of high-quality whenua and the design and implementation of infrastructure networks. The findings are also consistent with more recent empirical evidence that Māori firms experience difficulties accessing capital and pay a higher rate of interest on business lending. Given the presence of such inequities, this study argues that differences in firm performance should not be attributed to the practice of Māori cultural values and beliefs alone.

In contrast to existing literature on the performance of Māori firms, this study produced no evidence of a gap in MFP between Māori and non-Māori firms (Table 25). Māori firms comprise only 3% of firms in this study in comparison with the Māori share of population at approximately 17.3% and 15-20% of WP-led firms. Māori individuals appear to be starting firms at a comparable rate to non-Māori but

failing to grow into larger and more productive firms. This divergent growth trajectory could provide some context to the productivity findings in this study. For instance, is it that only the most highly productive Māori firms are able to overcome the relative disadvantage in the external business environment (e.g., transport infrastructure) and conditions for innovation (e.g., costs) to grow into eligibility for the BOS sample?

The findings (Tables 23 and 24) that Māori firms who use tikanga Māori and/or Māori management practices are less likely to report severe difficulty hiring workers from the 'tradespeople' and 'other' occupation groups suggest that there may be benefits for these firms in the labour market. Māori firms of all types are less likely to report access to unskilled labour as bad (Table 12). More research is required to develop a comprehensive understanding of the distinctive features of the Māori labour market, including the effects of Māori cultural values and beliefs (including whanaungatanga) and social capital.

This study, and in particular the contrast of its findings with prior studies that examine the relative performance of Māori firms, highlights the need for researchers to carefully consider the specific definition of a Māori firm used in their research and datasets, but to also consider consistency of self-identification. These decisions can have a significant influence over the analysis and results, and ultimately, the conclusions drawn.

The existing economic research on the influence of culture on economic outcomes places significant emphasis on persistence of cultural and beliefs, and makes specific regard to the elements of culture that are passed down relatively unchanged from generation to generation. In contrast, the literature on Māori firms suggests that firm owners can 'opt in' to tikanga Māori or Māori management practices. The intent of these literatures are different, so it is not necessarily the case that these perspectives are contrary. However, this study prompts questions as to whether ethnicity can or should be considered a proxy for culture in colonised indigenous populations.

It is widely accepted that there is a dearth of research on the Māori economy and Māori firms, and while this study has sought to contribute in a modest way to addressing this gap, it has perhaps identified more opportunities for further research than it has provided answers. Our understanding of Māori firms would be greatly enhanced by analysis on the productivity distribution of Māori firms, and enable us to answer such questions as; does the relative prevalence of barriers in the external environment prevent have an effect on the survival of Māori firms and their likelihood to grow into a

medium or large sized enterprise? What are the features of Māori firms who grow into large productive enterprises?

There is opportunity for future research to explore the role that innovation can play in helping Māori firms overcome the barriers in the external business environment. There is little research on the relative innovation practices of Māori firms, do Māori firms innovate at the same rate as non-Māori firms and are they more or less successful? How does access to capital influence the innovation practices of Māori firms? Does whanaungatanga play a role in the diffusion of technology and innovation amongst Māori firms? This research would be of benefit to policy makers, iwi, hapū and the owners of Māori firms alike, and would contribute a Māori perspective to the international literature on the relationship between collectivism and innovation.

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Appendices

Appendix 1 BOS Module A 2015

Figure 6

BOS Module A 2015[33]

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Business Operations Survey 2015

ED/BOS/01

For help and information:

Phone: **0800 333 108**
64 9 920 9108

Fax: 09 920 9195

Email: bus@stats.govt.nz

Mail: Statistics New Zealand
Freepost 10007
Private Bag 92003
Victoria Street West
Auckland 1142

Are the address details above correct? If **not,** use the boxes below to correct any errors.

Attention

Legal name

Building / Level / Unit

Street / Road **or** PO Box

Suburb **or** Rural Delivery

Town / City

Postcode

sample only

Please complete, sign, and return this questionnaire in the envelope supplied, by

Purpose of this survey

The purpose of this survey is to collect information on the business operations of New Zealand businesses. The data collected by this survey is needed to quantify business behaviour, capacity and performance across a wide selection of industries. The information will help government and other organisations in developing a better understanding of enterprise capacity and performance in New Zealand.

Your legal obligation

The information you provide contributes to important economic measures for New Zealand. This is why completing this survey is a requirement under the Statistics Act 1975. For more information, visit www.stats.govt.nz/obligation or call 0800 333 108.

Protecting privacy and confidentiality

Statistics New Zealand does not release or share confidential information that could identify individuals, organisations or businesses unless prior consent has been provided. The information we collect is only made available for research or statistical purposes.

Thank you for completing this survey. Your information contributes to statistics for business decision-making. To find out how we can help your business grow, visit www.stats.govt.nz.

Liz MacPherson
Government Statistician

Business Operations Survey

Section A: Business Operations

1 Please keep a record of the time it takes you (and anyone else) to read the instructions, collect the information, and answer the questions. You are asked to record this at the end of the questionnaire.

2 Only include information for the business named on the front page.
Don't provide consolidated data.

Don't include:
- subsidiary or associated businesses
- accounting divisions that operate entirely outside New Zealand (NZ)

3 How to answer:
- this form will be scanned and recognised by electronic equipment. Therefore please:
  - mark answers like this —
  - print answers in CAPITAL letters
  - keep each letter or number **within** the spaces provided
  - for example J O N E S L T D or 1 2 3
- please use a blue or black pen
- where actual figures are not available, please give close estimates
- where there is no response, leave blank unless instructed to write 0
- supply whole dollar values only.

Reporting information

4
- These questions should be completed by the General Manager.
- Some answers may need to be confirmed with support people in specific areas.

5 Please provide information relating to the most recent financial year for which this business has results available.

Note:
- if your balance date is between 1 Jan - 30 Sep, report for the year ending 2015
- if your balance date is between 1 Oct - 31 Dec, report for the year ending 2014

What is the balance date of the financial year you will use for this questionnaire?

day month year

A0501

This is the reference point for the questions that follow.

Sample only

Sales of goods and services

6 For the last financial year, estimate the proportion of this business's sales of goods and services that came from exports:

Note: Please round to the nearest %. If your exports are between 0 and 1%, please round up to 1%.

☐☐☐ %

A0601

7 For the last financial year, estimate the proportion of this business's sales that came from tourism:

Include:
- sales of goods and services **indirectly** related to tourism but purchased by tourists (eg retail sales of food, alcohol, and clothing)
- sales of goods and services **directly** related to tourism (eg accommodation, transport, and recreation services)

- ○ 1 zero
- ○ 2 1–25%
- ○ 3 26–50%
- ○ 4 51–75%
- ○ 5 76–100%
- ○ 6 don't know

A0700

New investment

8 For the last financial year, did this business invest in its expansion?

Include:
- purchase of one or more businesses or assets (eg land, buildings, equipment)
- development or introduction of new or significantly improved goods, services, or processes
- entry into new markets

Don't include:
- increases in turnover for existing business
- ongoing operational expenses

- ○ 1 yes
- ○ 2 no
- ○ 3 don't know

A0800

sample only

Research and development

9 For the last financial year, did this business undertake or fund any research and development (R&D) activities?

Include:
- any activity characterised by originality: it should have investigation as its primary objective, and an outcome of gaining new knowledge, new or improved materials, products, services, or processes
- the buying abroad of technical knowledge or information

Don't include:
- market research
- efficiency studies
- style changes to existing products

1 yes → go to **10**
2 no → go to **12**
3 don't know → go to **12**

A0900

10 For the last financial year, how much did this business **spend** on R&D activities? $, , , A1001

Don't include GST

11 Estimate the percentage of R&D expenditure from question **10** that relates to **in-house** R&D activities.

Include subcontractors working in-house.
Don't include R&D funded by this business but carried out by other organisations. % A1101

International presence

12 As at the end of the last financial year, did any individual or business located overseas hold an ownership interest or shareholding in this business?

1 yes → please give the total percentage: % A1201
2 no
3 don't know

A1200

13 As at the end of the last financial year, did this business hold any ownership interest or shareholding in an overseas located business (including its own branch, subsidiary or sales office)?

1 yes → go to **14**
2 no → go to **15**
3 don't know → go to **15**

A1300

14 Mark all that apply. Through which of the following methods did this business gain those overseas ownership interests or shareholdings?

joint ventures A1401
acquisitions of existing overseas businesses A1402
greenfields (ie establishment of new overseas businesses) A1403
other methods A1404

Sample only

Employment

15 Over the last financial year, what percentage of staff (working proprietors and employees) worked for this business on the following basis?

Include:
- those temporarily absent from work (eg sick, on leave, strike, or temporary lay-off)
- casual staff
- all managerial and executive staff (eg Chief Executive)

Don't include:
- contractors (eg temporary staff paid by employment agencies)
- working proprietors not actively engaged in the operation of this business

full-time (working 30 hours or more per week)	%	A1501
part-time (working less than 30 hours per week)	%	A1502
TOTAL staff	1 0 0 %	

16 As at the end of the last financial year, what percentage of staff (working proprietors and employees) were working in the following occupational groups?

Note: Assign staff to an occupational group according to the tasks or duties they spent the majority of their time performing.

If any answers are 'zero' please write **0**

Managers and professionals

- Managers lead organisations, departments or divisions and determine the policy of the organisation or department (eg General Manager, Finance Manager).
- Professionals perform analytical, conceptual or creative tasks with skills equivalent to a bachelor degree or higher (eg accountant, engineer, journalist, computer programmer).

% A1601

Technicians and associate professionals

Technicians and associate professionals perform complex technical or administrative tasks, often in support of professionals or managers (eg technical officer, building inspector, legal executive).

% A1602

Tradespersons and related workers (including apprentices)

Tradespersons and related workers perform tasks requiring trade specific technical knowledge. Include all apprentices and trade supervisors (eg electrician, mechanic, hairdresser, baker).

% A1603

All other occupations

Include:
- Clerical, sales and service workers who perform administrative, organisational, liaison, sales, and clerical tasks, and may provide support services in the fields of finance etc (eg secretary, receptionist, sales representative, waiter).
- Production and transport workers who operate vehicles or complex equipment (eg bulldozer operator, bus driver, storeperson).
- Labourers and related workers who perform routine tasks, either manually or using equipment (eg cleaner, factory hand, trades assistant).
- All other occupations.

% A1604

TOTAL staff 1 0 0 %

sample only

17 Mark one oval for each item listed. Over the last financial year, to what extent did this business experience difficulty in recruiting new staff for any of the following occupational groups?

Please mark ovals like this —

	no difficulty	moderate difficulty	severe difficulty	don't know	not applicable	
managers and professionals	1	2	3	4	5	A1701
technicians and associate professionals	1	2	3	4	5	A1702
tradespersons and related workers (including apprentices)	1	2	3	4	5	A1703
all other occupations	1	2	3	4	5	A1704

18 As at the end of the last financial year, what percentage of this business's employees were covered by a collective employment agreement?

- 1 zero
- 2 1–10%
- 3 11–50%
- 4 51–90%
- 5 91–100%
- 6 don't know

A1800

Business performance

19 Mark one oval for each item listed. How do you think this business compares to its major competitors on each of the following?

	lower than competitors	on a par with competitors	higher than competitors	don't know	
costs	1	2	3	4	A1901
time taken to provide customers with goods or services	1	2	3	4	A1902
quality	1	2	3	4	A1903
flexibility or ability to make changes	1	2	3	4	A1904
customer satisfaction	1	2	3	4	A1905
employee satisfaction	1	2	3	4	A1906
profitability	1	2	3	4	A1907
productivity	1	2	3	4	A1908

sample only

20 Mark one oval for each item listed. Over the last financial year, did the following items decrease, stay the same or increase for this business?

	decrease	stay the same	increase	don't know	
total sales of goods and services	1	2	3	4	A2001
profitability	1	2	3	4	A2002
productivity	1	2	3	4	A2003
market share	1	2	3	4	A2004

21 Over the last financial year, what percentage of goods or services from this business were provided to customers on time and to requirements?

1 zero–50%
2 51–80%
3 81–90%
4 91–95%
5 96–100%
6 don't know

A2100

22 In the last financial year, did this business develop or introduce any new or significantly improved:

- goods or services
- operational processes
- organisational or managerial processes
- marketing methods?

1 yes
2 no
3 don't know

A2200

23 Over the last financial year, did this business enter any new export markets?

1 yes
2 no
3 don't know

A2300

24 Over the last financial year, to what degree did this business's technology change?

1 not at all
2 to a minor degree
3 to a major degree
4 completely
5 don't know

A2400

sample only

25 How does this business's core equipment (that is used in the production of this business's main goods or services) compare with the best commonly available technology?

- 1 fully up to date
- 2 up to 4 years behind
- 3 4 years to 10 years behind
- 4 more than 10 years behind
- 5 don't know

A2500

Other business factors

26 Regardless of changes in ownership, what calendar year did this business commence operations? ☐☐☐☐ year A2601

27 How would you describe this business's competition?

- 1 captive market or no effective competition
- 2 no more than one or two competitors
- 3 many competitors, several dominant
- 4 many competitors, none dominant
- 5 don't know

A2700

28 Mark one oval for each item listed. When thinking about the city, town, or district in which this business operates, how would you rate the following factors?

Note: If this business has more than one location, please answer in relation to the location where the largest share of the business's activities occur.

	bad	neither bad nor good	good	don't know	
transport infrastructure	1	2	3	4	A2801
information and communications technology infrastructure (eg broadband availability, mobile phone coverage)	1	2	3	4	A2802
water and waste infrastructure	1	2	3	4	A2803
local body planning and regulatory processes (eg building consents, Resource Management Act approvals)	1	2	3	4	A2804
skilled labour market	1	2	3	4	A2805
unskilled labour market	1	2	3	4	A2806
business networks (eg local business associations)	1	2	3	4	A2807

29 Over the last financial year, did this business merge with or acquire a shareholding in any other New Zealand or overseas business?

- 1 yes
- 2 no
- 3 don't know

A2900

Sample only

30 Over the last financial year, did this business request any new or additional debt or equity finance?

Debt finance is any finance that the business must repay (eg overdrafts, credit cards, convertible debt).
Equity finance is any finance which is provided in exchange for a share in the ownership of this business.

Include requests that were fully approved, partly approved, withdrawn or declined.

- 1 yes → go to **31**
- 2 no
- 3 don't know → go to **33**

A3000

31 Mark all that apply. When requesting new or additional **debt** finance over the last financial year, were funds:

- available on acceptable terms — A3101
- available, but **not** on acceptable terms — A3102
- not available — A3103
- don't know — A3104
- did not request debt finance — A3105

32 Mark all that apply. When requesting new or additional **equity** finance over the last financial year, were funds:

- available on acceptable terms — A3201
- available, but **not** on acceptable terms — A3202
- not available — A3203
- don't know — A3204
- did not request equity finance — A3205

Business self-identification

33 Do you consider this business to be a Māori business?

- 1 yes → go to **34**
- 2 no → go to the start of **Section B** on page 10

A3300

34 Mark all that apply. Which of the following factors significantly influence your decision to consider this business a Māori business?

- ownership — A3401
- philosophy / principles / goals / tikanga — A3402
- management practices — A3403
- branding / marketing — A3404
- tangible assets / taonga a iwi, eg land or fishing rights — A3405
- intangible assets / kaupapa Māori, eg cultural property — A3406
- employees — A3407
- other, please specify _____ — A3408

sample only

Appendix 2 BOS Module B 2015

Figure 7

BOS Module B 2015[34]

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Section B: Innovation

1 Section B should be completed by the General Manager.

2 For the purpose of this survey innovation is broadly defined. It includes the development or introduction of any new or significantly improved activity for this business.
This includes products, processes and methods that this business was the first to develop and those that have been adopted from other organisations.

New goods or services

3 During the last 2 financial years, did this business introduce onto the market any new or significantly improved goods or services?

Please mark ovals like this —

Don't include the selling of new goods or services wholly produced and developed by other businesses.

- 1 yes → go to **4**
- 2 no → go to **7**

B0300

4 Mark all that apply. Were any of those new or significantly improved goods or services:

- developed by this business — B0401
- developed by this business in partnership with others — B0402
- obtained from others and significant improvements were made by this business — B0403
- obtained from others and **no** significant improvements were made by this business — B0404

5 Mark one oval for each item listed. Were any of those new or significantly improved goods or services:

	yes	no	don't know	
new to New Zealand	1	2	3	B0501
new to world	1	2	3	B0502

6 For the last financial year, please estimate the percentage of sales for this business that came from those new or significantly improved goods or services.

- 1 zero
- 2 1–10%
- 3 11–30%
- 4 31–100%
- 5 don't know

B0600

sample only

New operational processes

7 During the last 2 financial years, did this business implement any new or significantly improved operational processes (ie methods of producing or distributing goods or services)?

- ○ 1 yes → go to **8**
- ○ 2 no → go to **10** B0700

8 Mark all that apply. Were any of those new or significantly improved operational processes:

- ○ developed by this business B0801
- ○ developed by this business in partnership with others B0802
- ○ obtained from others and significant improvements were made by this business B0803
- ○ obtained from others and **no** significant improvements were made by this business B0804

9 Were any of those new or significantly improved operational processes required because of the introduction of new goods or services?

- ○ 1 yes
- ○ 2 no B0900

New organisational or managerial processes

10 During the last 2 financial years, did this business implement any new or significantly improved organisational or managerial processes (ie significant changes in this business's strategies, structures or routines)?

- ○ 1 yes → go to **11**
- ○ 2 no → go to **12** B1000

11 Mark all that apply. Were any of those new or significantly improved organisational or managerial processes:

- ○ developed by this business B1101
- ○ developed by this business in partnership with others B1102
- ○ obtained from others and significant improvements were made by this business B1103
- ○ obtained from others and **no** significant improvements were made by this business B1104

New marketing methods

12 During the last 2 financial years, did this business implement any new or significantly improved sales or marketing methods which were intended:

- to increase the appeal of goods or services for specific market segments
- to gain entry to new markets

- ○ 1 yes → go to **13**
- ○ 2 no → go to **14** B1200

sample only

13 Mark all that apply. Were any of those new or significantly improved sales or marketing methods:

- developed by this business B1301
- developed by this business in partnership with others B1302
- obtained from others and significant improvements were made by this business B1303
- obtained from others and **no** significant improvements were made by this business B1304

Activities to support innovation

14 Mark all that apply for each item listed. During the last 2 financial years, did this business do any of the following?

Note:
- to innovate means to develop or introduce new or significantly improved: goods or services; operational processes; organisational or managerial processes; or marketing methods.
- it is acceptable to mark both 'done to support innovation' and 'done, though not to support innovation', if applicable

	done to support innovation	done, though not to support innovation	not applicable	don't know	
acquisition of machinery and equipment	1	2	3	4	B1401
acquisition of computer hardware and software	1	2	3	4	B1402
acquisition of other knowledge (eg licences, patents or other intellectual property)	1	2	3	4	B1403
implementing new business strategies or management techniques	1	2	3	4	B1404
organisational restructuring	1	2	3	4	B1405
design (eg industrial, graphic or fashion design)	1	2	3	4	B1406
marketing the introduction of new goods or services	1	2	3	4	B1407
market research	1	2	3	4	B1408
significant changes to marketing strategies	1	2	3	4	B1409
employee training	1	2	3	4	B1410
apply for government funding	1	2	3	4	B1411

15 For the last financial year, please estimate this business's combined expenditure on **product development and related activities:**

If any answers are 'zero' please write ***0***

research and development (copy answer from question 10 on page 4 in Section A)	$, , ,	B1501
design	$, , ,	B1502
marketing and market research (for product development)	$, , ,	B1503
other expenditure related to product development (eg prototyping, trials, commercialisation)	$, , ,	B1504
TOTAL product development and related activities	$, , ,	B1505

sample only

Abandoned or not yet completed activities

16 Mark one oval for each item listed. During the last 2 financial years, did this business **abandon** any activity that was intended to result in the development or introduction of new or significantly improved:

	yes	no	don't know	
goods or services	1	2	3	B1601
operational processes	1	2	3	B1602
organisational or managerial processes	1	2	3	B1603
marketing methods	1	2	3	B1604

17 Mark one oval for each item listed. During the last 2 financial years, did this business **start but not yet complete** any activities to develop or introduce any new or significantly improved:

	yes	no	don't know	
goods or services	1	2	3	B1701
operational processes	1	2	3	B1702
organisational or managerial processes	1	2	3	B1703
marketing methods	1	2	3	B1704

18 Where to next?

	yes	no
Did you answer 'yes' to question **3**?		
Did you answer 'yes' to question **7**?		
Did you answer 'yes' to question **10**?		
Did you answer 'yes' to question **12**?		
Did you answer 'done to support innovation' to any part of question **14**?		
Did you answer 'yes' to any part of questions **16** or **17**?		

If you answered 'no' to all of the questions above, go to question **26** on page 17.
Otherwise continue to the next page (page 14).

Sample only

Reasons

19 Mark one oval for each item listed. During the last 2 financial years, what were the reasons that this business tried to innovate?

Note: to innovate means to develop or introduce new or significantly improved: goods or services; operational processes; organisational or managerial processes; or marketing methods.

	yes	no	don't know	
to improve productivity	1	2	3	B1901
to increase revenue	1	2	3	B1902
to reduce costs	1	2	3	B1903
to increase responsiveness to customers	1	2	3	B1904
to increase market share	1	2	3	B1905
to establish or exploit new market opportunities	1	2	3	B1906
to improve work safety standards	1	2	3	B1907
to reduce energy consumption	1	2	3	B1908
to reduce environmental impact	1	2	3	B1909
to replace goods or services being phased out	1	2	3	B1910

Sources of information or ideas

20 Mark one oval for each item listed. During the last 2 financial years, did this business find any of the following important as a source of information or ideas for innovation?

Note: to innovate means to develop or introduce new or significantly improved: goods or services; operational processes; organisational or managerial processes; or marketing methods.

	yes	no	don't know	
new staff (those appointed in the last 2 years)	1	2	3	B2001
existing staff	1	2	3	B2002
customers	1	2	3	B2003
suppliers	1	2	3	B2004
other businesses	1	2	3	B2005
professional advisors, consultants, banks or accountants	1	2	3	B2006
books, journals, patent disclosures or Internet	1	2	3	B2007
conferences, trade shows or exhibitions	1	2	3	B2008
industry or employer organisations	1	2	3	B2009
universities or polytechnics	1	2	3	B2010
crown research institutes, other research institutes, or research associations, including Callaghan Innovation	1	2	3	B2011
government agencies	1	2	3	B2012
overseas sources	1	2	3	B2013

sample only

Co-operative arrangements

21 In the following questions, **co-operative arrangements** mean actively participating with another organisation or individual, in activities for the purpose of **innovation**.

Note:
- this includes collaborative arrangements for the purpose of innovation
- each party should bring its own knowledge or expertise to the co-operation
- partners do not necessarily derive immediate commercial benefit from the co-operation

Don't include any arrangement where development work is contracted out without this business taking any active part in it.

22 During the last 2 financial years, did this business have any co-operative arrangements for the purpose of innovation?

Note: to innovate means to develop or introduce new or significantly improved: goods or services; operational processes; organisational or managerial processes; or marketing methods.

1 yes → go to **23**
2 no → go to **26** B2200

23 Mark all that apply for each item listed. During the last 2 financial years, with what types of businesses or institutions did this business have those co-operative arrangements?

	New Zealand	overseas	or	no co-operation
customers	B2301	B2302		B2303
suppliers	B2311	B2312		B2313
other businesses	B2321	B2322		B2323
universities or polytechnics	B2331	B2332		B2333
crown research institutes, other research institutes, or research associations, including Callaghan Innovation	B2341	B2342		B2343

24 Mark all that apply. During the last 2 financial years, in which **activities** did this business engage in under those co-operative arrangements?

- joint marketing or distribution B2401
- joint production B2402
- joint R&D B2403
- joint prototype development B2404
- joint training B2405
- other B2406

sample only

25 Mark all that apply. During the last 2 financial years, for what **reasons** did this business engage in those co-operative arrangements?

- ○ sharing costs B2501
- ○ spreading risk B2502
- ○ access to R&D B2503
- ○ access to production processes B2504
- ○ access to management skills B2505
- ○ access to new distribution channels B2506
- ○ access to work practices B2507
- ○ access to financial resources B2508
- ○ access to new markets B2509
- ○ access to new suppliers B2510
- ○ other B2511

sample only

Other factors

26 Mark all that apply. Which of the following does this business or the parent company use to protect intellectual property?

Note: intellectual property refers to the ownership of ideas and control over the use of those ideas.

- patents B2601
- copyrights B2602
- trademarks B2603
- registration of design B2604
- secrecy B2605
- confidentiality agreement B2606
- reaching the market first B2607
- goods, services or processes too complex to copy B2608
- none of the above B2609

27 Mark one oval for each item listed. During the last 2 financial years, to what degree did the following factors hamper this business's ability to innovate?

Note: to innovate means to develop or introduce new or significantly improved: goods or services; operational processes; organisational or managerial processes; or marketing methods.

	hampered innovation to a: high degree	medium degree	low degree	did not hamper	
costs to develop or introduce	1	2	3	4	B2701
lack of information	1	2	3	4	B2702
lack of marketing expertise	1	2	3	4	B2703
lack of co-operation with other businesses	1	2	3	4	B2704
access to intellectual property rights (eg licensing of patents or copyrights)	1	2	3	4	B2705
lack of appropriate personnel	1	2	3	4	B2706
lack of management resources (eg time)	1	2	3	4	B2707
government regulation	1	2	3	4	B2708

28 Mark one oval. Has this business had any contact with Callaghan Innovation?

Note: Callaghan Innovation is a stand-alone Crown Entity established on 1 February 2013.

- 1 yes, and it was helpful
- 2 yes, but it was not helpful
- 3 no B2800

sample only

Appendix 3 Robustness OLS Regressions

Table 26

OLS Results for Transport Infrastructure

Variables	**Transport Infrastructure**	**Transport Infrastructure**	**Transport Infrastructure**	**Transport Infrastructure**	**Transport Infrastructure**
Primary Māori	0.079**	0.089**	0.089**	0.089**	
	(0.040)	*(0.037)*	*(0.037)*	*(0.037)*	
Kaupapa Māori					0.113***
					(0.039)
Primary Māori - not Kaupapa					0.048
					(0.076)
Year	✓	✓	✓	✓	✓
Location		✓	✓	✓	✓
Industry			✓	✓	✓
Ln(RME)				0.005	0.005
				(0.004)	*(0.004)*
Constant	0.221***	0.324***	0.273***	0.257***	0.257***
	(0.010)	*(0.013)*	*(0.015)*	*(0.020)*	(0.020)
Observations	44,331	44,331	44,331	44,331	44,331
R^2	0.002	0.072	0.084	0.085	0.085

Note. RR3 has been applied to observations as per StatsNZ confidentiality requirements. Clustered standard errors in parenthesis. *10%, **5%, ***1%.

Table 27

OLS Results for ICT Infrastructure

Variables	**ICT Infrastructure**	**ICT Infrastructure**	**ICT Infrastructure**	**ICT Infrastructure**	**ICT Infrastructure**
Primary Māori	0.070*	0.031	0.031	0.031	
	(0.036)	*(0.026)*	*(0.027)*	*(0.027)*	
Kaupapa Māori					0.022
					(0.029)
Primary Māori - not Kaupapa					0.046
					(0.051)
Year	✓	✓	✓	✓	✓
Location		✓	✓	✓	✓
Industry			✓	✓	✓
Ln(RME)				-0.004	-0.004
				(0.003)	(0.003)
Constant	0.141***	0.089***	0.085***	0.097***	0.097***
	(0.009)	*(0.009)*	*(0.011)*	*(0.014)*	(0.014)
Observations	45,015	45,015	45,015	45,015	45,015
R^2	0.002	0.127	0.139	0.139	0.139

Note. RR3 has been applied to observations as per StatsNZ confidentiality requirements. Clustered standard errors in parenthesis. *10%, **5%, ***1%.

Table 28

OLS Results for Water and Waste Infrastructure

Variables	**Water & Waste Infrastructure**	**Water & Waste Infrastructure**	**Water & Waste Infrastructure**	**Water & Waste Infrastructure**	**Water & Waste Infrastructure**
Primary Māori	0.067**	0.055**	0.055**	0.055**	
	(0.030)	*(0.027)*	*(0.027)*	*(0.027)*	
Kaupapa Māori					0.050*
					(0.029)
Primary Māori - not Kaupapa					0.065
					(0.051)
Year	✓	✓	✓	✓	✓
Location		✓	✓	✓	✓
Industry			✓	✓	✓
Ln(RME)				*0*	0
				0.002	*0.002*
Constant	0.074***	0.057***	0.054***	*0.054***	0.054***
	(0.007)	*(0.008)*	*(0.009)*	*(0.012)*	(0.012)
Observations	43,284	43,284	43,284	43,284	43,284
R^2	0.007	0.042	0.044	0.044	0.044

Note. RR3 has been applied to observations as per StatsNZ confidentiality requirements. Clustered standard errors in parenthesis. *10%, **5%, ***1%.

Table 29

OLS Results for Local Body Planning and Regulation

Variables	**Local Body Planning & Reg**	**Local Body Planning & Reg**	**Local Body Planning & Reg**	**Local Body Planning & Reg**	**Local Body Planning & Reg**
Primary Māori	-0.003	-0.018	-0.012	-0.012	
	(0.032)	*(0.031)*	*(0.031)*	*(0.031)*	
Kaupapa Māori					0.007
					(0.043)
Primary Māori - not Kaupapa					-0.045
					(0.037)
Year	✓	✓	✓	✓	✓
Industry		✓	✓	✓	✓
Location			✓	✓	✓
Ln(RME)				-0.007*	-0.007*
				(0.004)	(0.004)
Constant	0.243***	0.246***	0.241***	0.263***	0.263***
	(0.011)	*(0.014)*	*(0.017)*	*(0.022)*	(0.022)
Observations	38778	38778	38778	38778	38778
R^2	0.005	0.035	0.04	0.04	0.04

Note. RR3 has been applied to observations as per StatsNZ confidentiality requirements. Clustered standard errors in parenthesis. *10%, **5%, ***1%.

Table 30

OLS Results for Skilled Labour Market

Variables	**Skilled Labour Market**	**Skilled Labour Market**	**Skilled Labour Market**	**Skilled Labour Market**	**Skilled Labour Market**
Primary Māori	0	-0.023	-0.004	-0.005	
	(0.040)	*(0.034)*	*(0.030)*	*(0.030)*	
Kaupapa Māori					-0.008
					(0.036)
Primary Māori - not Kaupapa					0
					(0.051)
Year	✓	✓	✓	✓	✓
Industry		✓	✓	✓	✓
Location			✓	✓	✓
Ln(RME)				0.008*	0.008*
				(0.004)	*(0.004)*
Constant	0.247***	0.199***	0.249***	0.224***	0.224***
	(0.011)	*(0.013)*	*(0.017)*	*(0.022)*	*(0.022)*
Observations	42,999	42,999	42,999	42,999	42,999
R^2	0.016	0.062	0.096	0.096	0.096

Note. RR3 has been applied to observations as per StatsNZ confidentiality requirements. Clustered standard errors in parenthesis. *10%, **5%, ***1%.

Table 31

OLS Results for Business Networks

Variables	**Business Networks**	**Business Networks**	**Business Networks**	**Business Networks**	**Business Networks**
Primary Māori	-0.007	-0.018	-0.016	-0.016	
	(0.011)	*(0.012)*	*(0.013)*	*(0.013)*	
Kaupapa Māori					-0.01
					(0.013)
Primary Māori - not Kaupapa					-0.025
					(0.027)
Year	✓	✓	✓	✓	✓
Industry		✓	✓	✓	✓
Location			✓	✓	✓
Ln(RME)				-0.008***	-0.008***
				(0.002)	(0.002)
Constant	0.039***	0.032***	0.022***	0.046***	0.046***
	(0.006)	*(0.007)*	*(0.008)*	*(0.009)*	(0.009)
Observations	40,413	40,413	40,413	40,413	40,413
R^2	0.001	0.026	0.041	0.042	0.042

Note. RR3 has been applied to observations as per StatsNZ confidentiality requirements. Clustered standard errors in parenthesis. *10%, **5%, ***1%.

Table 32

OLS Results for Unskilled Labour Market

Variables	**Unskilled Labour Market**	**Unskilled Labour Market**	**Unskilled Labour Market**	**Unskilled Labour Market**	**Unskilled Labour Market**
Primary Māori	-0.044**	-0.063***	-0.050**	-0.050**	
	(0.021)	*(0.024)*	*(0.025)*	*(0.025)*	
Kaupapa Māori					-0.019
					(0.029)
Primary Māori - not Kaupapa					-0.099**
					(0.038)
Year	✓	✓	✓	✓	✓
Industry		✓	✓	✓	✓
Location			✓	✓	✓
Ln(RME)				0.004	0.004
				(0.004)	*(0.004)*
Constant	0.108***	0.093***	0.116***	0.102***	0.102***
	(0.008)	*(0.010)*	*(0.013)*	*(0.017)*	*(0.017)*
Observations	38,247	38,247	38,247	38,247	38,247
R^2	0.027	0.057	0.074	0.074	0.074

Note. RR3 has been applied to observations as per StatsNZ confidentiality requirements. Clustered standard errors in parenthesis. *10%, **5%, ***1%.

Table 33

OLS Results for Costs Hampering Innovation

Variables	**Costs**	**Costs**	**Costs**	**Costs**	**Costs**
Primary Māori	0.107***	0.112***	0.111***	0.111***	
	(0.037)	*(0.037)*	*(0.038)*	*(0.038)*	
Kaupapa Māori					0.112**
					(0.049)
Primary Māori - not Kaupapa					0.110**
					(0.055)
Year	✓	✓	✓	✓	✓
Location		✓	✓	✓	✓
Industry			✓	✓	✓
Ln(RME)				-0.010**	-0.010**
				(0.004)	*(0.004)*
Constant	0.173***	0.184***	0.224***	0.254***	0.254***
	(0.009)	*(0.012)*	*(0.015)*	*(0.020)*	*(0.020)*
Observations	26,319	26,319	26,319	26,319	26,319
R^2	0.003	0.016	0.022	0.022	0.022

Note. RR3 has been applied to observations as per StatsNZ confidentiality requirements. Clustered standard errors in parenthesis. *10%, **5%, ***1%.

Table 34

OLS Results for Lack of Management Resources Hampering Innovation

Variables	**Lack of management resources**	**Lack of management resources**	**Lack of management resources**	**Lack of management resources**	**Lack of management resources**
Primary Māori	0.046	0.047	0.053*	0.054*	
	(0.031)	*(0.032)*	*(0.031)*	*(0.031)*	
Kaupapa Māori					0.076*
					(0.040)
Primary Māori - not Kaupapa					0.016
					(0.046)
Year	✓	✓	✓	✓	✓
Location		✓	✓	✓	✓
Industry			✓	✓	✓
Ln(RME)				-0.015***	-0.015***
				(0.004)	*(0.004)*
Constant	0.156***	0.164***	0.177***	0.223***	0.223***
	(0.009)	*(0.012)*	*(0.014)*	*(0.019)*	*(0.019)*
Observations	26,319	26,319	26,319	26,319	26,319
R^2	0.001	0.013	0.019	0.021	0.021

Note. RR3 has been applied to observations as per StatsNZ confidentiality requirements. Clustered standard errors in parenthesis. *10%, **5%, ***1%.

Table 35

OLS Results for Government Regulation Hampering Innovation

Variables	**Government Regulation**	**Government Regulation**	**Government Regulation**	**Government Regulation**	**Government Regulation**
Primary Māori	0.022	0.022	0.016	0.016	
	(0.023)	*(0.022)*	*(0.023)*	*(0.023)*	
Kaupapa Māori					-0.015
					(0.019)
Primary Māori - not Kaupapa					0.069
					(0.048)
Year	✓	✓	✓	✓	✓
Location		✓	✓	✓	✓
Industry			✓	✓	✓
Ln(RME)				-0.001	-0.001
				(0.003)	*(0.003)*
Constant	0.064***	0.058***	0.041***	0.044***	0.044***
	(0.006)	*(0.007)*	*(0.008)*	*(0.011)*	*(0.011)*
Observations	26,319	26,319	26,319	26,319	26,319
R^2	0.002	0.016	0.024	0.024	0.025

Note. RR3 has been applied to observations as per StatsNZ confidentiality requirements. Clustered standard errors in parenthesis. *10%, **5%, ***1%.

Table 36

OLS Results for Lack of Information Hampering Innovation

Variables	**Lack of information**	**Lack of information**	**Lack of information**	**Lack of information**	**Lack of information**
Primary Māori	-0.019***	-0.021***	-0.019**	-0.018**	
	(0.007)	*(0.008)*	*(0.008)*	*(0.008)*	
Kaupapa Māori					-0.011
					(0.012)
Primary Māori - not Kaupapa					-0.031***
					(0.006)
Year	✓	✓	✓	✓	✓
Location		✓	✓	✓	✓
Industry			✓	✓	✓
Ln(RME)				-0.007***	-0.007***
				(0.002)	*(0.002)*
Constant	0.035***	0.040***	0.038***	0.059***	0.059***
	(0.004)	*(0.006)*	*(0.007)*	*(0.010)*	*(0.010)*
Observations	26,319	26,319	26,319	26,319	26,319
R^2	0.001	0.013	0.016	0.017	0.017

Note. RR3 has been applied to observations as per StatsNZ confidentiality requirements. Clustered standard errors in parenthesis. *10%, **5%, ***1%.

Table 37

OLS Results for Lack of Marketing Hampering Innovation

Variables	**Lack of marketing**	**Lack of marketing**	**Lack of marketing**	**Lack of marketing**	**Lack of marketing**
Primary Māori	-0.012	-0.012	-0.009	-0.008	
	(0.012)	*(0.013)*	*(0.013)*	*(0.013)*	
Kaupapa Māori					-0.002
					(0.018)
Primary Māori - not Kaupapa					-0.019
					(0.016)
Year	✓	✓	✓	✓	✓
Location		✓	✓	✓	✓
Industry			✓	✓	✓
Ln(RME)				-0.010***	-0.010***
				(0.002)	*(0.002)*
Constant	0.048***	0.054***	0.060***	0.089***	0.089***
	(0.005)	*(0.007)*	*(0.008)*	*(0.011)*	*(0.011)*
Observations	26,319	26,319	26,319	26,319	26,319
R^2	0	0.011	0.015	0.016	0.016

Note. RR3 has been applied to observations as per StatsNZ confidentiality requirements. Clustered standard errors in parenthesis. *10%, **5%, ***1%.

Table 38

OLS Results for Lack of Cooperation Hampering Innovation

Variables	**Lack of cooperation**	**Lack of cooperation**	**Lack of cooperation**	**Lack of cooperation**	**Lack of cooperation**
Primary Māori	0.003	0.006	0.007	0.007	
	(0.013)	*(0.014)*	*(0.014)*	*(0.014)*	
Kaupapa Māori					0.004
					(0.011)
Primary Māori - not Kaupapa					0.011
					(0.032)
Year	✓	✓	✓	✓	✓
Location		✓	✓	✓	✓
Industry			✓	✓	✓
Ln(RME)				-0.004***	-0.004***
				(0.002)	*(0.002)*
Constant	0.019***	0.027***	0.030***	0.043***	0.043***
	(0.003)	*(0.004)*	*(0.006)*	*(0.008)*	*(0.008)*
Observations	26,319	26,319	26,319	26,319	26,319
R^2	0.001	0.01	0.012	0.013	0.013

Note. RR3 has been applied to observations as per StatsNZ confidentiality requirements. Clustered standard errors in parenthesis. *10%, **5%, ***1%.

Table 39

OLS Results for Lack of Access to IP Hampering Innovation

Variables	**Lack of access to IP**	**Lack of access to IP**	**Lack of access to IP**	**Lack of access to IP**	**Lack of access to IP**
Primary Māori	-0.011**	-0.009*	-0.009**	-0.009*	
	(0.004)	*(0.005)*	*(0.005)*	*(0.005)*	
Kaupapa Māori					-0.007
					(0.006)
Primary Māori - not Kaupapa					-0.014*
					(0.007)
Year	✓	✓	✓	✓	✓
Location		✓	✓	✓	✓
Industry			✓	✓	✓
Ln(RME)				-0.004***	-0.004***
				(0.001)	*(0.001)*
Constant	0.014***	0.019***	0.016***	0.028***	0.028***
	(0.003)	*(0.004)*	*(0.005)*	*(0.006)*	*(0.006)*
Observations	26,316	26,316	26,316	26,316	26,316
R^2	0.001	0.007	0.01	0.011	0.011

Note. RR3 has been applied to observations as per StatsNZ confidentiality requirements. Clustered standard errors in parenthesis. *10%, **5%, ***1%.

Table 40

OLS Results for Lack of Appropriate Personnel Hampering Innovation

Variables	**Lack of appropriate personnel**	**Lack of appropriate personnel**	**Lack of appropriate personnel**	**Lack of appropriate personnel**	**Lack of appropriate personnel**
Primary Māori	0.02	0.023	0.026	0.026	
Kaupapa Māori	*(0.028)*	*(0.028)*	*(0.028)*	*(0.028)*	
					0.021
Primary Māori - not Kaupapa					*(0.030)*
					0.034
Year					*(0.053)*
Location	✓	✓	✓	✓	✓
Industry		✓	✓	✓	✓
Ln(RME)			✓	✓	✓
				-0.003	-0.003
Constant				*(0.003)*	*(0.003)*
	0.088***	0.096***	0.097***	0.107***	0.107***
Observations	26,319	26,319	26,319	26,319	26,319
R^2	0.004	0.013	0.017	0.018	0.018

Note. RR3 has been applied to observations as per StatsNZ confidentiality requirements. Clustered standard errors in parenthesis. *10%, **5%, ***1%.