HERA

HERA Report R5-92

2021

INDUSTRY RESEARCH REPORT

Modelling the potential economic impacts of Construction 4.0 in New Zealand

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Revision	Description	Date	Originator	Reviewer	Approver
V1	First	20/9/2021	KH NR MC	TC	TC

Publisher

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1 Abstract

What is a likely economic impact of the construction industry adopting 4.0 technologies that allow, amongst other things, for more efficient, and more effective communication and task planning? We set out to answer this question using BERL's model of the Aotearoa New Zealand economy.

We begin by building a mathematical picture of the New Zealand economy under a set of assumptions, which closely match the reality of 2021. We then append to this base case model a set of different assumptions matching three scenarios. These scenarios allow us to build up a defensible range for the impact of the construction industry adopting 4.0 technologies that allow for more efficient, and more effective communication and task planning.

Our modelling showed that the outcome of these scenarios could add up to just over $8 billion in GDP over the next five years. Benefits also flow to households and directly to government, to enable further wellbeing activities.

Our modelling clearly demonstrates the benefits of investing in and adopting 4.0 technologies.

2 Introduction

This paper presents the results of a Computable General Equilibrium (CGE) analysis of the potential economic impacts of the uptake of Industry 4.0 technologies in New Zealand's construction industry. In other words, it examines the possible economic effects of a Construction 4.0 revolution. The analysis was undertaken by Business and Economic Research Limited (BERL) for the Heavy Engineering Research Association (HERA).

The definition of Industry 4.0 is not universally agreed upon. However, as cited in a literature review by Cox (2021), CanBIM (2020) records that some commentators talk about Construction 4.0 (Industry 4.0 and Construction 4.0 are equivalent in our report) as the use of ubiquitous connectivity technologies for real-time decision-making. The same publication stated that others see it as a means of finding a coherent complementarity between the main emerging technological approaches in the construction industry. It is also seen as a more encompassing approach that goes beyond the simple technology framework to best meet the industry's current challenges.

Another key concept for understanding the current paper is the idea of productivity. This term is used in multiple official publications and in everyday speech. In economics, productivity refers to getting more of what you want to get, by using less of what must be used.

We begin this report with an introduction to the reasoning behind CGE modelling, before summarising the results that are immediately useful for HERA in understanding how adopting Construction 4.0 technologies will impact the New Zealand economy.

The effect of adopting Industry 4.0 technologies is ambiguous. We understand it will improve productivity in the construction industry, but by precisely how much is unclear. In order to arrive at an estimate we develop three scenarios. In each scenario we illustrate the economic impacts of different rates of additional productivity growth driven by Industry 4.0 technology adoption. To calculate the impact we need to compare each scenario to a base case, or "business as usual" scenario. The business as usual approximates BERL's medium term economic forecast, accounting for the effects of policies adopted during 2020 and 2021 and global instability.

Finally, we present some conclusions.

3 What is CGE modelling?

Computable General Equilibrium (CGE) modelling is one of three main quantitative evaluation methods used in economics. The other two, which are not covered in this paper, are multiplier modelling and regression analysis.

A CGE model is a set of many simultaneous equations (often numbering hundreds or thousands) that describes the interrelationships between all sectors of an economy. For example, one subset of the simultaneous equations describes how consumers purchase different goods. Another subset describes how firms purchase inputs and produce outputs. Other subsets describe investment decisions, input decisions, and all other kinds of decisions in an economy.

CGE modelling is used widely internationally, albeit to a lesser extent in New Zealand, in policy, event, and programme evaluation. Notably, Gieseke (2007) used a CGE model to quantify the economic benefit of the Sydney Olympic Games in Australia. Another example of CGE modelling is that of Nam, Selin, Reilly, and Paltsev (2010). This paper examined the economic and welfare costs of air pollution in Europe using a global CGE model which included modelling of air quality and associated health costs. This tool of quantitative analysis has been used to a lesser extent in New Zealand as it requires specialised skills and extensive data, and there is a scarcity in New Zealand of CGE modellers and academic work in the field.

Previously we used the BERL CGE model in a study in 2011 to quantify what the effect on the New Zealand economy would be if the number of standards was increased by one percent. Standards in this context included all of: safety, product, and performance standards across the economy. This 2011 analysis was similar in spirit to the current analysis because the effect of the proposed change was driven through productivity. And we similarly modelled what impact that increase in productivity might have on the economy.

In theory, a CGE model can be as basic or as complex as the modeller prefers. However, in practice, very simple CGE models are not useful beyond teaching. CGE models adopted for real-world application are developed collaboratively between academic institutions. They are then licensed to practitioners for whom developing a bespoke CGE model is not practical. In BERL's particular case, our CGE model is closely related to a CGE model developed by Victoria University (Australia), but it has been modified by New Zealand academics.

A key feature in CGE modelling is that the model contains a greater number of variables, by default, than the number of equations. This means the model cannot be solved analytically without making assumptions about the excess variables. It is these assumptions which allow us to use the model to simulate an economy in multiple states, and then compare these states.

The basic methodology we use is to make a set of assumptions which approximate the economy to reflect a "business as usual" world. And another set of assumptions which approximate the economy after a series changes. In the case of the current analysis, the change we modelled was the effect of increases in productivity in the construction sector, following uptake of 4.0 technologies. By comparing the changed world to the business as usual world, we can calculate the net effect of the increase in productivity that could result from the adoption of 4.0 technologies

3.1 Caveats

While CGE modelling is a powerful tool for exploring the impact of policy and other changes in the economy, it is important, for the sake of transparency, to outline its limitations.

Approximation by design

A CGE model is necessarily an approximation of the economy at a point in time. It is limited by the underlying logic of understanding the economy as an accounting model of fixed relationships. This logic is necessary but cannot capture all the nuances of an economy.

Further, the equations in our CGE model have been made linear to make the solution computable analytically. Though, mathematically the solution is very good, a linear equation can, at best, only be an approximation of the real world.

Finally the mechanism of solving a CGE is also an approximation. The mathematics would be familiar in an engineering context for modelling all points on a bridge or other structure and all forces on each point. This method of solution implies a different set of approximations in the model.

Aggregation

A CGE model also necessarily must be highly aggregated. While we might conceivably be able to solve billions of equations using modern computing power, we still cannot have an equation for every firm, every industry, and so on. Further, the underlying data is also, by necessity, highly aggregate.

Comparative static analysis

BERL's CGE model simulates the New Zealand economy at a given point in time. We are able to simulate the economy at two points in time and compare them. However, the model does not contain equations which would allow us to simulate the path the economy takes between these two points. The analysis must be comparing two or more end-points, or states. We call this *comparative static* analysis.

Limited scope for decomposition

Later in this report, we summarise our results. It should be understood that these results show the *net* effect of the changes made under our scenarios. In each scenario, the changes made will affect all parts of the economy in multiple ways. It is out of the scope of this analysis to detail all the changes that compose the net effect.

Sensitivity of results to particular assumptions

CGE modelling requires a particular set of assumptions that make the system of simultaneous equations solvable. The results are sensitive to these assumptions in ways that differ from sensitivity to other assumptions, made in scenario design. In particular, the variables we choose to make fixed in order to make a solution possible imposes an assumption that there are no feedbacks from those variables. In our scenarios the economy-wide real wage rate is fixed (and exogenous) which means the effect of the modelled productivity improvements are in the context of a given real wage rate. Any impact there might be on the real wage is not captured by the model results. The trade balance could instead be fixed exogenous but this creates an entirely different context for interpreting the model results.

4 Scenarios modelled

Following from our description of CGE modelling as a comparison between two or more states of the world, we describe the scenarios created for this analysis.

Given the definition by CanBIM (2020) of Construction 4.0 as technologies for improving real-time decision making, we need to understand how to map this to what our CGE model looks at. The best candidate for this is the variables in our CGE model which measure capital and labour productivity.

Conceptually, if construction firms have technologies which enable them to make better real-time decisions, we should expect a change in the productivity of all factors – capital and labour. This could occur in labour if 4.0 technologies allow firms to allocate workers over jobsites more efficiently, as one example. Capital productivity might be improved as better real-time decisions mean less materials are wasted or machines spend less time idle. There are a limitless number of specific mechanisms that will drive increased labour and capital productivity, depending on the specifics of each construction firm. The impact would be felt differentially across all areas of the country, all types of construction businesses, and all individual firms.

When we map this conceptual effect onto our CGE model we can approximate the complexity of the real world. In particular, we must set a one-off increase in labour and capital productivity to all firms in each of the residential construction, and other construction industries (including industrial and commercial construction, and civil engineering) in aggregate. This implies an assumption that every construction firm is the same.

4.1 The base case

As indicated above, a CGE model analysis compares two situations. To develop a rich picture of what happens when we change the economy in some way, we need to build a picture of the starting situation, *i.e.* what the economy looks like as of 2021. We then forecast this forward under the assumption that there is no adoption of Industry 4.0 technologies. This is called the base case. The base case is intended to roughly describe how the New Zealand economy evolves, even in the absence of the adoption of Industry 4.0 technologies in construction.

The assumptions that go into the base case have been developed to approximate the New Zealand economy as at 2021, and BERL's view of what a reasonable path is from 2021 to 2026. This analysis has been undertaken following the emergence of a novel coronavirus in 2020. The response to the emergence of this virus was to suspend most normal economic activity in almost every country in the world. This response has created significant constraints in labour markets and supply chains across the world, so that people could avoid as much interaction as possible to prevent the spread of the virus. In New Zealand the labour supply will be significantly constrained for the foreseeable future. As of 2021 the economy is recovering, despite ongoing restrictions and uncertainty. We have designed our base case to roughly describe this ongoing recovery, as well as new constraints that have emerged in the labour market and other key supply chains over 2020 and 2021.

At the time of writing, the New Zealand economy was feeling the effects of another round of restrictions on economic activity that started in August 2021. However, experience of past restrictions (in 2020) suggests that the construction sector is likely to be largely unscathed by the current lockdown. At least from the demand side, but supply chains and labour shortages are obvious. Accordingly, we have assumed no COVID effect in our modelling apart from those affecting the supply side.

For brevity, we will not specify every assumption that goes into the base case, but we wish to draw attention to a key assumption: that employment growth is fixed. CGE modelling requires a number of variables to be held constant in any given simulation. This requirement is driven by the mechanism used to arrive at a solution to the simultaneous equations. One variable we chose to hold constant is the rate of increase in employment. This assumption accurately reflects the labour constraints New Zealand will face in 2021 to 2026, which are particularly felt in the construction industry. However, given this assumption, we cannot estimate a change in employment from an increase in productivity brought about by adopting Industry 4.0 technologies.

4.2 The scenarios

To simulate the economy after the adoption of Industry 4.0 technologies in construction, we build on the base case scenario by changing the variables that measure growth in capital and labour productivity in residential and other construction.

The three scenarios we construct are:

- Least optimistic, we assume that productivity growth in non-residential construction would be twice as fast in the next five years as it has been during the past 20 years, while productivity growth in the residential construction sector would be 50 percent faster than in the past.
- Middle ground, we assume that productivity growth in both non-residential construction and residential construction would be twice as fast in the next five years as it has been during the past 20 years.
- Most optimistic, we assume that productivity growth in non-residential construction would be three times as fast in the next five years as it has been during the past 20 years, while productivity growth in the residential construction sector would be twice as fast as in the past.

We summarise our scenarios in the table below. In this table the base case represents the growth in productivity we have seen over the last 20 years. This is drawn from official statistics.

Per annum productivity growth % 2021 – 2026				
	Base case	Least optimistic	Middle ground	Most optimistic
Residential construction				
Labour productivity	2.1	3.1	4.2	4.2
Capital productivity	2.6	3.9	5.1	5.1
Commercial construction				
Labour productivity	1.4	2.7	2.7	4.1
Capital productivity	1.7	3.4	3.4	5.0

Table 1: Scenario summary

5 The findings

In this section we present the findings of our analysis. As we noted earlier, CGE modelling is a comparative static analysis, we compare one state of the world to another. Accordingly, in each of our results, we will show the growth of the variable in the base case, as well as in each scenario.

5.1 Key macroeconomic variables

The scenario modelling yielded a plethora of economic statistics, we present a selection of what we regard as key indicators.

The first variable of interest is real GDP (*i.e.* adjusted for inflation). What we are interested in is the marginal effect of the adoption of Industry 4.0 technologies in construction. *i.e.* the "extra" real GDP.

We use our CGE calculated results, combined with official statistics, to calculate how much extra GDP would be generated in New Zealand over the period from 2021 to 2026 if Industry 4.0 technologies are taken up in construction. We summarise this in Figure 1.

The results show that in the first year after adopting (2022) Industry 4.0 technologies in construction it would add between $255 and $493 million in real GDP. In the fifth year of our scenario (2026), the results show that real GDP could be between $1,435 and $2,771 million greater than the base case scenario.

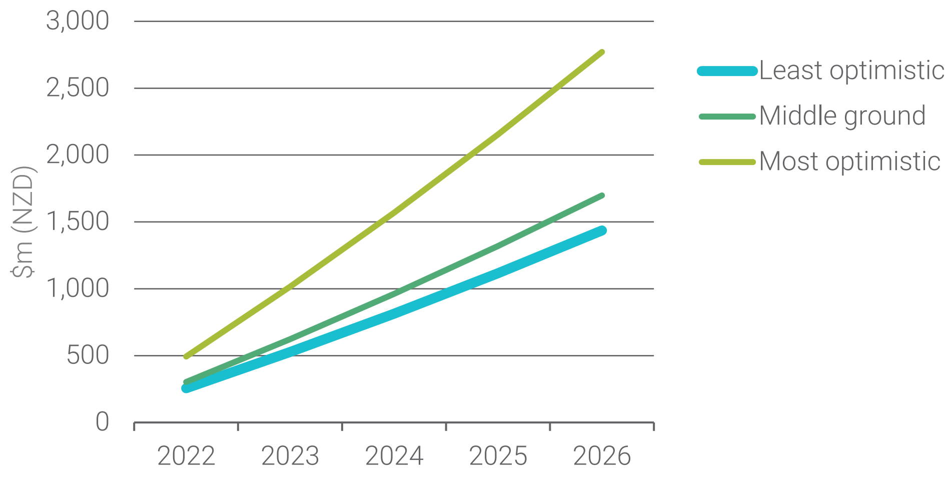

Figure 1: Increase in real GDP ($m NZD), under three scenarios 2006 - 2026

The next variable we focus on is household consumption. This is a key part of real GDP and roughly measures the real income of households. Income of households is an important indicator in measuring wellbeing.

As with real GDP above, we calculate the marginal effect on household consumption in dollars, by using our CGE results combined with official statistics. We summarise the results in Figure 2.

The results show that in the first year after Industry 4.0 technologies are adopted in construction, household consumption will increase by between $111 and $214 million. At the end of our forecast period (2026) household consumption will be between $618 and $1,190 million greater than in the base case.

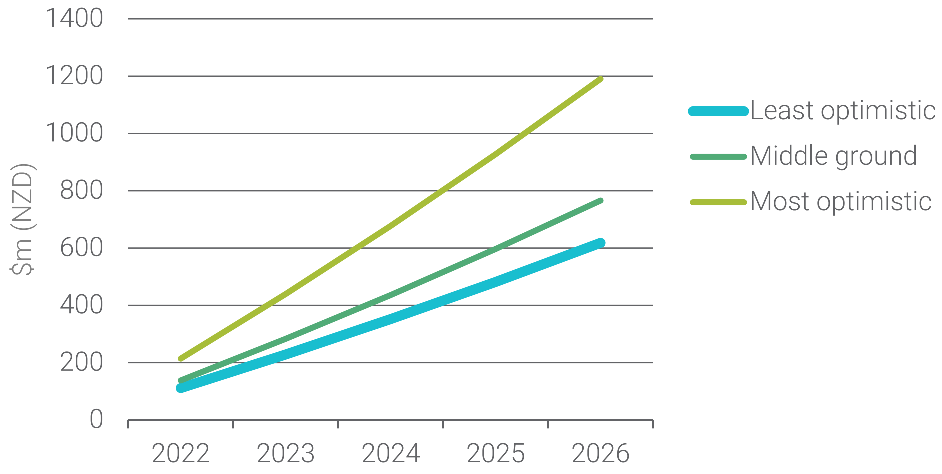

Figure 2: Increase in household consumption ($m NZD), 2006 - 2026

To show the differences between the base case and the scenarios we summarise the total percentage growth in these variables between 2021 and 2026 in Table 2. The results show that, in the base case, real GDP grows by 15.2 percent, household consumption grows 13.8 percent, price inflation grows 13.2 percent, and wages grow 12.5 percent from 2021 – 2026.

Total percent change 2021-2026				
Macro series		+ … to base case		
	Base case	Least optimistic	Middle ground	Most optimistic
Real GDP	15.2	0.5	0.6	1.1
Household consumption	13.8	0.4	0.5	0.7
CPI (price inflation)	13.2	0.0	0.1	0.1
Wages	12.5	0.2	0.1	0.3

Table 2: Total percent change in macro variables, 2021 – 2026

The base case column in this table shows the total growth of the variable over the period of 2021 – 2026. Each of the scenario columns shows the marginal impact of that scenario's assumptions on total growth, this should be read as "base case plus …"

The least optimistic scenario adds 0.5, 0.4, 0, and 0.2 percentage points to these growth rates. This results in total growth of 15.7, 14.2, 13.2, and 12.7 percent, respectively. The middle ground scenario adds 0.6, 0.5, 0.1, and 0.1 percentage points. And the most optimistic scenario adds 1.1, 0.7, 0.1, and 0.3 percentage points to each variable's growth, respectively.

Translating the percentages into dollar values, we calculate that, over the five years from 2021 to 2026 adopting Industry 4.0 technologies could add up to $8 billion in real GDP to the New Zealand economy as shown in Table 3. To illustrate the magnitude of this gain, it is equivalent to more than one third of the GDP of the entire primary sector in one year.

Similarly, by adopting Industry 4.0 technologies in construction the results show that household consumption could increase by up to $3.4 billion over the five years between 2021 and 2026.

Total value change 2021-2026 ($ million)				
Macro series	Base case	Least optimistic	Middle ground	Most optimistic
Real GDP	-	4,148.4	4,904.9	8,001.1
Household consumption	-	1,791.8	2,219.8	3,448.9

Table 3: Total value of adopting Industry 4.0 technologies in construction

5.2 Other key variables

We could present findings for many aspects of the economy, but we are confident that the most useful results for HERA are measures that focus on gains to households, and measures that focus on gains to government.

The first variable we summarise is household consumption, broken down by household income quintile. This measure is particular to BERL's CGE model. It can be used to provide a rough idea of how Industry 4.0 technology adoption in construction might affect material inequality in New Zealand from 2021 – 2026.

As with Table 2, we show the base case growth of household income from 2021 – 2026. And then provide the marginal impact of each scenario which should be read as "base case plus …" The results indicate that in each scenario the middle household income quintile grows the fastest. This reflects the particular mix of people employed in the construction sector, as well as the assumptions built into the base case of our model. We summarise this in Table 4.

The results show that the bottom household income quintile will have the lowest growth in consumption from 2021 – 2026. This is an important finding; inequality is a key part of the government's wellbeing framework and is an issue the New Zealand government has been trying to address. Although the lower quintile households enjoy the lowest growth in consumption, the middle quintile enjoys the highest and the high and top quintile enjoy a little less. This describes a situation of the gap between the middle and highest quintiles decreasing, which is a step toward decreasing inequality. The fact that inequality can be partially addressed through key investment in different industries offers an additional tool.

Household consumption				
Household income	Total percent change 2021-2026			
	+ … to base case			
	Base case	Least optimistic	Middle ground	Most optimistic
Bottom	13.0	0.3	0.3	0.5
Low	13.6	0.4	0.5	0.8
Mid	15.0	0.6	0.7	1.1
High	13.0	0.4	0.5	0.8
Top	14.1	0.3	0.4	0.5

Table 4: Total percentage growth of household consumption, by household income quintile, 2021 - 2026

In a similar vein, we can describe the impact adopting Industry 4.0 technologies in the construction sector has on household income, again by household income quintile. We summarise this in Table 5.

The results show that across all three scenarios the bottom income quintile has the lowest gains. And the middle-income quintile has the greatest gains. Again, this is driven both by the assumptions built into the model about household income quintiles and by the shocks to productivity of the residential and other construction industries.

Household income				
Household income	Total percent change 2021-2026			
	+ … to base case			
	Base case	Least optimistic	Middle ground	Most optimistic
Bottom	23.8	0.2	0.1	0.3
Low	24.4	0.3	0.3	0.6
Mid	25.9	0.5	0.6	0.9
High	23.7	0.3	0.4	0.6
Top	24.9	0.2	0.3	0.3

Table 5: Total percentage growth in household income by household income quintile, 2021 – 2026

Next, in Table 6, we break down the increase in wages for each household income quintile under each scenario. The results show that the reason the bottom household income quintile has lower consumption and income growth is because wage growth for this quintile is negative in our scenarios.

This reflects the assumptions built into the base case of a pessimistic view for unskilled labour throughout the economy. It also reflects the nature of the labour force in construction.

Wages				
Household income	Total percent change 2021-2026			
	+ … to base case			
	Base case	Least optimistic	Middle ground	Most optimistic
Bottom	23.1	-0.3	-0.7	-0.5
Low	25.4	0.4	0.4	0.8
Mid	26.0	0.6	0.7	1.1
High	22.4	0.3	0.4	0.6
Top	22.3	0.0	0.1	0.0

Table 6: Total percentage growth in wages, by household income quintile, 2021 - 2026

The next variable we summarise is the change in income by source of income. We summarise this in Table 7.

Our CGE modelling shows that, across all scenarios, the greatest growth by source of income is in the growth of the services rendered by home ownership. This is a synthetic measurement which aims to estimate how much owning a home adds to a household's income, in terms of rent paid to the household by the household in some sense. We have this variable growing fast in our base case scenario as well, to reflect the present state of the world.

The second fastest growing source of income is business profits. This is driven by the increased productivity of the construction sector improving profitability across the whole economy.

The other variable of particular interest is the negative growth in unemployment benefit income. This is driven both by our base case assumptions as well as the effect on employment in the scenarios. Increased labour productivity in the construction sector increases employment, as does increased capital productivity.

Total percent change 2021-2026				
Household income	+ … to base case			
	Base case	Least optimistic	Middle ground	Most optimistic
Profits	29.8	0.4	0.5	0.9
Home ownership (OOD)	66.9	3.3	4.1	6.3
NZ Super	28.2	0.2	0.2	0.4
Unemployment benefit	-12.2	0.1	0.1	0.3
Other welfare	19.0	0.0	0.1	0.1
Other	19.6	0.0	0.1	0.1

Table 7: Total percentage growth in household income, by source, 2021 - 2026

Finally, in Table 8, we summarise how government spending can evolve over the next five years, given the adoption of Industry 4.0 technologies in construction.

The largest effect is seen on government other spending. This category includes all those "special" investments into the economy such as the Provincial Growth Fund, or other large infrastructure projects.

The results show that the second largest effect will be in government consumption spending. Government consumption spending is what we would describe as the regular investments government makes into the economy. It includes all the regular maintenance of infrastructure, schools, hospitals, etc.

In this way we can show how the adoption of Industry 4.0 technologies can enable government to deliver wellbeing.

Total percent change 2021-2026				
Government spending		+ … to base case		
	Base case	Least optimistic	Middle ground	Most optimistic
NZ Super	28.2	0.2	0.2	0.4
Unemployment benefit	-12.2	0.1	0.1	0.3
Other welfare	19.0	0.0	0.1	0.1
Consumption spending	14.8	0.2	0.3	0.4
Other spending	26.6	0.3	0.4	0.6

Table 8: Total percentage growth in government spending, by spend type, 2021 - 2026

Also of interest is a measure of how much production increases in each industry, and we provide this in an appendix. These results are interesting, as there are large impacts in the forestry and logging industry as well as reasonably large impacts in each manufacturing industry. This suggests that the increases in productivity from adopting Industry 4.0 technologies will flow up stream (to loggers) as well as downstream (to the users of commercial buildings).

6 Conclusions

While previous research, cited by Cox (2021), indicated that the uptake of 4.0 technologies in construction could have significant economic impacts, the results from that research were not generally presented at granular level, and the way in which they were obtained was not often clear. In this paper, we have attempted to provide more detailed results and have been specific about how they were obtained.

It is uncertain exactly how large the construction industry performance improvements associated with the uptake of 4.0 technologies will be. Consequently, we developed credible scenarios for 4.0 technology-induced productivity gains in the industry, and we then used CGE modelling to indicate how different aspects of the New Zealand economy would be affected under the different scenarios.

Our modelling indicates that the economic gains are likely to be significant. We needed to be selective in the results we presented, but we showed, amongst other things, that GDP and wages would be boosted. The results show that, under the most optimistic scenario total GDP gained could be $8 billion over 2021 to 2026, compared to the base case. Wages across the economy could increase by almost $3.5 billion over the coming five years. The results also show that, because of the interconnectedness of the economy, output will increase, to a greater or lesser extent, in virtually all sectors in our model, even under the pessimistic scenario.

We also showed which groups of households would benefit most and least. The results show that the middle quintile of household earners will enjoy the most rapid consumption growth under all scenarios. Our results also show how a faster growing economy would result in an improvement in the ability of government to fund its spending programmes. In addition, we showed that, as well as the construction industry benefitting, other industries would also increase their output.

Overall, the effect of adopting 4.0 technologies in construction will be positive and widespread. The challenge will be to encourage the uptake of the technologies.

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Appendix A: Effect on industry output

In this appendix we present a table showing the total impact of adopting Industry 4.0 technology in construction has on every industry in the economy. This is measured in terms of increase in output.

We split this table into two to easily fit on an A4 page.

Total percent change 2021-2026				
		+ … to base case		
Industry output	Base case	Least optimistic	Middle ground	Most optimistic
Horticulture	17.8	0.7	0.8	1.4
Sheep and beef farming	13.0	0.5	0.6	1.0
Dairy farming	10.8	0.4	0.5	0.8
Other farming	14.3	0.6	0.6	1.1
Forestry and logging	22.5	1.3	1.5	2.5
Fishing and aquaculture	19.3	0.8	0.9	1.4
Fishing support services	15.2	0.7	0.8	1.3
Mining	14.8	0.6	0.7	1.2
Oil and gas	19.1	0.9	1.1	1.8
Mining exploration	19.9	1.0	1.1	2.0
Meat processing	11.6	0.4	0.5	0.8
Dairy processing	10.6	0.4	0.4	0.8
Other food manufacturing	18.0	0.7	0.8	1.3
Beverage manufacturing	21.5	0.8	1.0	1.6
Textile and leather	19.4	1.0	1.1	1.9
Wood processing	22.0	0.8	0.9	1.5
Paper processing	18.7	0.9	1.0	1.7
Printing	19.0	0.7	0.8	1.3
Petroleum and coal	14.3	0.8	0.9	1.5
Chemical manufacturing	17.4	0.9	1.1	1.8
Polymer product	17.3	0.7	0.9	1.4
Non metal mineral	20.0	0.7	0.9	1.4
Metal product manufacturing	18.1	0.7	0.8	1.3
Fabrication	21.7	0.8	0.9	1.6
Transport	23.6	0.8	1.0	1.6
Electronic manufacturing	23.4	1.0	1.1	1.9
other manufacturing	22.3	1.0	1.1	1.9

Total percent change 2021-2026

		+ … to base case		
Industry output	Base case	Least optimistic	Middle ground	Most optimistic
Electricity and gas	17.7	0.7	0.8	1.3
Water supply	11.1	0.4	0.5	0.8
Residential construction	21.1	0.1	0.1	0.2
Other construction	19.7	0.9	1.0	1.8
Construction services	18.4	0.7	0.7	1.3
Material wholesaling	18.5	0.7	0.8	1.3
Grocery wholesaling	18.9	0.7	0.8	1.3
Retail	18.6	0.6	0.7	1.2
Other retail	18.1	0.6	0.7	1.1
Accommodation and food	23.2	0.7	0.9	1.4
Road transport	18.0	0.7	0.8	1.3
Rail transport	19.4	0.7	0.8	1.4
Air transport	33.2	1.1	1.3	2.1
Other transport	21.7	0.8	0.9	1.5
Publishing	20.9	0.8	0.9	1.5
Telecommunications	18.4	0.7	0.8	1.3
Financial services	16.2	0.5	0.6	1.0
Rental hiring	20.2	0.8	0.9	1.5
Real estate	12.3	0.4	0.4	0.7
Owner occupied	5.2	0.0	0.0	0.0
Scientific services	19.2	0.7	0.8	1.4
Business services	19.4	0.7	0.8	1.3
Cleaning and pest control	17.6	0.6	0.7	1.2
Government administration	8.1	0.4	0.5	0.8
Schools	8.7	0.4	0.5	0.7
Other education	13.9	0.5	0.6	0.9
Hospitals	7.6	0.4	0.5	0.7
Other healthcare	10.3	0.4	0.5	0.8
Heritage and art	16.6	0.5	0.7	1.0
Personal services	19.2	0.6	0.8	1.2

Table 9: Total effect on output by industry 2021 - 2026

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