ACIL ALLEN CONSULTING

REPORT TO
THE UNIVERSITY OF MELBOURNE AND RMIT
AUGUST 2019

FISHERMANS BEND CAMPUS DEVELOPMENTS

ECONOMIC IMPACTS ON VICTORIA

DRAFT REPORT

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EXECUTIVE SUMMARY

ACIL Allen Consulting has been commissioned by The University of Melbourne and RMIT to analyse the projected economic impacts of the universities' planned campus developments at Fishermans Bend on Victoria.

New university campuses at Fishermans Bend

The co-location of RMIT University and The University of Melbourne would position Fishermans Bend as a global centre of Engineering educational and research excellence. It provides an opportunity to blend two distinct but synergistic approaches in the field of engineering: RMIT's approach with its emphasis on application and problem-based learning across a set of undergraduate and postgraduate engineering programs and The University of Melbourne's reflective and research-focused approach centring on a comprehensive suite of postgraduate programs.

RMIT has a large market share of vocational education in Victoria, facilitating important pathways into higher education. It also maintains a very high market share of undergraduate Engineering enrolments in Victoria (approximately 38 per cent in 2016), and the engineering program was ranked in the top 100 globally in 2018 by QS. It also has a 17 per cent market share of enrolment in postgraduate coursework in Engineering in Victoria.

The University of Melbourne offers engineering at the postgraduate level after students complete a generalist bachelor's program. Its market share of postgraduate coursework engineering in Victoria was 48 per cent in 2016, and the university's engineering program was ranked 27th globally in 2018 by QS.

The co-location of The University of Melbourne and RMIT University at Fishermans Bend would facilitate increased pathways and opportunities for shared project and student/research-led initiatives.

Year-by-year economic impacts

ACIL Allen has assessed four key drivers of the economic impact of the planned campus developments at Fishermans Bend by Melbourne University and RMIT:

1. Impact of capital expenditure on campus infrastructure as well as the impact of increased university recurrent expenditures
2. Impact of increased student expenditure and associated visitor expenditure
3. Impact of additional research enabled by the new campuses on industry productivity and value added
4. Impact of additional university and VET graduates in enlarging the skilled workforce in Victoria.

Impact on Victoria's Gross State Product

The year-by-year impact of Melbourne University's and RMIT's Fishermans Bend campuses on Victoria's Gross State Product (GSP) between FY2018 and FY2040 is shown in Figure ES 1.

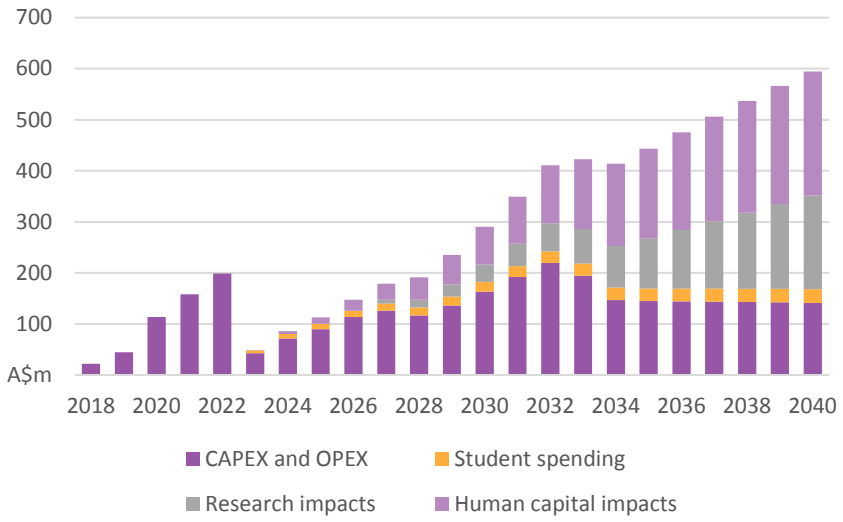
GSP is the monetary value of all finished goods and services produced in Victoria and is equal to the sum of the gross value added of all businesses located in the state. It is the most commonly used indicator of the size of the state's economy.

By the end of the analysis period in FY2040, the two campuses at Fishermans Bend are projected to contribute $595.84 million in 2019 dollars towards Victoria's GSP.

The breakdown of the additional GSP in FY2040 is as follows:

- $141.23 due to capital and additional recurrent expenditures
- $26.75 million due to additional student spending
- $184.00 million due to the impact of additional research on industry productivity
- $242.35 million due to the additional human capital associated with the increased number of graduates working in Victoria.

FIGURE ES 1 YEAR-BY-YEAR IMPACT OF MELBOURNE UNIVERSITY'S AND RMIT'S FISHERMANS BEND CAMPUSES ON VICTORIA'S GROSS STATE PRODUCT, FY2018 TO FY2040 ($M, 2019 DOLLARS)



SOURCE: ACIL ALLEN CONSULTING

Impact on employment in Victoria

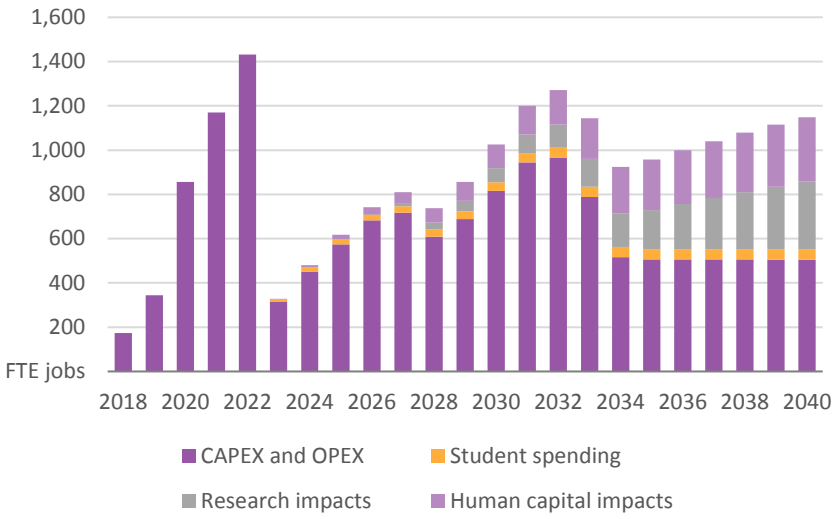
The year-by-year impact of Melbourne University's and RMIT's Fishermans Bend campuses on Full-Time Equivalent (FTE) employment in Victoria between FY2018 and FY2040 is shown in Figure ES 2.

By the end of the analysis period in FY2040, the two campuses are projected to contribute an additional 1,148 FTEs towards Victoria's employment.

The breakdown of the additional employment in FY2040 is as follows:

- 504.5 FTEs due to capital and additional recurrent expenditures
- 47.1 FTEs due to additional student spending
- 307.9 FTEs due to the impact of additional research on industry productivity
- 288.5 FTEs due to the additional human capital associated with the increased number of graduates in Victoria.

FIGURE ES 2 YEAR-BY-YEAR IMPACT OF MELBOURNE UNIVERSITY'S AND RMIT'S FISHERMANS BEND CAMPUSES ON VICTORIA'S EMPLOYMENT, FY2018 TO FY2040 (FTE'S)



SOURCE: ACIL ALLEN CONSULTING

Cumulative economic impacts

The *cumulative* impacts of the Fishermans Bend campuses of Melbourne University and RMIT on the Victorian economy to FY2040 are shown in Table ES 1.

TABLE ES 1 CUMULATIVE IMPACT OF MELBOURNE UNIVERSITY'S AND RMIT'S FISHERMANS BEND CAMPUSES ON VICTORIA'S REAL GSP AND EMPLOYMENT, FY2018 TO FY2040

	Real GSP		Employment	
	Total	NPV @4% real discount rate	Total	Annual average
	A$m	A$m	FTE jobs	FTE jobs
Construction and operations	3,009	1,910	15,074	655
Induced student and visitor spend	349	196	679	30
Research program	1,173	580	2,082	91
Human capital	2,016	1,034	2,616	114
Total	6,547	3,720	20,451	889

SOURCE: ACIL ALLEN CONSULTING

The Fishermans Bend campuses of Melbourne University and RMIT are projected to generate a cumulative impact of $3,720 million in 2019 dollars on Victoria's GSP to FY2040 in present value terms (under a 4 per cent real discount rate).

Over that period, the two campuses are projected to generate a total employment gain of 20,451 FTEs (or an average of 889 FTEs each year).

The modelling results suggest that the Fishermans Bend campuses would be a significant contributor to the Victorian economy in the years to come.

1 INTRODUCTION

ACIL Allen Consulting (ACIL Allen) has been commissioned by The University of Melbourne and RMIT to analyse the projected economic impacts of the universities' planned campus developments at Fishermans Bend on Victoria.

1.1 Background and context

The University of Melbourne has purchased land at Fishermans Bend to establish a new campus and expand the Melbourne School of Engineering (MSE) as well as the Melbourne School of Design (Faculty of Architecture, Building and Planning (ABP)).

The project aims to build future engineering, IT and other leaders by creating a 21st century campus located five kilometres from the city. Part of Australia's largest urban renewal project across two municipalities, Fishermans Bend is located in the City of Melbourne and the City of Port Phillip.

Set to open in the early 2024, the new campus will enable engineering, IT, architecture, building, planning and other students and academics to connect and collaborate with leading local and international organisations, across the aerospace, automotive, energy, manufacturing, water, food, mining, defence and infrastructure sectors.

Co-location amongst world industry leaders in design, engineering and technology will enable seamless, intellectual collaboration between students, academics and industry practitioners.

Focussed on green industry and innovation, the new campus will feature large-scale research platform facilities, such as wind and water tunnels, smart grid technologies, electric vehicle and engine propulsion testing, as well as autonomous vehicles testing. It is the university's intention that these facilities will drive research and innovation to address socially and environmentally significant issues affecting the world.

Buildings at Melbourne University's Fishermans Bend campus will hold very high ratings around energy use, recycling and waste management, aligned with the University's Sustainability Plan.

RMIT is also planning to build a new engineering-focused campus at Fishermans Bend. The campus, which will offer both Vocational Education and Training (VET) and higher education programs, will complement the institution's existing Melbourne City Campus and Bundoora Campus.

RMIT has had a long relationship with Boeing Australia, which is located at Fishermans Bend. In 2016, the university signed a new, four-year collaborative research agreement with Boeing that supports and enhances strategic research ties between the two organisations and provide RMIT graduate students with opportunities that can lead to career possibilities in aerospace and other high-tech industries.

Areas of interest to be explored during this next phase of the decades-long Boeing/RMIT relationship include improved design and advanced manufacturing processes. In addition to research, RMIT will establish its first Boeing Professor of Aerospace.

The co-location of RMIT University and The University of Melbourne would position Fishermans Bend as a global centre of Engineering educational and research excellence. It provides an opportunity to blend two distinct approaches in the field of engineering: RMIT's approach with its emphasis on application and problem-based learning across a set of undergraduate and postgraduate engineering programs and The University of Melbourne's reflective and research-focused approach centring on a comprehensive suite of postgraduate programs.

The two universities wish to gain a greater understanding of the likely impacts of their planned campus developments at Fishermans Bend on the Victorian state economy.

1.2 Study objective

The main objective of the study is for The University of Melbourne and RMIT to gain an in-depth understanding of the economic impacts and benefits that their planned development of new campuses at Fishermans Bend will have on Victoria over the next two decades.

The universities plan to share the key findings of the study with important stakeholders such as the Victorian Government and local government, so that comprehensive planning and investment can be undertaken to ensure that high-quality infrastructure (such as public transport infrastructure) will be in place to support the operations of the campuses as well as the students and staff at the two campuses.

1.3 Study approach

For the economic impact modelling exercise, ACIL Allen was provided with the following information and data from Melbourne University and RMIT:

- Capital expenditure for the campus development projects
- Incremental operating expenditure associated with the running of the new campuses at Fishermans Bend
- Projected number of additional engineering, architecture/building/planning and other graduates (VET and higher education) made possible by the new campuses
- Proportion of these students who would otherwise have studied at other Victorian universities or other Australian universities in the absence of the new campuses at Fishermans Bend
- Likely proportion of graduates that will remain in Victoria for work upon completion of their courses at Melbourne University and RMIT
- Types and quantum of research that will be undertaken at the new campuses.

To assess the economic impacts and benefits of the two planned campuses at Fishermans Bend, ACIL Allen deployed our in-house model of the Australian economy, *Tasman Global*. *Tasman Global* is a large-scale, dynamic, Computable General Equilibrium (CGE) model that is a powerful tool for undertaking economic analysis at the regional, state, national and global levels.

Details of the modelling methodology and process are described in the next chapter of the report.

1.4 Report structure

This report is structured as follows:

- Chapter 2 describes the modelling methodology adopted by ACIL Allen for the economic impact analysis of the Melbourne University and RMIT Fishermans Bend campuses
- Chapter 3 presents the results of ACIL Allen's modelling in terms of the *year-by-year* impacts of the two campuses on Victoria's Gross State Product (GSP) and employment to FY2040

Chapter 4 discusses the *cumulative* impacts to FY2040 of the two campuses on Victoria's GSP and employment.

2 MODELLING APPROACH AND METHODOLOGY

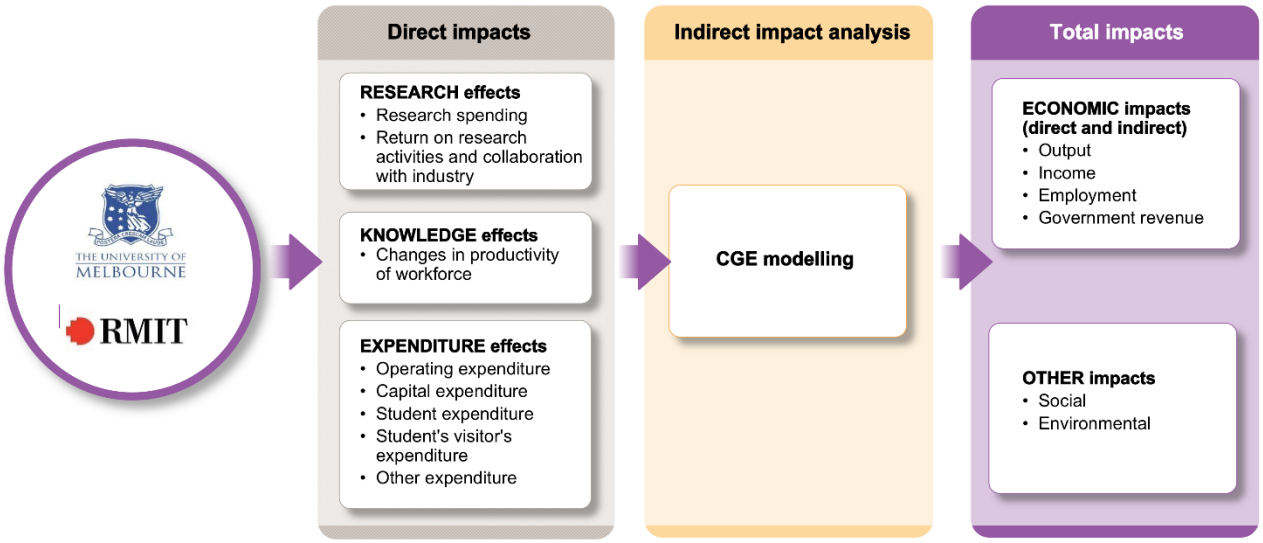
ACIL Allen has assessed four key economic impacts of Melbourne University's and RMIT's planned new campuses at Fishermans Bend on Victoria:

1. Impact of capital expenditure on campus infrastructure as well as the impact of increased university recurrent expenditures
2. Impact of increased student expenditure and associated visitor expenditure
3. Impact of additional research enabled by the new campuses on industry productivity and value added
4. Impact of additional university and VET graduates in enlarging the skilled workforce in Victoria (human capital impact / knowledge effect).

2.1 Overview of approach

ACIL Allen's analytical framework for analysing the impacts of Melbourne University's and RMIT's Fishermans Bend campuses is shown in Figure 2.1.

FIGURE 2.1 ECONOMIC IMPACT ANALYTICAL FRAMEWORK



SOURCE: ACIL ALLEN CONSULTING

ACIL Allen has estimated both the direct economic impacts of the Fishermans Bend campuses and the indirect, flow-on impacts. The direct impacts arise from three main channels:

1. The research activities generated by Melbourne University (MSE and ABP) and RMIT at their Fishermans Bend campuses
2. The expenditures (capital, operational and student) associated with the Fishermans Bend campuses
3. The human capital embodied in the increased number of Melbourne University (MSE and ABP) and RMIT graduates made possible by the infrastructure and staff expansion.

The Fishermans Bend campuses will have economic impacts that go well beyond the initial direct impacts. For example, the firms benefitting from collaborative research with Melbourne University and RMIT will experience increased demand for their more innovative products and services, which will in turn increase demand for inputs from their suppliers, and so on.

To assess the total economic implications of Melbourne University's and RMIT's Fishermans Bend campuses, ACIL Allen has deployed our in-house model of the Australian economy, *Tasman Global*. *Tasman Global* is a large-scale, dynamic, Computable General Equilibrium (CGE) model that is a powerful tool for undertaking economic analysis at the regional, state, national and global levels.

The CGE framework allows an estimate of the total economic impacts (that is, both direct and indirect impacts) of the two Fishermans Bend campuses. Unlike the more simplistic input-output analysis, CGE models have greater credibility because they incorporate price adjustments and economy-wide resource constraints. More details on *Tasman Global* are provided in Appendix A.

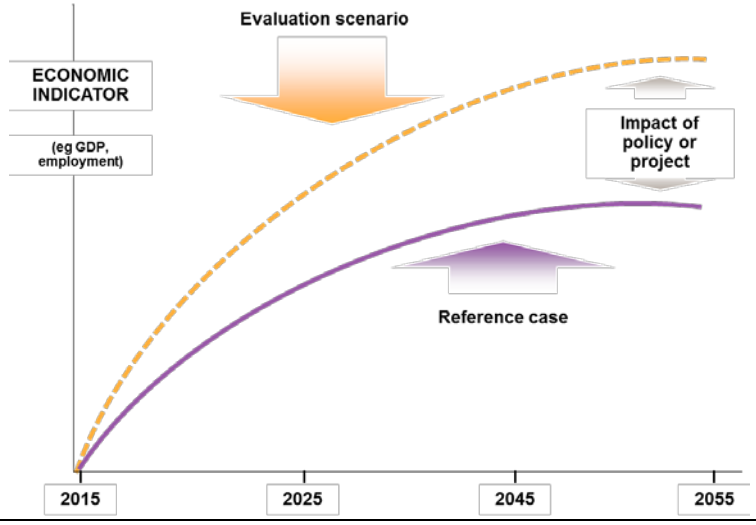
To estimate the impact of the Fishermans Bend campuses on the state and national economies, it was necessary to determine:

— *a 'baseline' scenario (or reference case)* — a scenario projecting the future development of the economy under business-as-usual assumptions about macroeconomic variables and structural trends, including growth of the two universities without the Fishermans Bend campuses. The baseline scenario is used as a benchmark with which to compare the results of the reference scenario

— *an evaluation scenario* — a scenario estimating how different the future of the economy would look as a result of the development of the two new campuses at Fishermans Bend.

The difference between the baseline and evaluation scenario allows us to quantify the impacts of the incremental change in the economy as a result of the Melbourne University and RMIT campuses at Fishermans Bend, as depicted in Figure 2.2.

FIGURE 2.2 ILLUSTRATIVE SCENARIO USING A CGE MODEL OF THE AUSTRALIAN ECONOMY



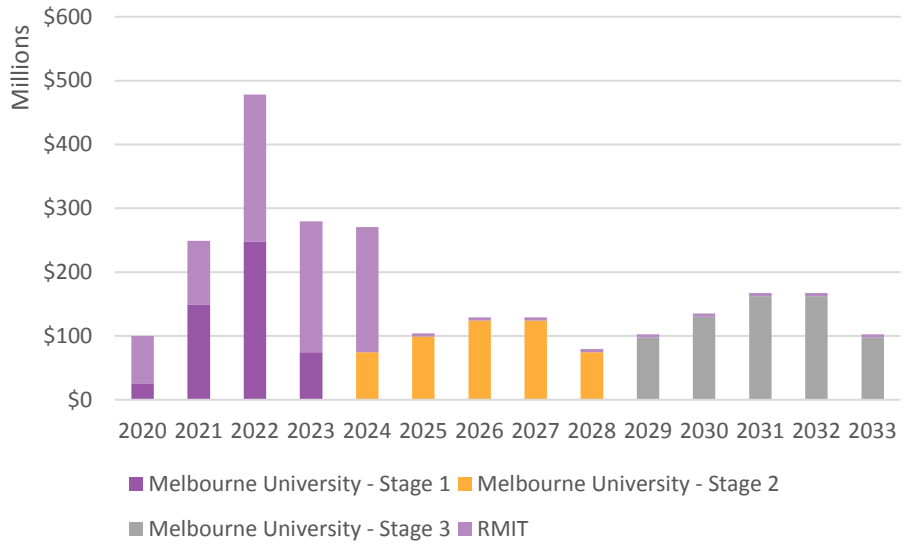
SOURCE: ACIL ALLEN CONSULTING

2.2 Analysis of the impact of capital expenditures

ACIL Allen analysed the economic impacts of the estimated $2.493 billion combined planned capital expenditures by Melbourne University and RMIT in their Fishermans Bend campuses.

A breakdown of capital expenditures by year and by phase between FY2020 and FY2033 (that is between 2019-20 and 2032-33) is shown in Figure 2.3.

FIGURE 2.3 FISHERMANS BEND CAMPUSES CAPITAL EXPENDITURE BY YEAR, FY2020 TO FY2033



SOURCE: MSE

2.3 Analysis of the impact of increased recurrent expenditures

The increase in Melbourne University's and RMIT's recurrent expenditure as a result of the two new campuses at Fishermans Bend will have a direct effect on economic activity, raising demand for regional goods and services. This contribution arises from the following:

— Increased salaries and wages paid to university employees

— Increased direct university expenditures for goods and services, including non-construction and non-capital materials, supplies, equipment, services and utilities.

ACIL Allen used data from RMIT's and Melbourne University's MSE and ABP projected future budgets to estimate the economic impacts of the increase in recurrent expenditure.

2.4 Analysis of the impact of increased student and visitor expenditures

The expenditures of the additional Melbourne University and RMIT students made possible by the development of the Fishermans Bend campuses were estimated using data from the 2013 Universities Australia *Study of the Financial Circumstances of Domestic and International Students in Australia's Universities*, which surveyed students on their expenditure by type during 2012, adjusted for inflation.

The increase in Melbourne University and RMIT students will lead to increased spending in Victoria by interstate and overseas friends and relatives of these students. According to Giesecke and Madden (2006), data from the 2002 International Visitor Survey (which included "visiting an international

student" as a check box for the question on purpose of visit to Australia, an option that was removed in subsequent surveys) indicated that there are 0.3 induced international visitors per student.[1]

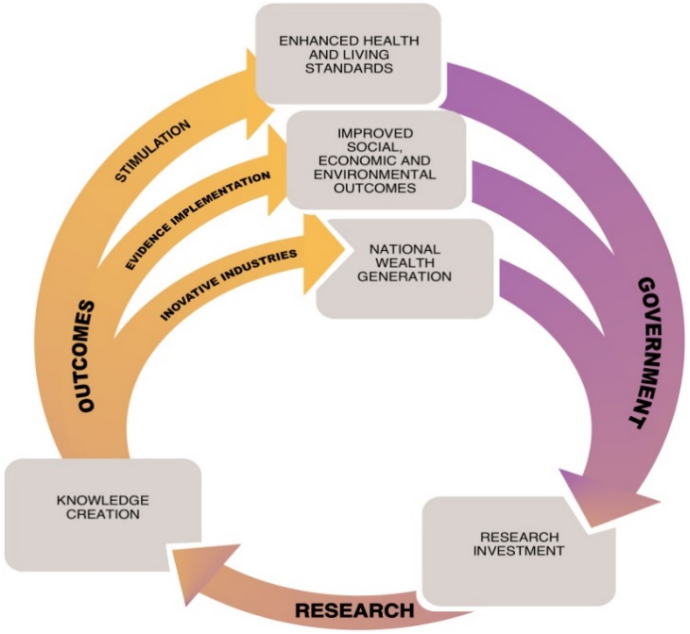
Expenditure per interstate visitor and international visitor was based on Tourism Research Australia data derived from the National Visitor Survey and the International Visitor Survey.

2.5 Analysis of the impacts of collaborative research with industry

Research and innovation lead to the development of new and efficient processes, technologies and products which, when deployed across the economy, improve living standards.

Publicly and privately funded research can lead to enhanced health and living standards, improved economic, social and environmental outcomes and national wealth creation. It can also raise national productivity, increase national competitiveness, create new jobs and increase tax revenues. This then enables further investment in research, creating a virtuous cycle (see Figure 2.4).

FIGURE 2.4 RESEARCH CYCLE



SOURCE: ACIL ALLEN CONSULTING AND NHMRC 2010.

In assessing the economic impacts of the research that will be undertaken at the Fishermans Bend campuses, a crucial variable is the assumed rate of return associated with the additional investment in research activities.

The Productivity Commission (2007) suggests that even when uncertainty about the parameters is taken into account, social rates of return of publicly supported R&D are mostly between 35 per cent and 100 per cent.[2] Dowrick (2002), in a review of international literature, reports that estimates of the national rates of return on R&D tend to cluster around the 50 to 60 per cent level.[3]

Cameron (1998) reported that social rates of return to R&D are typically estimated at between 20 and 50 per cent.[4] However, the author also notes that studies have suggested that the returns on basic R&D tend to be higher than returns associated with applied R&D. Salter and Martin (1999), in a review of economic studies, cited studies reporting social rates of return of anywhere between 10 and 160

[1] Giesecke, James A and Madden, John R 2006, CGE evaluation of a university's effects on a regional economy: an integrated assessment of expenditure and knowledge impacts. *Review of Urban and Regional Development Studies*, 18 (3). pp. 229-251.
[2] Productivity Commission, 2007, *Public Support for Science and Innovation*, Productivity Commission Research Report, March 2007.
[3] Dowrick, S., 2002, *The Contribution of Innovation and Education to Economic Growth*, 2002 Economic and Social Outlook Conference.
[4] Cameron, G., 1998, *Innovation and Growth: a survey of the empirical evidence*, Nuffield College, Oxford, Discussion Paper.

per cent, but with most results falling in the 20 to 50 per cent range.[5] Martin (2007) also indicates that empirical studies often indicated a rate of return typically of between 20 per cent and 50 per cent for public R&D.[6]

A summary of some literature estimates of rate of return that have been used in ACIL Allen's analysis are shown in Table 2.1.

TABLE 2.1 LITERATURE ESTIMATES OF THE BENEFITS OF UNIVERSITY RESEARCH

Type of R&D	Literature estimates	Potential value that can be used in this study
Overall public R&D	While Literature estimates vary considerably, many studies place the rate of return on overall publicly funded research in the order of 20% to 50%.	35%
Basic (academic science) research	Mansfield (1991) — 28%	28%
Agricultural R&D	Literature estimates vary from 15% per cent to 562%, mostly between 20% and 60%	40%
Mining R&D	– Productivity Commission (2007) — 159% – Return on AMIRA's P260 Project to the minerals industry (DFEEST, 2014) — 2100% – Return on seven CSIRO's minerals and energy R&D projects — between 200% and 3,800% (Commonwealth of Australia, 2003)	100% (conservative)
Health/medical R&D	Various studies in the literature report very substantial returns – for example, Access Economics (2008) estimated an average return of 117%	80% (conservative)

SOURCE: ACIL ALLEN CONSULTING

In addition to estimating the returns to MSE's additional research investment, ACIL Allen worked with MSE to identify the industries that would be likely to benefit from this research. It is assumed that additional research enabled by MSE's expansion to Fishermans Bend is distributed equally in the following areas:

- Transport
- Energy
- Water & environment
- Food & agribusiness
- Mining, equipment and technology sciences
- Safe and secure infrastructure
- Advanced manufacturing
- Cybersecurity
- Defence technologies
- Data & society
- Medtech
- Pharmaceuticals.

Corresponding assumptions were also made in regards to the likely fields of research that would be undertaken by the Faculty of Architecture, Building and Planning at Melbourne University's Fishermans Bend campus and by RMIT at its Fishermans Bend campus.

[5] Salter, A., Martin, B., 1999, *The Economic Benefits of Publicly Funded Basic Research: A Critical Review*, Science Policy Research Unit, University of Sussex.
[6] Martin, B. R., 2007, 'Assessing the Impact of Basic Research on Society and the Economy', see <www.scienceimpact.ac.at/documentation/pdf/Session_C_Martin.pdf>.

2.6 Analysis of the impact of additional graduates

University teaching (at all levels, including postgraduate training) is essentially an investment in human capital. There is substantial research showing that higher education increases labour productivity and enhances lifetime earnings.

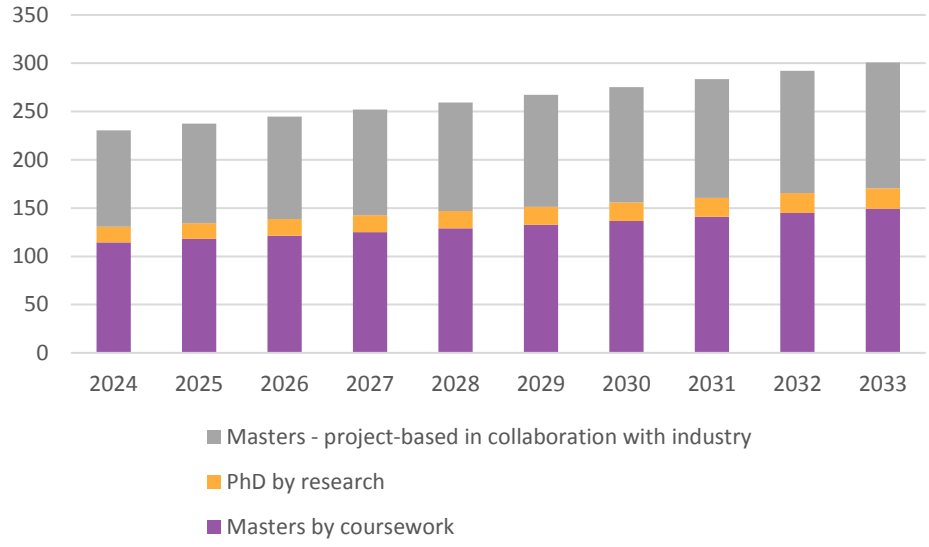
To assess the direct and indirect, flow-on impacts of Melbourne University's and RMIT's expansion in educational activities enabled by the two new campuses at Fishermans Bend, ACIL Allen estimated the effects on the productivity of the Victorian workforce by estimating:

- the impact of the new campuses on the total number of engineering as well as architecture / building / planning graduates in Victoria
- the wage premium received by engineering and architecture / building / planning graduates relative to graduates in other disciplines and fields of study
- the impact of higher education on the labour productivity of engineers, as proxied by Census data on the earnings of persons with Masters degrees in engineering relative to those with only a Bachelor's degree in engineering or a non-engineering degree
- the impact of higher education on the labour productivity of architects and planners, as proxied by Census data on the earnings of persons with Masters degrees in architecture and building relative to those with only a Bachelor's degree in architecture or building
- the impact of VET on labour productivity, relative to no VET qualification.

2.6.1 Melbourne University - MSE

The projected number of additional engineering graduates from MSE between 2024 and 2033 that is due to the development of Melbourne University's Fishermans Bend campus is shown in Figure 2.5. According to MSE, *all* of these additional graduates are expected to be overseas students.

FIGURE 2.5 PROJECTED NUMBER OF ADDITIONAL MSE GRADUATES DUE TO FISHERMANS BEND CAMPUS, 2024 TO 2033



SOURCE: MSE

In the counterfactual (that is, without Melbourne University's Fishermans Bend campus), it is assumed that the additional students who would have undertaken an engineering course at MSE due to the increased intake facilitated by the new campus would have undertaken different courses in the following proportions:

- Engineering at other Victorian universities: 20 per cent

— Engineering at other Australian universities: 40 per cent
— Other field of study at other Victorian universities: 5 per cent
— Other field of study at other Australian universities: 5 per cent
— Not undertaken a course in Australia: 30 per cent.

The assumed destinations of MSE graduates with and without the Fishermans Bend campus are shown in Table 2.2. The assumed proportions in the with Fishermans Bend campus scenario (where all students are from overseas) are based on information from recent MSE graduate destination surveys.

TABLE 2.2 MSE GRADUATE DESTINATION ASSUMPTIONS – WITH FISHERMANS BEND CAMPUS AND COUNTERFACTUAL

	With Fishermans bend campus	No Fishermans Bend campus
Work in Victoria	55%	18%
Work in other parts of Australia	15%	52%
Work overseas	30%	30%

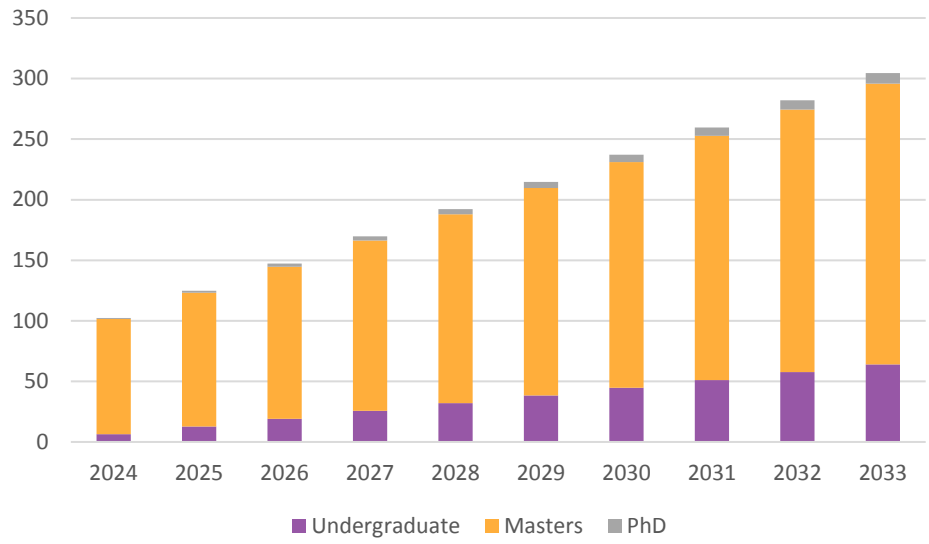
SOURCE: ACIL ALLEN

The figures for the counterfactual relate to students who also chose to undertake the same courses in the counterfactual as in the 'with Fishermans Bend campus' scenario.

2.6.2 Melbourne University - ABP

The projected number of additional Melbourne University architecture / building / planning graduates between 2024 and 2033 that is due to the development of the university's Fishermans Bend campus is shown in Figure 2.6. According to Melbourne University, 46 per cent of these additional graduates are expected to be overseas students.

FIGURE 2.6 PROJECTED NUMBER OF ADDITIONAL MELBOURNE UNIVERSITY ABP GRADUATES DUE TO FISHERMANS BEND CAMPUS, 2024 TO 2033



SOURCE: MSE

In the counterfactual (that is, without Melbourne University's Fishermans Bend campus), it is assumed that the additional students who would have undertaken an architecture / building / planning course at the university due to the increased intake facilitated by the new campus would have undertaken different courses in the proportions shown in Table 2.3.

TABLE 2.3 COURSES AND PLACES OF STUDY ASSUMED IN THE COUNTERFACTUAL – MELBOURNE UNIVERSITY ARCHITECTURE / BUILDING / PLANNING

	Masters / PhD		Undergradaute	
	Australian students	Overseas students	Australian students	Overseas students
Engineering at other Victorian universities	30%	20%	50%	20%
Engineering at other Australian universities	50%	40%	20%	40%
Other field in a Victorian university	10%	5%	20%	5%
Other field in other Australian university	5%	5%	5%	5%
Not undertaken a course	5%	0%	5%	0%
Not come to Australia	0%	30%	0%	30%

SOURCE: ACIL ALLEN CONSULTING

The assumed destinations of Melbourne University's ABP graduates with and without the Fishermans Bend campus are shown in Table 2.4. The figures for the counterfactual (that is, those on the right side of the table) relate to students who also choose to undertake the same courses in the counterfactual as in the 'with Fishermans Bend campus' scenario. These figures are a function of the assumed values in Table 2.3 and the assumed values in the left half of Table 2.4.

TABLE 2.4 MELBOURNE UNIVERSITY ABP GRADUATE DESTINATION ASSUMPTIONS – WITH FISHERMANS BEND CAMPUS AND COUNTERFACTUAL

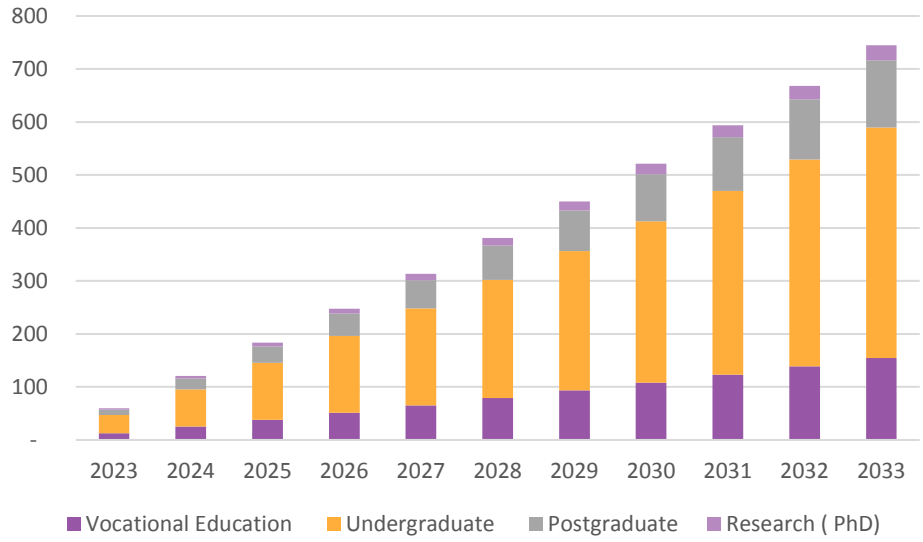
	With Fishermans bend campus		No Fishermans Bend campus	
	Australian students	Overseas students	Australian students	Overseas students
Masters / PhD				
Work in Victoria	80%	55%	30%	18%
Work in other parts of Australia	15%	15%	65%	52%
Work overseas	5%	30%	5%	30%
Undergraduate				
Work in Victoria	80%	35%	57%	12%
Work in other parts of Australia	15%	5%	38%	28%
Work overseas	5%	60%	5%	60%

SOURCE: ACIL ALLEN

2.6.3 RMIT

The projected number of additional RMIT graduates between 2023 and 2033 (by qualification level) that is due to the development of the Fishermans Bend campus is shown in Figure 2.7. According to RMIT, 25 per cent of vocational education students and undergraduates as well as 50 per cent of postgraduate and research (PhD) students will be from overseas.

FIGURE 2.7 PROJECTED NUMBER OF ADDITIONAL RMIT GRADUATES DUE TO FISHERMANS BEND CAMPUS, 2023 TO 2033



SOURCE: RMIT

In the counterfactual (that is, without RMIT's Fishermans Bend campus), it is assumed that the additional students who would have undertaken an engineering course at RMIT due to the increased intake facilitated by the new campus would have undertaken different courses in the proportions shown in Table 2.5.

TABLE 2.5 COURSES AND PLACES OF STUDY ASSUMED IN THE COUNTERFACTUAL - RMIT

	Postgraduate / research (PhD)		Undergradaute / vocational education	
	Australian students	Overseas students	Australian students	Overseas students
Engineering at other Victorian universities	30%	20%	50%	20%
Engineering at other Australian universities	50%	40%	20%	40%
Other field in a Victorian university	10%	5%	20%	5%
Other field in other Australian university	5%	5%	5%	5%
Not undertaken a course	5%	0%	5%	0%
Not come to Australia	0%	30%	0%	30%

SOURCE: ACIL ALLEN CONSULTING

The assumed destinations of RMIT's graduates with and without the Fishermans Bend campus are shown in Table 2.6. The figures for the counterfactual relate to students who also choose to undertake the same courses in the counterfactual as in the 'with Fishermans Bend campus' scenario. These figures are a function of the assumed values in Table 2.5 and the assumed values in the left half of Table 2.6.

TABLE 2.6 RMIT GRADUATE DESTINATION ASSUMPTIONS – WITH FISHERMANS BEND CAMPUS AND COUNTERFACTUAL

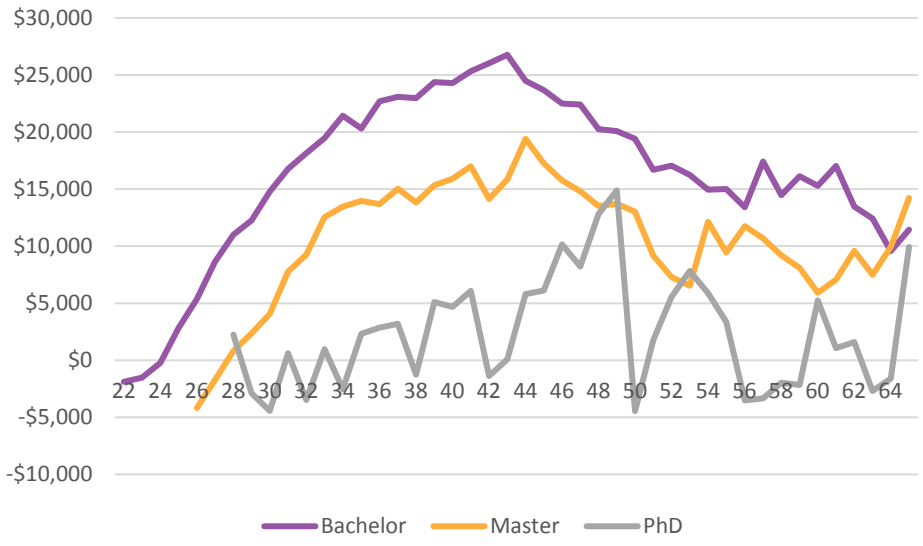
	With Fishermans bend campus		No Fishermans Bend campus	
	Australian students	Overseas students	Australian students	Overseas students
Masters / PhD				
Work in Victoria	80%	55%	30%	18%
Work in other parts of Australia	15%	15%	65%	52%
Work overseas	5%	30%	5%	30%
Undergraduate				
Work in Victoria	80%	35%	57%	12%
Work in other parts of Australia	15%	5%	38%	28%
Work overseas	5%	60%	5%	60%

SOURCE: ACIL ALLEN

2.6.4 Wage premiums

The wage premium enjoyed by engineering graduates at various ages compared with those with qualifications of a similar level but in other fields of study, drawn from 2016 Census data, is shown in Figure 2.8.

FIGURE 2.8 ENGINEERING INCOME PREMIUM BY AGE COMPARED WITH OTHER FIELDS OF STUDY AT THE SAME QUALIFICATION LEVEL



SOURCE: ABS CENSUS OF POPULATION AND HOUSING 2016

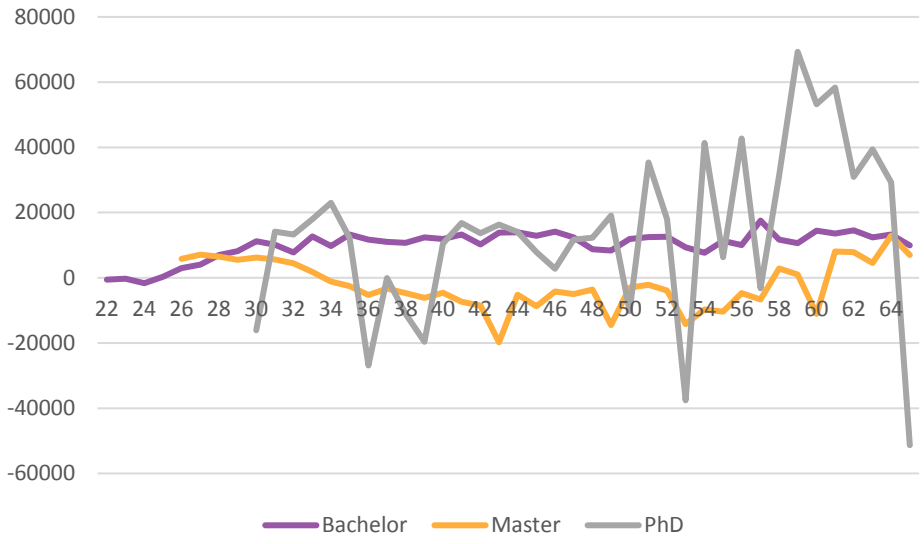
The wage premium associated with an advanced engineering degree relative to a Bachelor's degree in engineering, by age, is shown in Figure 2.9.

FIGURE 2.9 INCOME PREMIUM BY AGE FOR HIGHER ENGINEERING DEGREES, COMPARED WITH A BACHELOR OF ENIGINEERING QUALIFICATION

SOURCE: ABS CENSUS OF POPULATION AND HOUSING 2016

The wage premium enjoyed by architecture and building graduates at various ages compared with those with qualifications of a similar level but in other fields of study, drawn from 2016 Census data, is shown in Figure 2.10..

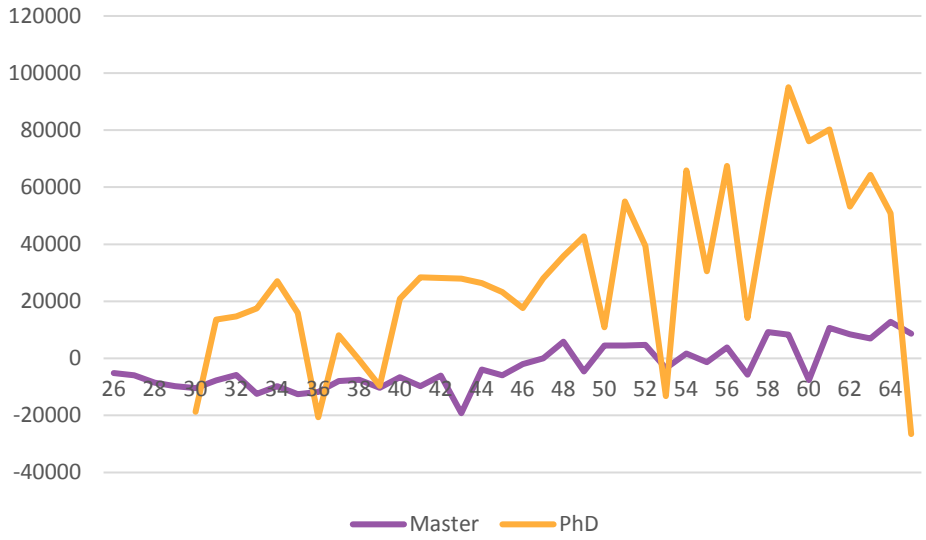
FIGURE 2.10 ARCHITECTURE AND BUILDING INCOME PREMIUM BY AGE COMPARED WITH OTHER FIELDS OF STUDY AT THE SAME QUALIFICATION LEVEL



SOURCE: ABS CENSUS OF POPULATION AND HOUSING 2016

The wage premium associated with an advanced architecture or building degree relative to a Bachelor's degree in architecture or building, by age, is shown in Figure 2.11..

FIGURE 2.11 INCOME PREMIUM BY AGE FOR HIGHER ARCHITECTURE AND BUILDING DEGREES, COMPARED WITH A BACHELOR OF ARCHITECTURE OR BUILDING QUALIFICATION



SOURCE: ABS CENSUS OF POPULATION AND HOUSING 2016

3 MODELLINIG RESULTS: YEAR-BY-YEAR IMPACTS

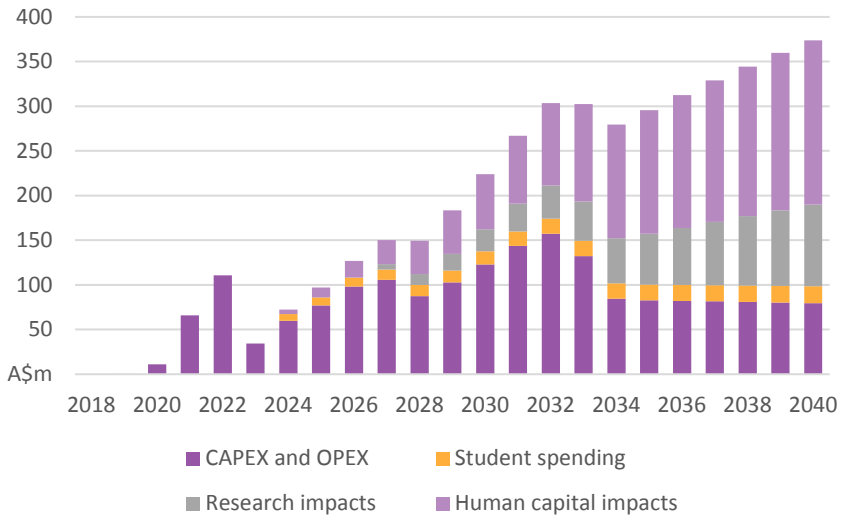
This chapter presents the year-by-year economic impacts of Melbourne University's and RMIT's Fishermans Bend campuses on Victoria.

3.1 Melbourne University impacts

3.1.1 Impact on Victoria's Gross State Product

The year-by-year impact of Melbourne University's Fishermans Bend campus on Victoria's Gross State Product (GSP) between FY2018 and FY2040 is shown in **Figure 3.5**. GSP is the monetary value of all finished goods and services produced in Victoria and is equal to the sum of the gross value added of all businesses located in the state. It is the most commonly used indicator of the size of the state's economy.

FIGURE 3.1 YEAR-BY-YEAR IMPACT OF MELBOURNE UNIVERSITY'S FISHERMANS BEND CAMPUS ON VICTORIA'S GROSS STATE PRODUCT, FY2018 TO FY2040 ($M, 2019 DOLLARS)



SOURCE: ACIL ALLEN CONSULTING

By the end of the analysis period in FY2040, the campus is projected to contribute $358.43 million in 2019 dollars towards Victoria's GSP.

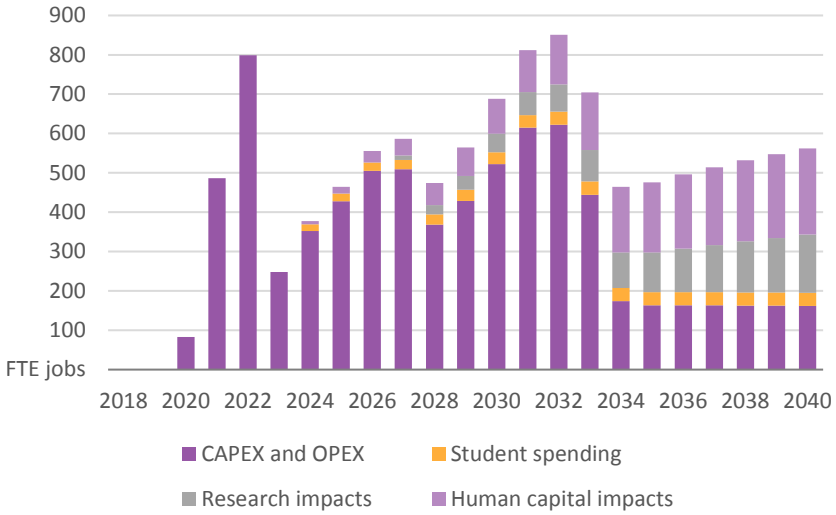
The breakdown of the additional GSP in FY2040 is as follows:

- $79.50 due to capital and additional recurrent expenditures
- $19.08 million due to additional student spending and associated visitor spending
- $91.19 million due to the impact of additional research on industry productivity
- $183.84 million due to the additional human capital associated with the increased number of graduates working in Victoria.

3.1.2 Impact on employment in Victoria

The year-by-year impact of Melbourne University's Fishermans Bend campus on Full-Time Equivalent (FTE) employment in Victoria between FY2018 and FY2040 is shown in Figure 3.6.

FIGURE 3.2 YEAR-BY-YEAR IMPACT OF MELBOURNE UNIVERSITY'S FISHERMANS BEND CAMPUS ON VICTORIA'S EMPLOYMENT, FY2018 TO FY2040 (FTE'S)



SOURCE: ACIL ALLEN CONSULTING

By the end of the analysis period in FY2040, the campus is projected to contribute an additional 545.2 FTEs towards Victoria's employment.

The breakdown of the additional employment in FY2040 is as follows:

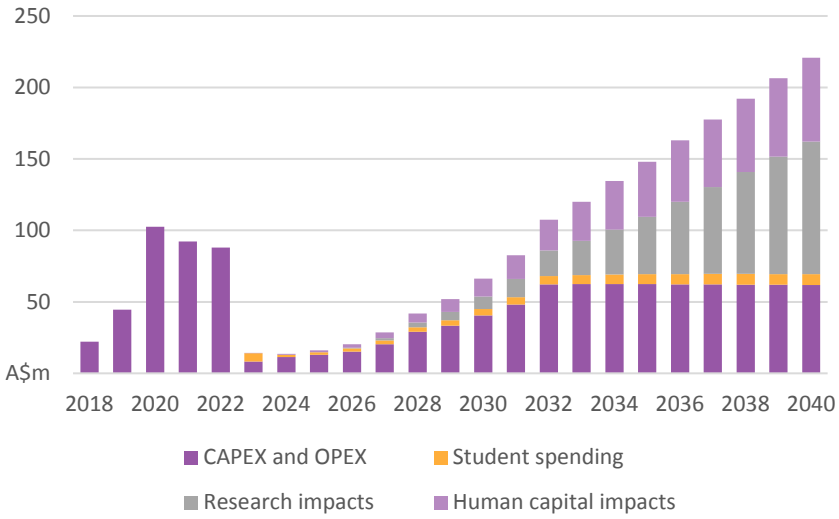
- 161.8 FTEs due to capital and additional recurrent expenditures
- 33.6 FTEs due to additional student spending and associated visitor spending
- 147.6 FTEs due to the impact of additional research on industry productivity
- 218.9 FTEs due to the additional human capital associated with the increased number of graduates in Victoria.

3.2 RMIT impacts

3.2.1 Impact on Victoria's Gross State Product

The year-by-year impact of RMIT's Fishermans Bend campus on Victoria's GSP between FY2018 and FY2040 is shown in Figure 3.3.

FIGURE 3.3 YEAR-BY-YEAR IMPACT OF RMIT'S FISHERMANS BEND CAMPUS ON VICTORIA'S GROSS STATE PRODUCT, FY2018 TO FY2040 ($M, 2019 DOLLARS)



SOURCE: ACIL ALLEN CONSULTING

By the end of the analysis period in FY2040, the campus is projected to contribute $237.41 million in 2019 dollars towards Victoria's GSP.

The breakdown of the additional GSP in FY2040 is as follows:

- $61.73 due to capital and additional recurrent expenditures
- $7.67 million due to additional student spending and associated visitor spending
- $92.81 million due to the impact of additional research on industry productivity
- $58.51 million due to the additional human capital associated with the increased number of graduates working in Victoria.

3.2.2 Impact on employment in Victoria

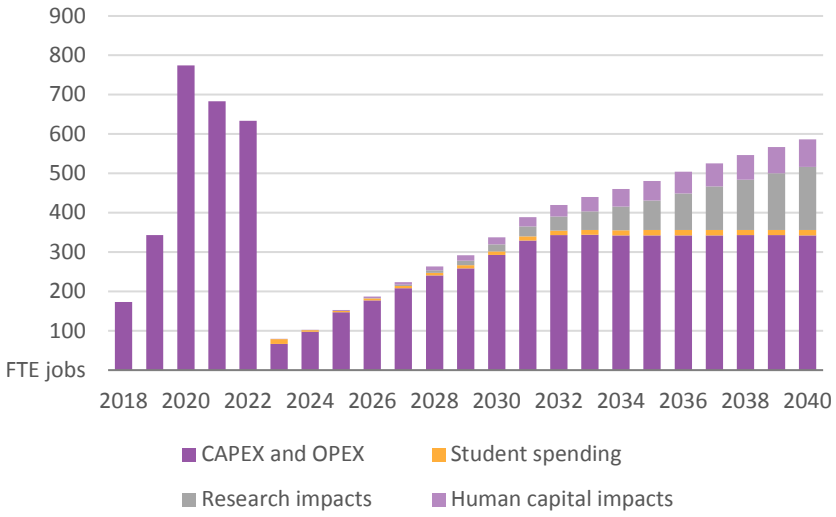
The year-by-year impact of RMIT's Fishermans Bend campuses on FTE employment in Victoria between FY2018 and FY2040 is shown in Figure 3.4.

By the end of the analysis period in FY2040, the campus is projected to contribute an additional 606.7 FTEs towards Victoria's employment.

The breakdown of the additional employment in FY2040 is as follows:

- 342.8 FTEs due to capital and additional recurrent expenditures
- 13.5 FTEs due to additional student spending and associated visitor spending
- 160.3 FTEs due to the impact of additional research on industry productivity
- 69.7 FTEs due to the additional human capital associated with the increased number of graduates in Victoria.

FIGURE 3.4 YEAR-BY-YEAR IMPACT OF RMIT'S FISHERMANS BEND CAMPUS ON VICTORIA'S EMPLOYMENT, FY2018 TO FY2040 (FTE'S)



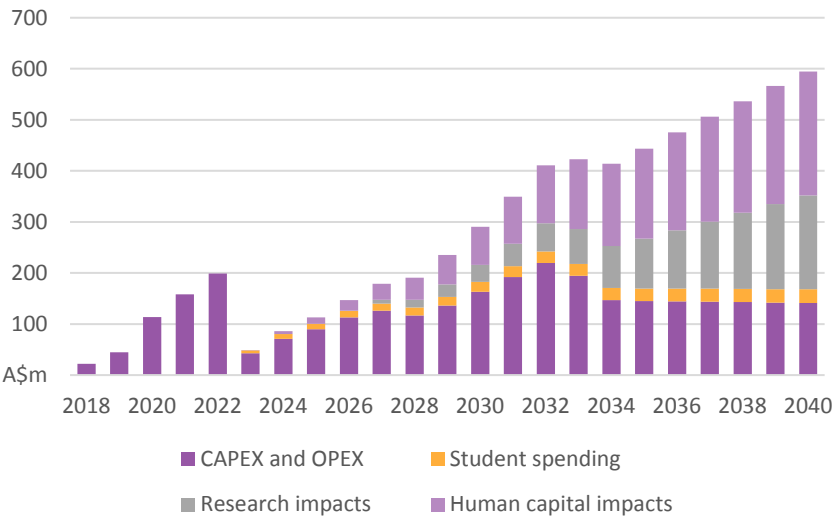
SOURCE: ACIL ALLEN CONSULTING

3.3 Combined impacts

3.3.1 Impact on Victoria's Gross State Product

The year-by-year impact of Melbourne University's and RMIT's Fishermans Bend campuses on Victoria's GSP between FY2018 and FY2040 is shown in Figure 3.5.

FIGURE 3.5 YEAR-BY-YEAR IMPACT OF MELBOURNE UNIVERSITY'S AND RMIT'S FISHERMANS BEND CAMPUSES ON VICTORIA'S GROSS STATE PRODUCT, FY2018 TO FY2040 ($M, 2019 DOLLARS)



SOURCE: ACIL ALLEN CONSULTING

By the end of the analysis period in FY2040, the two campuses at Fishermans Bend are projected to contribute $595.84 million in 2019 dollars towards Victoria's GSP.

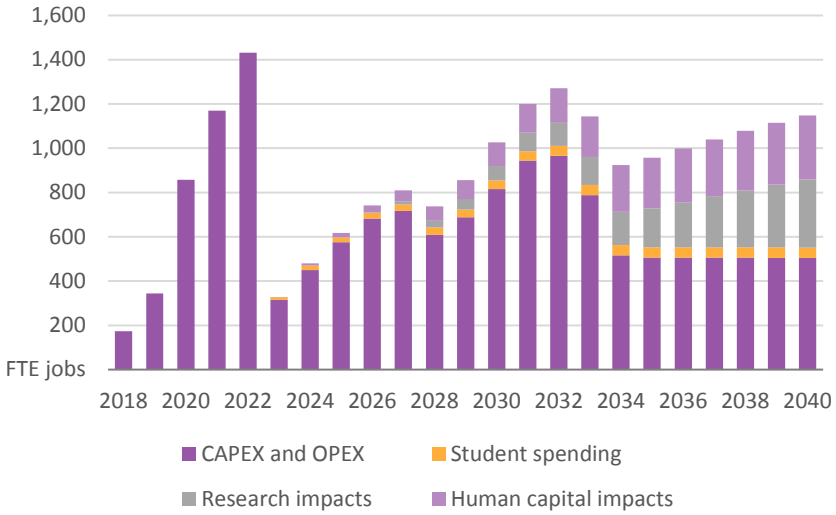
The breakdown of the additional GSP in FY2040 is as follows:

- $141.23 due to capital and additional recurrent expenditures
- $26.75 million due to additional student spending and associated visitor spending
- $184.00 million due to the impact of additional research on industry productivity
- $242.35 million due to the additional human capital associated with the increased number of graduates working in Victoria.

3.3.2 Impact on employment in Victoria

The year-by-year impact of Melbourne University's and RMIT's Fishermans Bend campuses on FTE employment in Victoria between FY2018 and FY2040 is shown in Figure 3.6.

FIGURE 3.6 YEAR-BY-YEAR IMPACT OF MELBOURNE UNIVERSITY'S AND RMIT'S FISHERMANS BEND CAMPUSES ON VICTORIA'S EMPLOYMENT, FY2018 TO FY2040 (FTE'S)



SOURCE: ACIL ALLEN CONSULTING

By the end of the analysis period in FY2040, the two campuses are projected to contribute an additional 1,148 FTEs towards Victoria's employment.

The breakdown of the additional employment in FY2040 is as follows:

- 504.5 FTEs due to capital and additional recurrent expenditures
- 47.1 FTEs due to additional student spending and associated visitor spending
- 307.9 FTEs due to the impact of additional research on industry productivity
- 288.5 FTEs due to the additional human capital associated with the increased number of graduates in Victoria.

4 MODELLING RESULTS: CUMULATIVE IMPACTS

This chapter presents the cumulative economic impacts of Melbourne University's and RMIT's Fishermans Bend campuses on Victoria.

4.1 Melbourne University impacts

The cumulative impacts of the Fishermans Bend campus of Melbourne University on the Victorian economy to FY2040 are shown in Table 4.3.

TABLE 4.1 CUMULATIVE IMPACT OF MELBOURNE UNIVERSITY'S FISHERMANS BEND CAMPUS ON VICTORIA'S REAL GSP AND EMPLOYMENT, FY2018 TO FY2040

	Real GSP		Employment	
	Total	NPV @4% real discount rate	Total	Annual average
	A$m	A$m	FTE jobs	FTE jobs
Construction and operations	1,881	1,169	7,563	329
Induced student and visitor spend	256	144	497	22
Research program	670	337	1,162	51
Human capital	1,586	818	2,064	90
Total	4,392	2,468	11,286	491

SOURCE: ACIL ALLEN CONSULTING

The Fishermans Bend campus of Melbourne University is projected to generate a cumulative impact of $2,468 million in 2019 dollars on Victoria's GSP to FY2040 in present value terms (under a 4 per cent real discount rate).

Over that period, the campus is projected to generate a total employment gain of 11,286 FTEs or an average of 491 FTEs each year.

4.2 RMIT impacts

The *cumulative* impacts of the Fishermans Bend campus of RMIT on the Victorian economy to FY2040 are shown in Table 4.2..

TABLE 4.2 CUMULATIVE IMPACT OF RMIT'S FISHERMANS BEND CAMPUS ON VICTORIA'S REAL GSP AND EMPLOYMENT, FY2018 TO FY2040

	Real GSP		Employment	
	Total	NPV @4% real discount rate	Total	Annual average
	A$m	A$m	FTE jobs	FTE jobs
Construction and operations	1,128	741	7,512	327
Induced student and visitor spend	94	52	182	8
Research program	503	243	919	40
Human capital	430	216	551	24
Total	2,155	1,252	9,165	398

SOURCE: ACIL ALLEN CONSULTING

The Fishermans Bend campus of RMIT is projected to generate a cumulative impact of $1,252 million in 2019 dollars on Victoria's GSP to FY2040 in present value terms (under a 4 per cent real discount rate).[7]

Over that period, the RMIT campus is projected to generate a total employment gain of 9,165 FTEs or an average of 398 FTEs each year.

4.3 Combined impacts

The *cumulative* impacts of the Fishermans Bend campuses of Melbourne University and RMIT on the Victorian economy to FY2040 are shown in Table 4.3.

TABLE 4.3 CUMULATIVE IMPACT OF MELBOURNE UNIVERSITY'S AND RMIT'S FISHERMANS BEND CAMPUSES ON VICTORIA'S REAL GSP AND EMPLOYMENT, FY2018 TO FY2040

	Real GSP		Employment	
	Total	NPV @4% real discount rate	Total	Annual average
	A$m	A$m	FTE jobs	FTE jobs
Construction and operations	3,009	1,910	15,074	655
Induced student and visitor spend	349	196	679	30
Research program	1,173	580	2,082	91
Human capital	2,016	1,034	2,616	114
Total	6,547	3,720	20,451	889

SOURCE: ACIL ALLEN CONSULTING

[7] The cumulative human capital impact for RMIT is considerably smaller than that for Melbourne University due to the following reasons: (i) the student intake is greater at Melbourne University's Fishermans Bend campus than RMIT's (particularly in the earlier years of the analysis), (ii) the proportion of international students is considerably higher at Melbourne University (for example, all MSE students at Fishermans Bend are assumed to be overseas students), and (iii) the proportion of postgraduate students (PhD, Masters) is higher at Melbourne University than RMIT. International students who work in Victoria after graduation have a greater impact on the Victorian economy than Australian students as the latter are more likely to also work in Victoria in the counterfactual than the former. Postgraduate students embody more human capital than undergraduates and generally receive higher wages and salaries in return.

The Fishermans Bend campuses of Melbourne University and RMIT are projected to generate a cumulative impact of $3,720 million in 2019 dollars on Victoria's GSP to FY2040 in present value terms (under a 4 per cent real discount rate).

Over that period, the two campuses are projected to generate a total employment gain of 20,451 FTEs or an average of 889 FTEs each year.

A

TASMAN GLOBAL CGE MODEL

ACIL Allen's computable general equilibrium model *Tasman Global* is a powerful tool for undertaking economic impact analysis at the regional, state, national and global level.

There are various types of economic models and modelling techniques. Many of these are based on partial equilibrium analysis that usually considers a single market. However, in economic analysis, linkages between markets and how these linkages develop and change over time can be critical. *Tasman Global* has been developed to meet this need.

Tasman Global is a large-scale computable general equilibrium model which is designed to account for all sectors within an economy and all economies across the world. ACIL Allen uses this modelling platform to undertake industry, project, scenario and policy analyses. The model is able to analyse issues at the industry, global, national, state and regional levels and to determine the impacts of various economic changes on production, consumption and trade at the macroeconomic and industry levels.

A.1 A dynamic model

Tasman Global is a model that estimates relationships between variables at different points in time. This is in contrast to comparative static models, which compare two equilibriums (one before a policy change and one following). A dynamic model such as *Tasman Global* is beneficial when analysing issues where both the timing of and the adjustment path that economies follow are relevant in the analysis.

A.2 The database

A key advantage of *Tasman Global* is the level of detail in the database underpinning the model. The database is derived from the latest Global Trade Analysis Project (GTAP) database (version 8.1). This database is a fully documented, publicly available global data base which contains complete bilateral trade information, transport and protection linkages among regions for all GTAP commodities.

The GTAP model was constructed at the Centre for Global Trade Analysis at Purdue University in the United States. It is the most up-to-date, detailed database of its type in the world.

Tasman Global builds on the GTAP model's equation structure and database by adding the following important features:

- dynamics (including detailed population and labour market dynamics);
- a detailed breakdown of the occupational structure of the Australian labour market;
- the ability to repatriate labour and capital income; and
- a detailed emissions accounting abatement framework.

The *Tasman Global* database contains a wealth of sectoral detail currently identifying up to 70 industries (which, for this analysis, have been aggregated to the 57 industries presented in Table A.1). The foundation of this information is the input-output tables that underpin the database. The input-output tables account for the distribution of industry production to satisfy industry and final demands. Industry demands, so-called intermediate usage, are the demands from each industry for inputs.

For example, electricity is an input into the production of communications. In other words, the communications industry uses electricity as an intermediate input. Final demands are those made by households, governments, investors and foreigners (export demand). These final demands, as the name suggests, represent the demand for finished goods and services. To continue the example, electricity is used by households – their consumption of electricity is a final demand.

Each sector in the economy is typically assumed to produce one commodity, although in *Tasman Global*, the electricity, transport and iron and steel sectors are modelled using a 'technology bundle' approach. With this approach, different known production methods are used to generate a homogeneous output for the 'technology bundle' industry. For example, electricity can be generated using brown coal, black coal, petroleum, base load gas, peak load gas, nuclear, hydro, geothermal, biomass, wind, solar or other renewable based technologies – each of which have their own cost structure.

TABLE A.1 SECTORS IN THE *TASMAN GLOBAL* DATABASE FOR THIS ANALYSIS

	Sector		Sector
1	Paddy rice	30	Wood products
2	Wheat	31	Paper products, publishing
3	Cereal grains nec	32	Petroleum, coal products
4	Vegetables, fruit, nuts	33	Chemical, rubber, plastic products
5	Oil seeds	34	Mineral products nec
6	Sugar cane, sugar beef	35	Ferrous metals
7	Plant- based fibres	36	Metals nec
8	Crops nec	37	Metal products
9	Bovine cattle, sheep, goats, horses	38	Motor vehicle and parts
10	Animal products nec	39	Transport equipment nec
11	Raw milk	40	Electronic equipment
12	Wool, silk worm cocoons	41	Machinery and equipment nec
13	Forestry	42	Manufactures nec
14	Fishing	43	Electricity
15	Coal	44	Gas manufacture, distribution
16	Oil	45	Water
17	Gas	46	Construction
18	Minerals nec	47	Trade
19	Bovine meat products	48	Transport nec
20	Meat products nec	49	Water transport
21	Vegetables oils and fats	50	Air transport
22	Dairy products	51	Communication
23	Processed rice	52	Financial services nec
24	Sugar	53	Insurance
25	Food products nec	54	Business services nec
26	Beverages and tobacco products	55	Recreational and other services
27	Textiles	56	Public Administration, Defence, Education, Health
28	Wearing apparel	57	Dwellings
29	Leather products		

SOURCE: ACIL ALLEN CONSULTING

The other key feature of the database is that the cost structure of each industry is also represented in detail. Each industry purchases intermediate inputs (from domestic and imported sources) primary factors (labour, capital, land and natural resources) as well as paying taxes or receiving subsidies.

A.3 Factors of production

Capital, land, labour and natural resources are the four primary factors of production. The capital stock in each region (country or group of countries) accumulates through investment (less depreciation) in each period. *Tasman Global* explicitly models natural resource inputs as a sector specific factor of production in resource based sectors (coal mining, oil and gas extraction, other mining, forestry and fishing).

A.4 Population growth and labour supply

Population growth is an important determinant of economic growth through the supply of labour and the demand for final goods and services. Population growth for the international and domestic regions represented in the *Tasman Global* database is projected using ACIL Allen's in-house demographic model. The demographic model projects how the population in each region grows and how age and gender composition changes over time and is an important tool for determining the changes in labour supply and total population over the projection period.

For each of the regions in *Tasman Global*, the model projects the changes in age-specific birth, mortality and net migration rates by gender for 101 age cohorts (0-99 and 100+). The demographic model also projects changes in participation rates by gender by age for each region, and, when combined with the age and gender composition of the population, endogenously projects the future supply of labour in each region. Changes in life expectancy are a function of income per person as well as assumed technical progress on lowering mortality rates for a given income (for example, reducing malaria-related mortality through better medicines, education, governance, etc.). Participation rates are a function of life expectancy as well as expected changes in higher education rates, fertility rates and changes in the workforce as a share of the total population.

Labour supply is derived from the combination of the projected regional population by age by gender and the projected regional participation rates by age by gender. Over the projection period labour supply in most developed economies is projected to grow slower than total population as a result of ageing population effects.

For Australia, the projected aggregate labour supply from ACIL Allen's demographics module is used as the base level potential workforce for the detailed Australian labour market module, which is described in the next section.

A.5 The Australian labour market

Tasman Global has a detailed representation of the Australian labour market which has been designed to capture:

- different occupations;
- changes to participation rates (or average hours worked) due to changes in real wages;
- changes to unemployment rates due to changes in labour demand; and
- limited substitution between occupations by the firms demanding labour and by the individuals supplying labour.

Tasman Global recognises 97 different occupations within Australia. The firms who hire labour are provided with some limited scope to change between these 97 labour types as the relative real wage between them changes. Similarly, the individuals supplying labour have a limited ability to change occupations in response to the changing relative real wage between occupations. The model produces results at the 97 3-digit ANZSCO (Australian New Zealand Standard Classification of Occupations) level which are presented in Table A.2.

TABLE A.2 OCCUPATIONS IN THE TASMAN GLOBAL DATABASE, ANZSCO 3-DIGIT LEVEL (MINOR GROUPS)

ANZSCO code, Description	ANZSCO code, Description	ANZSCO code, Description
1. MANAGERS	**3. TECHNICIANS & TRADES WORKERS**	**5. CLERICAL & ADMINISTRATIVE**
111 Chief Executives, General Managers and Legislators	311 Agricultural, Medical and Science Technicians	511 Contract, Program and Project Administrators
121 Farmers and Farm Managers	312 Building and Engineering Technicians	512 Office and Practice Managers
131 Advertising and Sales Managers	313 ICT and Telecommunications Technicians	521 Personal Assistants and Secretaries
132 Business Administration Managers	321 Automotive Electricians and Mechanics	531 General Clerks
133 Construction, Distribution and Production Managers	322 Fabrication Engineering Trades Workers	532 Keyboard Operators
134 Education, Health and Welfare Services Managers	323 Mechanical Engineering Trades Workers	541 Call or Contact Centre Information Clerks
135 ICT Managers	324 Panel beaters, and Vehicle Body Builders, Trimmers and Painters	542 Receptionists
139 Miscellaneous Specialist Managers	331 Bricklayers, and Carpenters and Joiners	551 Accounting Clerks and Bookkeepers
141 Accommodation and Hospitality Managers	332 Floor Finishers and Painting Trades Workers	552 Financial and Insurance Clerks
142 Retail Managers	333 Glaziers, Plasterers and Tilers	561 Clerical and Office Support Workers
149 Miscellaneous Hospitality, Retail and Service Managers	334 Plumbers	591 Logistics Clerks
	341 Electricians	599 Miscellaneous Clerical and Administrative Workers
2. PROFESSIONALS	342 Electronics and Telecommunications Trades Workers	**6. SALES WORKERS**
211 Arts Professionals	351 Food Trades Workers	611 Insurance Agents and Sales Representatives
212 Media Professionals	361 Animal Attendants and Trainers, and Shearers	612 Real Estate Sales Agents
221 Accountants, Auditors and Company Secretaries	362 Horticultural Trades Workers	621 Sales Assistants and Salespersons
222 Financial Brokers and Dealers, and Investment Advisers	391 Hairdressers	631 Checkout Operators and Office Cashiers
223 Human Resource and Training Professionals	392 Printing Trades Workers	639 Miscellaneous Sales Support Workers
224 Information and Organisation Professionals	393 Textile, Clothing and Footwear Trades Workers	**7. MACHINERY OPERATORS & DRIVERS**
225 Sales, Marketing and Public Relations Professionals	394 Wood Trades Workers	711 Machine Operators
231 Air and Marine Transport Professionals	399 Miscellaneous Technicians and Trades Workers	712 Stationary Plant Operators
232 Architects, Designers, Planners and Surveyors	**4. COMMUNITY & PERSONAL SERVICE**	721 Mobile Plant Operators
233 Engineering Professionals	411 Health and Welfare Support Workers	731 Automobile, Bus and Rail Drivers
234 Natural and Physical Science Professionals	421 Child Carers	732 Delivery Drivers
241 School Teachers	422 Education Aides	733 Truck Drivers
242 Tertiary Education Teachers	423 Personal Carers and Assistants	741 Store persons
249 Miscellaneous Education Professionals	431 Hospitality Workers	**8. LABOURERS**
251 Health Diagnostic and Promotion Professionals	441 Defence Force Members, Fire Fighters and Police	811 Cleaners and Laundry Workers
252 Health Therapy Professionals	442 Prison and Security Officers	821 Construction and Mining Labourers
253 Medical Practitioners	451 Personal Service and Travel Workers	831 Food Process Workers
254 Midwifery and Nursing Professionals	452 Sports and Fitness Workers	832 Packers and Product Assemblers
261 Business and Systems Analysts, and Programmers		839 Miscellaneous Factory Process Workers
262 Database and Systems Administrators, and ICT Security Specialists		841 Farm, Forestry and Garden Workers
263 ICT Network and Support Professionals		851 Food Preparation Assistants
271 Legal Professionals		891 Freight Handlers and Shelf Fillers
272 Social and Welfare Professionals		899 Miscellaneous Labourers

SOURCE: ACIL ALLEN CONSULTING

The labour market structure of *Tasman Global* is thus designed to capture the reality of labour markets in Australia, where supply and demand at the occupational level do adjust, but within limits.

Labour supply in *Tasman Global* is presented as a two stage process:

1. labour makes itself available to the workforce based on movements in the real wage and the unemployment rate; and
2. labour chooses between occupations in a state based on relative real wages within the state.

By default, *Tasman Global*, like all CGE models, assumes that markets clear. Therefore, overall, supply and demand for different occupations will equate (as is the case in other markets in the model).

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ACIL ALLEN CONSULTING IS THE LARGEST INDEPENDENT, AUSTRALIAN OWNED ECONOMIC AND PUBLIC POLICY CONSULTANCY.

WE SPECIALISE IN THE USE OF APPLIED ECONOMICS AND ECONOMETRICS WITH EMPHASIS ON THE ANALYSIS, DEVELOPMENT AND EVALUATION OF POLICY, STRATEGY AND PROGRAMS.

OUR REPUTATION FOR QUALITY RESEARCH, CREDIBLE ANALYSIS AND INNOVATIVE ADVICE HAS BEEN DEVELOPED OVER A PERIOD OF MORE THAN THIRTY YEARS.