NSW Treasury Employment Calculator – User Guide

New South Wales Treasury

October 2020

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Glossary

Acronym	Description
ABS	Australian Bureau of Statistics
ANZSIC	Australian and New Zealand Standard Industrial Classification
CBA	Cost-Benefit Analysis
CEE	(New South Wales Treasury) Centre for Evidence and Evaluation
COVID	Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2)
CPAG	Common Planning Assumptions Group
IO	Input-Output
IOIG	Input-Output Industry Group
NSW	New South Wales
TPP	(New South Wales Treasury) Treasury Policy Paper
TRP	(New South Wales Treasury) Treasury Research Paper
WoG	Whole-of-Government

Contents

User Guide

- ✓ *Background*
- ✓ *Calculator Structure*
- ✓ *Primary User Sheets*
- ✓ *Secondary User Sheets*

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Background

The calculator has been developed to estimate employment impacts associated with COVID-related responses

Context

Analysts are requested to **estimate employment supported for Government actions.** Existing guidance provides principles and method to undertake this task:

- TPP 09-7 (Policy Paper); and
- TRP 09-3 (Methodology Paper)

The calculator, input-output (IO) employment multipliers and supporting material have been endorsed by the Common Planning Assumptions Group (CPAG) for whole-of-Government (WoG) implementation and use for estimating employment supported in investment proposals.

Scope

NSW Treasury developed an employment calculator that presents IO employment multipliers for all industries, to assist agencies with:

- Automated calculation and reporting of employment estimates
- Consistent framework application, source data and reporting
- Understanding the link between **(1)** Government expenditure, to **(2)** industry impacts and **(3)** eventual employment supported

This User Guide contains the principles and methodology supporting the development of this calculator and should be read prior to its application. Technical Appendices are provided for the interested reader.

Calculator Structure

The calculator is separated in three categories (Introduction, User Sheets, and Data)

Introduction

- **ReadMe** – Contains important contextual information and caveats, and details the structure of the calculator.
- **Approach** – Presents diagrammatic overviews of IO methodology and in-scope IO employment multipliers.
- **Limitations** – List of IO limitations extracted from TPP09-7 and ABS 5209.

Data*

- **IOIG(2015) to ANZSIC06** – ABS mapping of IOIG (2015) to ANZSIC (4-Digit).
- **IOIG(2015)** – ABS mapping of IOIG (2015) to ANZSIC (1-Digit).

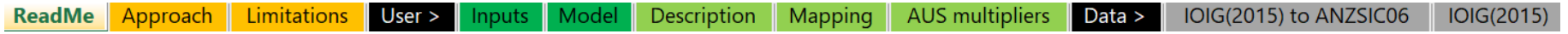
User Sheets

Primary

- **Inputs** – Contains four steps for user input of key assumptions of the investment proposal.
- **Model** – Reports automated calculations and reporting templates for IO employment estimates.

Secondary*

- **Description** – Exhaustive descriptions of IOIG, mapped to ANZSIC (1-Digit).
- **Mapping** – Summary of ABS mapping of IOIG (2015) to ANZSIC (1-Digit).
- **AUS Multipliers** – IO employment multipliers transparently listed by industry and multiplier type.



***IOIG:** *Input-Output Industry Group*

Primary User Sheet – Inputs (Example)

The “Inputs” sheet is split into four key steps for user input.

Step 1: Please specify the name of the investment proposal.

Insert *the name of the investment proposal.*

Name	Government Action #1

Cell D12

Step 2: Which industries in the investment proposal will be primarily funded?

Select *the relevant industry groups (up to ten) below that are most likely to be impacted by the investment proposal.*

No.	Industry
1	Heavy and Civil Engineering Construction
2	
3	
4	
5	

Cells D18:D22

Step 3: What is the nature of the investment?

Select *whether the nature of the investment proposal is* ***"Project-based"*** *or* ***"Program-based"****.*

Investment Type	Project

Cell D29

Refer to Column D in the “Approach” tab for the definitions of “Project” and “Program”

Step 4: Which industries in the investment proposal will be primarily funded?

Allocate *the total Government funding / investment expenditure ($m) at each respective year (up to ten).*

No.	Industry	Year 1 ($m)	Year 2 ($m)	Year 3 ($m)	Year 4 ($m)	Year 5 ($m)
1	Heavy and Civil Engineering Construction	$ 10.0	$ 10.0	$ 10.0		
2						
3						
4						
5						

Cell E38:I42

Primary User Sheet – Model (1/2)

The “Model” sheet automates the calculation and reporting of employment estimates from the “Inputs” sheet

Summary results for Government Action #1 (Project) ← **Automated text based on proposal name and nature (Step 1 and 3)**

← **Automated text based on proposal nature (Step 3)**

	Project - Currently used	Project - Currently not used													
Industry	**Initial Effect Multiplier**	**Production-induced Effect** *(First-round + Industrial Support)*	**Year 1** *(FTE)*	**Year 2** *(FTE)*	**Year 3** *(FTE)*	**Year 4** *(FTE)*	**Year 5** *(FTE)*	**Year 6** *(FTE)*	**Year 7** *(FTE)*	**Year 8** *(FTE)*	**Year 9** *(FTE)*	**Year 10** *(FTE)*	**TOTAL - Employment supported** *(no.)*	**TOTAL - Impacted years** *(no.)*	**AVERAGE - Employment supported** *(no. per year)*
Heavy and Civil Engineering Constr	0.9	2.5	9	9	9	-	-	-	-	-	-	-	27	3	9
			-	-	-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL			9	9	9	-	-	-	-	-	-	-	27		9

↑ **Automated text based on relevant industry impacts (Step 2)**

Industry-specific IO employment multiplier extracted from “AUS multipliers”

- ✓ **Estimated employment supported by industry and by year based on annual funding (Step 4)**
- ✓ **Includes / excludes indirect effects depending on proposal nature (Step 3)**

- ✓ **Total employment supported**
- ✓ **Total funding years**
- ✓ **Average employment supported per year**

Primary User Sheet – Model (2/2)

The “Model” sheet automates the calculation and reporting of employment estimates from previous inputs.

Rounding Convention for Reporting

IO reporting requires appropriate rounding of estimates to reflect its average, imprecise nature.

Range	Rounding	Automated Total	Automated Average
10,001+	Nearest 1,000	0	0
1,001-10,000	Nearest 100	0	0
101-1,000	Nearest 50	0	0
1-100	Nearest 10	30	10

! Conditional rounding of Cells J13 and L13

Interpretation and Reporting

- Lists selected key limitations / interpretation caveats from the **“Limitations”** sheet as a reminder for users.

Use Convention

Proposal Nature	Funding Timing Profile	Use
Project	Known[a]	Average jobs supported per year
Program	Known	Average jobs supported per year
Program	Unknown[b]	Total jobs supported

Reporting Template

Automates reporting outputs in best-practice language based on TPP09-7 from:

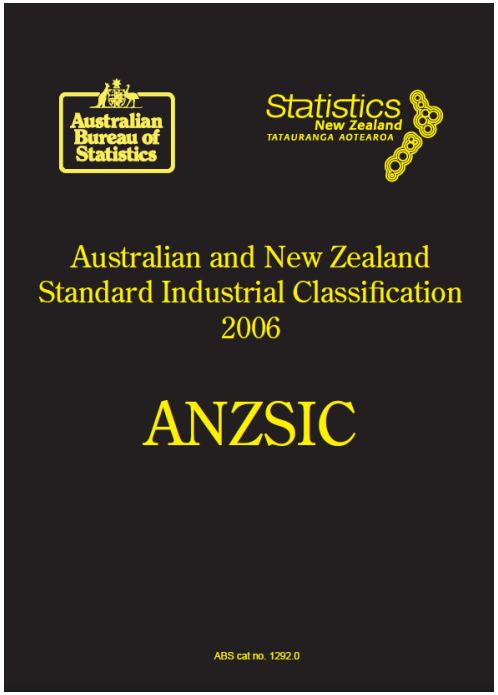
- Information provided in the “Inputs” sheet;
- Outputs estimated in the “Model” sheet; and
- Appropriate rounding / reporting conventions.

[a] It is assumed that for a Project - the funding timing profile should be known by the proponent.

[b] Expected in early days of initial Program design / announcement. However, this should be updated as the Program's projects are confirmed.

Secondary User Sheet – Description

A list of industry descriptions is provided to assist users with identifying relevant industries to be impacted.



Industry Descriptions

To assist users with identifying relevant industries to be impacted by the investment proposal, a detailed list of industry descriptions was extracted from ABS 1292.0.

1. Firstly, the user may consider the ANZSIC (1-Digit) industries (**Column C**) as an initial guess for which broad sector will be impacted by the investment proposal.
2. Secondly, the user should review in detail the respective industry descriptions in (**Column D**), based on the ANZSIC (1-Digit) industry of interest.
3. Finally, the user should select the most appropriate IOIG (**Column B**), based on the respective industry description reviewed (**Column D**).

Note: *In the rare event that there is no IOIG that can be deemed as relevant to the investment proposal, the user should still use this table as an evidence-base to justify selecting the next "closest" industry for use in the "Inputs" sheet. Agencies should contact NSW Treasury instead of undertaking any manual re-construction of tables, industry classifications, multipliers etc.*

Source: *ABS 1292.0. Available online at:*
https://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/1292.02006%20(Revision%202.0)?OpenDocument

Secondary User Sheet – Mapping and AUS multipliers

The purpose of these sheets are for neat and transparent presentation of key data.

Mapping

- Organised and transparent presentation of IOIG mapping to ANZSIC (1-Digit).
- Used for drop-down lists in the “Inputs” sheet.
- Used for searching / automated calculations in the “Model sheet”

AUS Multipliers (2017-18)

- Organised and transparent presentation of all IO employment multipliers by IOIG (114 industries) and by multiplier type.
- Used for searching / automated calculations in the “Model sheet”

AUS Multipliers (cont.)

Industry	*Initial Effect*	First-round	Industrial Support	Production-induced	Simple Employment	Consumption	Total Employment
Sheep, Grains, Beef and Dairy Cattle	1.4	1.0	1.0	1.9	3.3	1.4	4.7
Poultry and Other Livestock	1.9	0.6	0.7	1.3	3.2	1.1	4.3
…	…	…	…	…	…	…	…
Other Services	4.5	0.2	0.1	0.3	4.7	4.1	8.8

Source: *NSW Treasury analysis based on ABS 5209.0, 5246.0, TPP09-7 and TRP09-3.*

Principles and methodology

- ✓ *Introduction to IO*
- ✓ *When should IO analysis be used?*
- ✓ *IO Employment Multipliers*
- ✓ *Interpretation and Reporting*
- ✓ *Limitations*

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Introduction to Input-Output analysis

Overview of input-output analysis

Deriving employment support estimates

There are two principal approaches for deriving employment support estimates:

1. Project-specific estimates (Bottom-up)
2. Economic model-based estimates (Top-down)

What is IO analysis?

- IO models are associated with **the economic impacts of projects**, and can be **augmented to analyse employment impacts**.
- An IO model provides industry sector employment multipliers, which are **applied to spending estimates to formulate employment estimates**. Employment multipliers can be used to estimate direct employment, and possible flow-on employment supported.
- Developed based on each industry's total **(1)** inputs, **(2)** outputs and **(3)** interlinkages with other industries.

Using IO analysis

The application of IO multipliers is a "partial analysis" because it does not capture all of the flow on impacts from the project across the economy. Given the simplifying assumptions and data limitations, the resulting employment support estimates must be appropriately presented and interpreted.

Constructing IO multipliers (employment)

An example (national level) of constructing IO employment multipliers is provided in the next chapter (Technical Appendix).

References: *TPP09-7 Section 1.2 Pages 6-8, ABS 5246.0*

When should Input-Output analysis be considered?

Applicable methodologies for estimating employment support by category of action

Category	Applicable methodologies	Comment
1.1 Capital Program **1.2 Procurement**	• Project-specific estimates for direct employment. • I-O Multipliers may be used for direct and flow on employment estimates.	• Project-specific estimates are preferred, if available. • Methods using implied multipliers (i.e. ratios of jobs to spending) should be consistent with the multipliers advised by Treasury to ensure consistency of estimates or otherwise agreed with Treasury.
2.1 Discretionary industry assistance	• Project-specific methodology.	• Discretionary assistance is usually based on a detailed business case, which would include consideration of possible employment supported. • Direct employment may be observable for some businesses receiving discretionary support.
2.2 Major events	• Event-specific methodology.	• Most supported employment is likely to be temporary. • Consult with NSW Treasury for Major Events.
2.3 Facilitation of major private sector projects	• Project-specific estimates for direct employment. • I-O Multipliers may be used for direct and flow on employment estimates.	• Proponent's estimates should be used if available **and validated**, and clearly attributed to the proponent. • If not available, estimates may be made based on I-O multipliers.
2.4 Generic investment attraction	• Input-Output analysis is not recommended. • It may be possible to derive estimates from survey data of investors and other stakeholders.	• Given the difficult of isolating the contribution of investment attraction programs, it is not possible to derive robust estimates for employment supported from input-output analysis. • Consult with NSW Treasury for Investment Attraction.

See TPP09-07 and TRP 09-03 for additional detail.

When should IO analysis be considered? (cont.)

Applicable methodologies for estimating employment support by category of action

Category	Applicable methodologies	Comment
2.5 Industry promotion*	• Input-Output analysis is not recommended. • It may be possible to derive estimates from survey data of beneficiaries and other stakeholders.	• Similar difficulties to 2.4. • Some programs will generate data such as volume of advice provided by the Industry Capability Network (ICN), which could provide a basis for estimates.
2.6 Industry development*	• Case by case estimates for individual programs such as a feed in tariff, or an energy efficiency program, may be based on a program specific model. • Methodology for calculating low carbon jobs supported by a program will depend on the initiative. • Initiatives under this sub-category that are project-based could have project-based estimates of jobs supported.	• Promoting green jobs involves a number of supply and demand side initiatives, as such, it is important not to double count. • Attribution of jobs to policy may be unclear. • Credible third party analysis may be available for some programs, and should always be attributed to its source.
2.7 Business support and advice	• Input-Output analysis is not recommended. • There may be cases for which individual project-based estimates can be made.	• Attribution of jobs to policy may be unclear.
2.8 Grants rebates and subsidies	• Project-specific estimates for direct employment.	• Direct employment may be ascertained for some grant, subsidy, and rebate programs.
3.1 Red tape reduction	• CGE Model-based estimates for aggregated programs. • If relevant credible external modelling is available, it may be used.	• Best estimating via CGE, or other more specialised modelling • External modelling should be attributed to its source.

See TPP09-07 and TRP 09-03 for additional detail.

**As with 2.4 consult with NSW Treasury for Industry promotion.*

When should IO analysis be considered? (cont.)

Applicable methodologies for estimating employment support by category of action

Category	Applicable methodologies	Comment
3.2 Training – includes apprenticeships	• Case by case estimates for some programs may be possible, such as re-employment. • If relevant credible external modelling is available, it may be used.	• Depends on assumptions about demand and state of economy. • Addressing skill shortages can support employment directly. • Can support employment growth where spare capacity or skills shortages exist.
3.3 Taxes, fees and charges	• Input-Output analysis of employment impacts is not appropriate.	• Input-Output modelling is expenditure-based and therefore should not be used to estimate employment impacts of tax policy changes. • Employment impacts of tax reform should be estimated via more specific approaches including general equilibrium modelling.
3.4 Infrastructure* 3.5 Goods and service procurement*	• Input-Output analysis is not recommended. • If relevant credible external modelling is available, it may be used.	• There may be cases for which individual project based estimates can be made. • Depends on assumptions about demand and state of economy. • Can support employment growth where spare capacity or skills shortages exist.
3.6 RD&D support	• Case by case estimates for some programs may be possible. • Input-Output analysis is not recommended. • If relevant credible external modelling is available, it may be used.	• Depends on assumptions about the impact the program can have on demand. • Can support employment growth where spare capacity or skills shortages exist. • Can lead to higher value employment opportunities.
3.7 Other micro-economic policies	• CGE modelling is generally the best approach for estimating the benefits of microeconomic reform measures. • If relevant credible external modelling is available, it may be used.	• Use external estimates if available, e.g. from COAG process. Should be attributed to source. • Microeconomic reform can support employment growth when there is spare labour market capacity, or where the reform leads to higher workforce participation.

See TPP09-07 and TRP 09-03 for additional detail.

**Consult with Treasury on applicable Frameworks. Supplementary items may be available.*

IO Employment Multipliers (1/3)

IO employment multipliers capture employment impacts at all stages of an increase in an industry's output

Consider an investment proposal that leads to an increase in an industry's output…

Corresponding Employment Multipliers

Included in calculator
Excluded in calculator

Initial Effect → **First-round** → **Industrial Support** → **Consumption**

Production-induced

Simple Employment

Total

IO Employment Multipliers (2/3)

IO employment multipliers capture employment impacts at all stages of an increase in an industry's output

Multiplier types

Each employment multiplier corresponds to the **additional employment** (number of FTE employed) **supported by producing an extra $1 million of industry output**.

1. **Initial Effect** – The initial employment required within a **specific industry** to produce an extra $1m of output.
2. **First-round Effect** – The amount of employment required from **all industries** to produce the initial extra $1m of output from a specific industry.
3. **Industrial Support Effect** – The flow-on employment requirements **following** the first-round output, iterated to the n-th degree**.
4. **Production-induced Effect** – The total amount of employment required from all industries to produce the initial extra $1m of output from a specific industry. **Also equivalent to (2) + (3)**.
5. **Simple Multiplier Effect** – The total amount of employed required by all industries to produce an extra $1m of output from a specific industry. **Also equivalent to (1) + (2) + (3)**.
6. **Consumption Effect** – The employment supported from induced production of extra goods and services from Private Final Consumption Expenditure. **Not to be confused with the Production-induced Multiplier**.
7. **Total Employment Multiplier Effect** – **(5) + (6)**.

Note: *Consumption Effect is reported for completeness, but is* ***excluded*** *from the calculator as these effects are tentative and unobservable (as detailed in TPP09-7).* ***Therefore, the calculator only reports up to the Simple Multiplier Effect.***

Included in calculator
Excluded in calculator

***The first-round output from all industries will induce extra output from all industries, and in turn, will induce extra output etc.*

IO Employment Multipliers (3/3)

IO employment multipliers capture employment impacts at all stages of an increase in an industry's output

Rationale for multiplier choice (up to "Simple Employment Multiplier")

- Consistent application with TPP09-7 and TRP09-3
- Appropriately capture effects across varying proposal types[1]:
  - **Project** – **Direct** effects only ("Initial Effect")
  - **Program** – **Direct** and **indirect** effects ("Initial Effect" + "First-Round" + "Industrial Support" = "Simple Employment")
- Reflects the intention of supporting all industries during COVID
- **Consumption was excluded** to reflect unknown consumer spending patterns during COVID

Rationale for excluding regional economy analyses

- Compared to National economies, regional economies see **non-existent** inputs and outputs for some industries, and **smaller** inter-industry linkages. Specific econometric techniques and theory need to be applied on State IO analysis to obtain regional IO multipliers.
- Accordingly, applying higher-level multipliers (National) to lower-level economies may lead to less reliable / over-estimated results, and is therefore not recommended.

[1]See TPP17-03 Glossary (Page 72) for definitions of proposal types.

Interpretation and Reporting

Caution should be noted regarding interpretation of I-O analyses

Interpretation	Statements	
Employment estimates should be described as **"jobs supported by"** Government spending, instead of **"created by"**.	✓ *This proposal is estimated to **support approximately 1,000 jobs** across Industries A-Z.*	× *This proposal will **create 1,000 jobs** across Industries A-Z.*
I-O multiplier-based estimates relate to **annual full-time equivalent (FTE) jobs**.	✓ *An estimated **500 jobs (annual FTE)** would be supported from this proposal.*	× *An estimated **500 permanent jobs** would be supported from this proposal.*
I-O estimation approaches do not provide any information on the **timing of impacts**.	✓ *It is estimated that **an average of 330 jobs per year, for three years,** would be supported from this proposal.*	× *It was estimated that **1,000 jobs specifically in Year X** would be supported from this proposal.*
Direct or indirect (flow-on) employment supported **may not be directly observed**.	✓ *1,000 jobs are estimated to be supported **in total**, including direct and indirect employment.*	× *1,000 jobs were **created by company X, Y and Z.***
Multiplier-based estimates for employment supported **should not be reported specifically as occurring in a project's region**. Direct or flow-on employment will not necessarily occur in the immediate vicinity of the project.	✓ *The infrastructure built in this region is estimated to support 1,000 jobs **nationally**.*	× *The infrastructure built in this region is estimated to support 1,000 jobs **in that specific region's economy**.*

Limitations

Limitations of input-output analysis

Limitations

1. Estimates are based on ABS IO parameters derived from Australia-wide data, and therefore provide **estimates of national impacts**.
2. I-O employment estimates relate to **average industry impacts rather than marginal impacts**.
3. I-O estimation approaches do not provide any information on the **timing of impacts**.
4. From above, employment estimates are therefore **approximations of ultimate aggregate theoretical impacts**. Flow-on employment supported may not be directly observed.
5. Point estimates should not be interpreted as **literal**, and should be regarded as sitting within a **range of possible outcomes**. Estimates should be rounded.
6. Estimates do not describe the "measure of net jobs created for the economy", but rather **"jobs supported by / associated with" a particular Government action**.

Limitations (cont.)

7. Direct or flow-on employment will not necessarily occur in the immediate vicinity of the project.
8. IO multipliers inform decisions on the potential impacts of government expenditure on the economy, they **do not measure community welfare**. Therefore, I-O multipliers can only **supplement evaluation techniques** such as cost-benefit analysis, not replace them.

Contextual Note: *As per ABS 5209, the most significant limitation of IO analysis is the implicit assumption that the economy has no supply-side constraints. That is, extra output is produced in one area without taking resources away from other activities, thus overstating economic impacts. These are offset to some degree by:*

1. *Excluding consumption effects; and*
2. *The current COVID environment potentially having more capacity / less supply-side constraints.*

Sources: *TPP09-7, ABS 5209.0 (commentary of 2006-07 tables as at 2010).*

Technical Appendices

- ✓ A Simple Economy
- ✓ The Australian Economy
- ✓ IO Employment Multipliers
- ✓ Key Matrices

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A Simple Economy

Input-Output analysis visualises the interdependencies between industries of an economy.

Suppose an economy consists of the following:

- **Industries** – Coal, Electricity and Steel
- **Final Demand** – Consumption from households and Government
- **Other Inputs** – Capital, Labour

This is represented in the input-output (IO) table to the right:

- **Rows** – Respective output (supply) of each industry
- **Columns** – Respective input (demand) of each industry

As industries are interlinked, an increase in an industry's output requires the increase in output of all other industries.

Inputs \ Outputs	Coal	Electricity	Steel	Final Demand	**Total Outputs**
Coal	30	40	0	30	**100**
Electricity	10	200	50	140	**400**
Steel	20	80	200	200	**500**
Other inputs	40	80	250	230	**600**
Total Inputs	**100**	**400**	**500**	**600**	**1600**

E.g. The Steel industry outputs are worth $500m, with the following allocations of $20m used by the Coal industry, …$200m consumed by Final Demand etc.

E.g. To produce, the Coal industry uses inputs totalling $100, with the following allocations of $30m of intermediate inputs (Coal), …$40m of capital and labour etc.

The Australian Economy (Example)

114 ANZSIC industries underpin the IO table representing Australian economy's GDP

114 industries (→)

114 industries (↓)

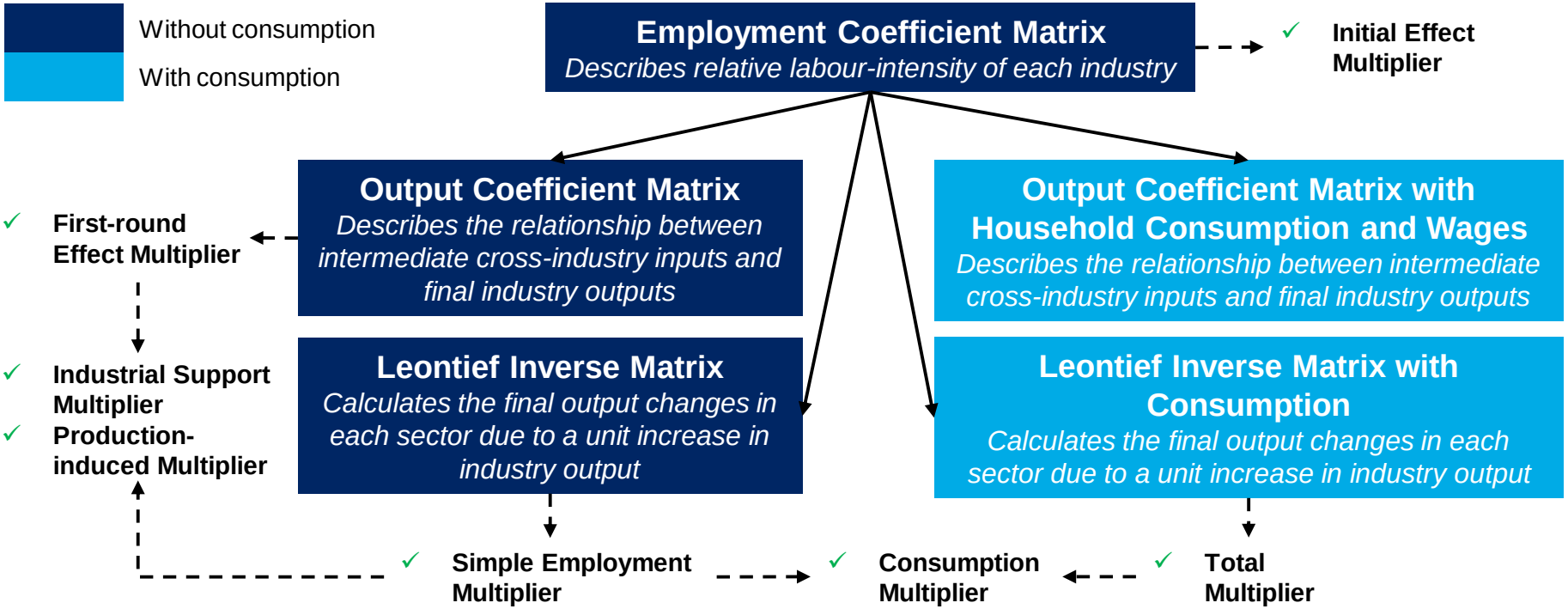
	Sheep, Grains, Beef and Dairy Cattle	Poultry and Other Livestock	Other Agriculture	…	Other Services	**Total Outputs (excl. Final Demand)**	Final Demand	**Total Outputs**
Sheep, Grains, Beef and Dairy Cattle	2,037	205	347	…	80	**29,541**	14,171	**43,712**
Poultry and Other Livestock	63	140	140	…	0	**6,080**	2,346	**8,426**
Other Agriculture	1,788	353	675	…	2	**15,828**	10,994	**26,822**
…	…	…	…	…	…	**…**	…	**…**
Other Services	1	0	0	…	1	**1,044**	11,683	**12,727**
Total Inputs (excl. Other Inputs)	**21,490**	**2,795**	**11,610**	**…**	**735**	**1,506,038**	**1,935,771**	**3,441,809**
Other Inputs	22,222	5,631	15,212	…	11,992	**1,935,771**	309,754	**2,245,525**
Total Inputs	**43,712**	**8,426**	**26,822**	**…**	**12,727**	**3,441,809**	**2,245,525**	**5,687,334**

! Industry outputs = Industry inputs

Source: *ABS 5209.0 (2017-18), Table 5 – Industry by industry flow table (direct allocation).*

IO Employment Multipliers

IO Employment Multipliers are calculated from the multiplication of three key matrices



Methodology: *5246.0 - Information Paper: Australian National Accounts: Introduction to Input-Output Multipliers*

Key Matrix 1 – Output Coefficient Matrix (AUS Example)

The Output Coefficient Matrix describes the interlinkages of all industries in “per $1m” terms

Output Matrix

As previously established, the IO table is a birds-eye view of the Australian economy, where the reader is able to see each industry’s **input**, **output** and **interlinkages** with other industries in **dollar terms ($m)**.

Output Coefficient Matrix

However, it is more useful to describe impacts in **unit terms (per $1m)**. That is, *“an increase in output of $1m in Industry A will lead to an increase in output of $10m in Industry B and $15m in Industry C respectively”* as opposed to *“an increase in output of $37m in Industry A will lead to an increase in output of $13m in Industry B and $83m in Industry C respectively”*.

	Sheep, Grains, Beef and Dairy Cattle	Poultry and Other Livestock	Other Agriculture	…	Other Services
Sheep, Grains, Beef and Dairy Cattle	2,037	205	347	…	80
Poultry and Other Livestock	63	140	140	…	0
Other Agriculture	1,788	353	675	…	2
…	…	…	…	…	…
Other Services	1	0	0	…	1
Total Inputs (excl. Other Inputs)	**21,490**	**2,795**	**11,610**	**…**	**735**
Other Inputs	22,222	5,631	15,212	…	11,992
Total Inputs	**43,712**	**8,426**	**26,822**	**…**	**12,727**

Divide each industry’s intermediate usages by its respective total input / output to express industry output in unit terms

Source: *ABS 5209.0 (2017-18), Table 6 – Direct requirement coefficients (direct allocation).*

Key Matrices 2 and 3 – Employment and Leontief Matrix (AUS Example)

Employment Coefficient Matrix

- An **additional matrix** to the Output Coefficient Matrix
- Describes the **number of jobs per $1m of industry output**
- Describes **relative labour-intensity** of each industry

Industry	*(1)* Total FTE Employees	*(2)* Australian Production ($m)	*(3) = (1) / (2)* Employment Coefficient
Sheep, Grains, Beef and Dairy Cattle	60,285	43,712	**1.38**
Poultry and Other Livestock	15,627	8,426	**1.85**
Other Agriculture	53,873	26,822	**2.01**
Aquaculture	2,383	1,997	**1.19**
Forestry and Logging	5,206	3,856	**1.35**
…	…	…	…
Other Services	56,663	12,727	**4.45**

Source: *ABS 5209.0 (2017-18), Table 5-7; ABS 5209.0 (2012-13), Table 20.*

Leontief Inverse Matrix

- Leontief inverse matrix **calculation on the Output Coefficient Matrix**
- Calculates the **final output changes in each industry due to a unit increase in industry output**

Methodology (technical calculations)

- ✓ **ABS 5246.0** - Information Paper: Australian National Accounts: Introduction to Input-Output Multipliers
- ✓ **TRP 09-3** (Appendix 4)

Contact Details

NSW GOVERNMENT

Contact Details

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Other CEE guidance:

- TPP 18-6 – Business Case Guidelines
- TPP 17-3 – Cost-Benefit Analysis Guidelines
- Program Evaluation Guidelines
- Pricing for User Charges