

Wage costs

Overview

- 1 On 20 June 2023, the Commission issued [a consultation paper](#) on the wages assessment. The Commission considered changes since the 2020 Review and their implications for the assessment method. The Commission then engaged Professor Alison Preston to provide advice on the assessment. On 27 September 2023, it issued an [addendum](#), incorporating its response to [Professor Preston's paper](#).
- 2 In both papers, the Commission proposed changes to the 2020 Review assessment method.
- 3 A summary of state responses to each consultation question is included below, as well as the Commission's draft position and the draft 2025 Review assessment method.
- 4 State submissions can be viewed [here](#) for the consultation paper and [here](#) for the addendum.

Consultation questions

Q1. Do states agree on continuing to use private sector wages as a policy neutral proxy for the market pressures faced by public sector employers?

State views

- 5 States had mixed views. New South Wales, Western Australia, the ACT and the Northern Territory supported using the proxy. Queensland, South Australia and Tasmania did not support using the proxy. Victoria expressed concerns about the conceptual basis and policy neutrality of the proxy, but supported its use provided the discount is maintained.
- 6 New South Wales said that the private sector responds to similar drivers as the public sector. It noted that there is a reasonably low influence of public sector employers on private sector wages, allowing its use as a proxy.
- 7 Victoria raised concerns that in states with large public sectors, public sector wage levels could significantly influence private sector wage levels. Victoria also questioned some of the factors listed by the Commission as non-policy drivers of regional differences in wages but did recognise climate as one such factor.

- 8 Queensland said that there is national competition for labour in specific public sector occupations, and that competition between states is much more significant than competition between the public and private sectors for such workers. During the Commissioners' state visit, Tasmanian officials also made the case that healthcare workers are recruited from national and international labour markets. However, Victoria questioned whether states significantly compete with each other for workers, quoting analysis of the Household Income and Labour Dynamics in Australia survey showing low interstate migration associated with job changes.¹
- 9 Queensland said that the private sector proxy is not appropriate, as public sector wages may be more influenced by factors such as 'national sectoral conditions and shortages for skilled workers that are predominantly public sector employees', rather than geographic factors. It also said that the relevant market for many public-sector occupations is the national labour market for these occupations. South Australia also said that private sector wage movements are primarily influenced by local and national sectoral conditions rather than the broader local labour market.
- 10 Victoria said that the Commission's model, rather than capturing differences in wages for comparable employees, does not fully control for differences in state labour markets. The apparent high wage costs in Western Australia and the ACT may reflect the prevalence of high wage industries in these states.
- 11 South Australia was concerned with the interstate comparability of employees, stating that wage differentials likely reflect differences in 'responsibilities, differences in employment status (e.g. tenure), timing differences from when pay adjustments take effect, the impact of non-wage benefits and other policy choice differences'.
- 12 Tasmania pointed to differences in public and private sector wage differentials as well as differences in labour market composition as evidence that the underlying geographic wage pressures do not equally affect the public and private sector. Tasmania said that this may result in underestimation of public sector wage pressure differentials and does not appropriately reflect recent wage movements.

Commission response

- 13 The Commission recognises that public sector wage setting can indirectly affect private sector wages, and that this effect is likely to be more pronounced in states with relatively large public sectors. Notwithstanding this relationship, a private sector proxy results in less policy contamination than any direct measure of public sector wages.
- 14 Regarding Victoria's reservations about the identification of non-policy drivers of interstate wage differences, the Commission's model does not attempt to quantify

¹ RBA (Reserve Bank of Australia), Labour Market Turnover and Mobility, RBA, 2012, accessed 14 February 2024.

individual drivers. As long as there are drivers of differences in wages between states beyond causes that are controlled for in the model, the total effect of these drivers will be reflected in the state regression coefficients. Victoria acknowledged that such drivers exist.

- 15 States compete for labour in both the local private sector market and national and international markets. Analysis using the Australian Census Longitudinal Dataset shows that over 25% of public sector workers in 2011 who were still employed in 2016 had switched to the private sector.² Where national labour markets exist, the conceptual validity of the assessment and the proxy measure only require that some factor beyond state control (such as cost of living or climate) affects worker relocation decisions and wage negotiations in both the public and private sectors. When workers choose to move between jurisdictions, they consider these factors in addition to wages. There is no evidence that factors like cost of living or climate are weighted differently by workers in a particular sector or industry.
- 16 The Commission agrees with Queensland that national sectoral conditions and shortages for skilled workers in certain occupations is likely to have a bigger influence on the wage paid to some public sector employees than geographic differences. Nationally consistent sectoral/occupational effects are already controlled for through industry/occupation variables in the regression. The wage costs assessment measures the residual differences that cause states to face different employee costs in the national labour market. While geography is not the primary influence on a person's salary, it is an influence.
- 17 For instance, on average, workers will demand a higher wage to work in a remote community than in a metropolitan area. This is consistent with the above-average wage cost factor measured in the Northern Territory. The prevalence of high-wage industries in states such as Western Australia or the ACT is likely to be accompanied by a higher cost of living, increasing local wage pressures for all industries.
- 18 The Commission sees no conceptual basis to expect a systematic difference between the responsibilities or non-wage benefits of similar private sector employees in different states. Measured wage differentials should not reflect differences in employment status, education, tenure and experience, as these variables are controlled for in the model. Timing differences in pay adjustments for private sector employees should balance out on average.
- 19 The Commission recognises different interstate differentials in the public and private sectors. This may be due to differences in the responsiveness of the public and private sectors, labour markets of different industries varying, and state wage setting policies directly affecting public sector wage levels. There is also imperfect

² Australian Bureau of Statistics (ABS), [Australian Census Longitudinal Dataset \(ACLD\)](#) [TableBuilder], ABS website, 2016, accessed 5 March 2024.

measurement in both sectors. These issues do not preclude the proxy being an unbiased estimate of state-specific pressure on public sector wages.

- 20 While noting that public and private labour markets are distinct, Professor Preston (who the Commission engaged as a consultant to review the wages assessment) recommended the continued use of relative private sector wages as a policy neutral proxy for public sector wage costs.

Commission draft position

- 21 The Commission proposes to continue to use relative private sector wage levels as a proxy for relative public sector wage costs.

Q2. Do states agree that the Commission should continue to use all private sector employees to proxy for public sector drivers of costs?

State views

- 22 Most states supported the use of a private sector sample including males and females. South Australia said that female private sector workers are more representative of pressures on public sector salaries than male private sector workers. It suggested using a weighted average of female and male estimates, combined in proportion to their share of the public sector.
- 23 Tasmania and South Australia also recommended the Commission consider removing industries with little relevance to the public sector, such as mining.

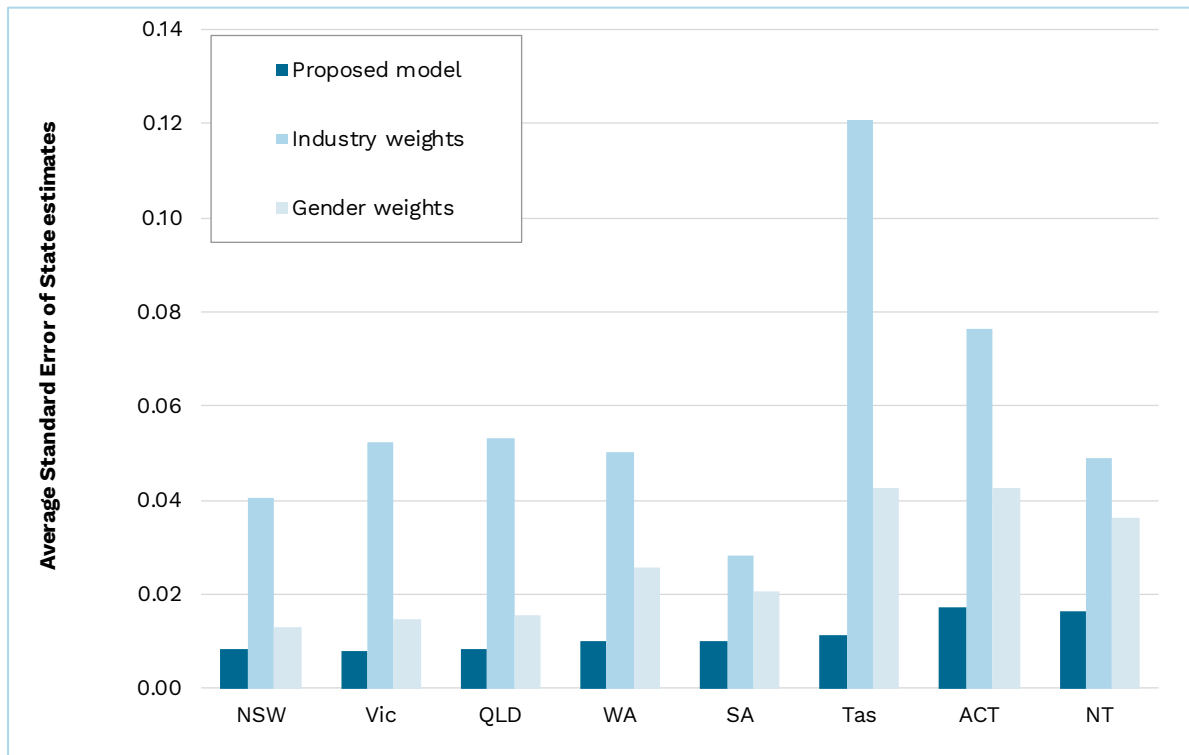
Commission response

- 24 The Commission accepts the conceptual case that the accuracy of the model might be improved by either selecting a sub-sample of private sector workers more closely resembling the public sector workforce, or by reweighting the sample to better reflect the public sector profile. However, the ABS Characteristics of Employment Survey does not have a sufficiently large sample to support these options. The Commission considers that the reduction in sample size from a female-only model would outweigh any potential gains in accuracy, particularly given the objective to mitigate volatility.
- 25 The Commission developed a model in which private sector workers were reweighted by gender, to reflect the gender breakdown of the public sector workforce. As with limiting the sample to females only, reducing the weights of males relative to females in the sample reduced the explanatory power of the model and increased the standard errors of the estimates, although not to the same extent as the female-only model. The coefficients produced by the model were no better correlated to the public sector coefficients than when using the unadjusted weights in the private sector sample.

- 26 Weighting the sample to reflect the size of a group in the public sector has some conceptual appeal. However, to do this by industry would result in a very small effective sample and one dominated by private sector health and education industries, which are likely to be more affected by wage setting policies of the state government.
- 27 The Commission also investigated a model in which private sector workers were weighted according to their industry. Weighting to the actual industries of employment in the public sector would drastically reduce the effective sample, as outlined above. Instead, a proxy measure of substitutability across industries was applied.
- 28 Using the Australian Census Longitudinal Dataset, the Commission examined the numbers of public sector workers in 2011 who worked in each private sector industry in 2016, among workers who did not change their level of qualification between 2011 and 2016.³ These data were used as a proxy for how substitutable workers in each of those industries are with public sector workers. A new model was built after reweighting workers by industry based on this measure.
- 29 Former public sector workers are most under-represented in the manufacturing and retail trade industries. Private sector workers in these industries had their weight reduced to one-third of the weight they have in the standard model. Workers who left the public sector were most over-represented in the education and training industry. Private sector workers in this industry were given 2.5 times the weight they had in the standard model. While this approach is more representative of public sector type workers, the reduction in the effective sample more than offsets this gain. The reduction in effective sample introduced sufficient random error to drown out any potential gains in accuracy, and standard errors were raised considerably.
- 30 The average standard errors of estimates of state relative wages using the alternative weighting methods tested by the Commission are shown in Figure 1.

³ The 2016 to 2021 longitudinal census is not yet available.

Figure 1 Average standard errors on state relative estimates using alternative sample weighting methods



Note: Average standard errors over 5 years of annual estimates 2018–2023, using the Commissions proposed 2025 Review model specification.

Source: Commission calculations using Characteristics of Employees survey data and Australian Census Longitudinal Data.

- 31 The Commission does not consider that the added complexity of creating custom weights in the survey data is justified. Reducing the sample by omitting individuals based on their industry, occupation or gender is likewise hard to justify and greatly reduces the reliability of estimates.

Commission draft position

- 32 The Commission does not propose to exclude groups from or apply custom weights to the private sector employees survey data.

Q3. Do states support the continued use of the Characteristics of Employment survey data?

State views

- 33 Most states supported the use of the ABS Characteristics of Employment Survey. Several states encouraged investigation into other data sources for the purposes of validating the results, or as potential alternative assessment methods.
- 34 Tasmania expressed concern over the Tasmanian sample size resulting in high standard errors. It also drew attention to variables concerning workplace size and employee health not being available in the Characteristics of Employment Survey, and considered their absence may bias state coefficients.

- 35 Several states expressed an interest in investigating the use of alternative data sources. Victoria suggested the Household, Income and Labour Dynamics in Australia Survey, Victoria and Queensland suggested the Person Level Integrated Data Asset.⁴
- 36 Western Australia expressed concerns that a household survey, such as the Characteristics of Employment Survey, is significantly affected by measurement error. It said this may be alleviated by an employer survey such as Average Weekly Earnings. It said that the reduced range of variables that can be controlled for would be more than offset by the increased quality of labour cost data. The ACT suggested considering the Monthly Employee Earnings and Weekly Payroll Jobs, or the Linked Employer-Employee Database.

Commission response

- 37 For use in the wages assessment, a dataset should:
- have a large sample size in all states to estimate all state coefficients with reasonable certainty
 - have sufficient information about factors that determine differences in wages between individuals
 - reliably capture the data it purports to capture.
- 38 Each available dataset has relative strengths and weaknesses in these domains. The Commission needs to identify the data source with the best overall combination of the above attributes. Its analysis has found the following:
- The Household, Income and Labour Dynamics in Australia survey allows for control for endogeneity through a range of employee information, but it has an extremely small sample size. For example, it follows the same sample of fewer than 50 private sector employees in the Northern Territory every year. By comparison, the Characteristics of Employment Survey creates independent samples of over 500 private sector employees in the Northern Territory each year.
 - The Person Level Integrated Data Asset (or other linked administrative datasets) has a much larger sample than survey-based data, however the quality of the data is lower. It would be necessary to relate total income earned in a financial year (as reported to the Australian Taxation Office) to the occupation, hours and other attributes described for one week in August in the census. This weak link between the outcome of interest (annual income) and the predictors (employment status and occupation at one point in time) reduces the precision of the model.
 - Employer-based collections, such as Average Weekly Earnings, Single Touch Payroll data, or the Linked Employer-Employee Dataset, may provide a more precise estimate of labour costs. However, they only allow limited controls such as industry and hours. This means they cannot adjust for key differences in state labour markets.

⁴ Formerly known as the Multi-Agency Data Integration Project (MADIP).

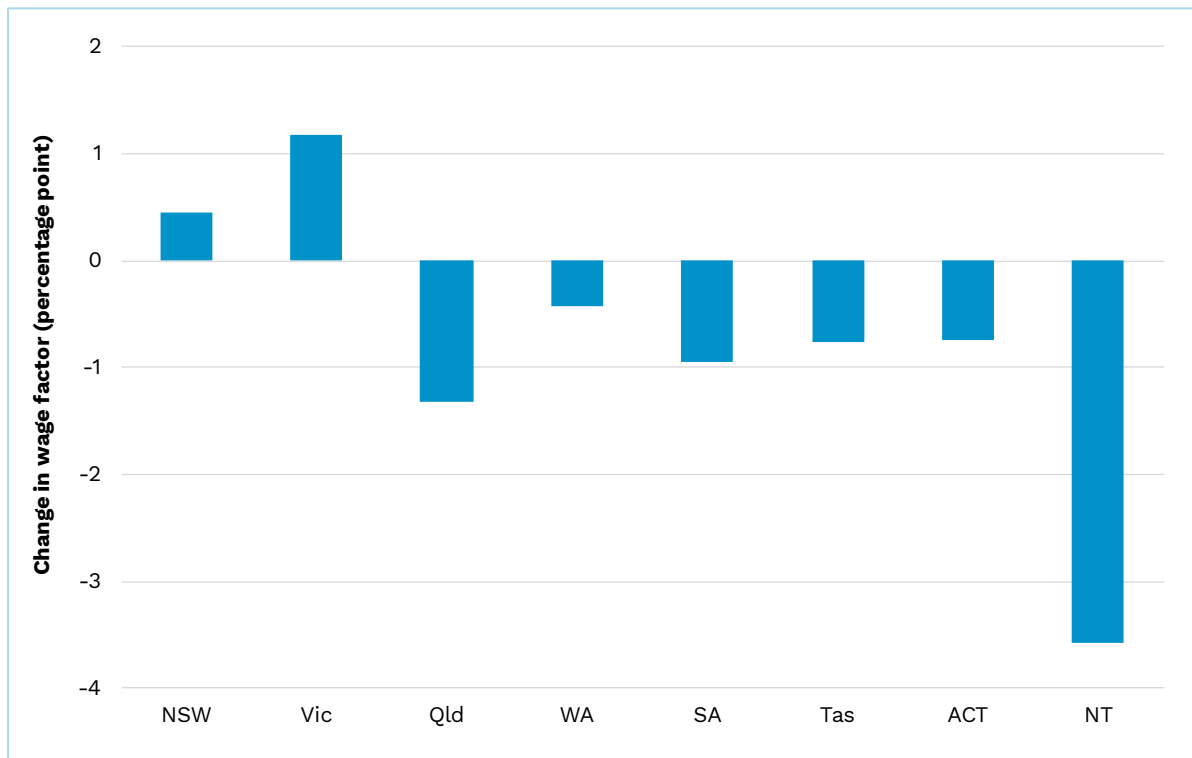
- 39 For validation purposes, the Commission has built models using the Person Level Integrated Data Asset and the Household, Income and Labour Dynamics in Australia survey data. While it does not see these as alternative datasets for the Commission's assessment, they help to provide confidence in the patterns found in the Characteristics of Employment Survey and can assist in identifying any bias from using this dataset.
- 40 The models using the alternative data sources all show the same basic pattern between states. Switching to an alternative data source would not change the general ordering of the states but would increase the quantum of the effects for smaller states, due to a reduced ability to control for confounding variables in the alternative data sources identified.
- 41 Analysis of Tasmania's concerns with potential bias due to omission of workplace size and employee health controls has been conducted using the Household, Income and Labour Dynamics in Australia survey data.
- 42 Including an index of self-reported health in a model using the Household, Income and Labour Dynamics in Australia survey data did improve the ability to predict individual level wages, however it had no consistent effect on any state coefficients. There is no evidence to suggest that there is any bias in the state estimates due to the health of the workforce in different states. This is consistent with poor health reducing a person's earnings. While some states have poorer average health outcomes than others, these health differences are largely explained by other variables in the model, such as lower educational attainment, fewer hours worked and lower skilled occupations.
- 43 There is a documented effect of workplace size on wages.⁵ Workers in small workplaces have less opportunity for advancement, and thus tend to have lower wages than comparable workers in larger workplaces. Smaller workplaces also provide less opportunity for specialisation and reduced ability to match labour with capital, resulting in lower productivity and reduced wages.
- 44 Including a coefficient of workplace size in a model using the Household, Income and Labour Dynamics in Australia survey data led to increased explanatory power of the model and consistently moved the coefficient for one state (Tasmania). While the level of movement is extremely small relative to the reliability of the limited survey data and is never statistically significant, it does represent a material difference for Tasmania. Unfortunately, the Household Income and Labour Dynamics survey does not have sufficient sample size to reliably measure such effects, especially for smaller states, so these results must be treated with caution.

⁵ W. Oi and T. Idson, 'Chapter 33, Firm Size and Wages', Handbook of Labor Economics Volume 3, Elsevier, 1999.

- 45 If this variable existed in the Characteristics of Employment Survey and showed the same relationship to state coefficients as it does in Household, Income and Labour Dynamics in Australia survey data, then the Commission could include it in its model.
- 46 The Commission has built models in the Person Level Integrated Data Asset and tested the inclusion of a proxy for workplace size. There is no material effect of including workplace size for any state other than the Northern Territory in those data. This result does come with a caveat, as the employee and work characteristics in the model all come from the 2021 Census week, when many workplaces were affected by COVID-19 emergency measures.
- 47 The balance of evidence is not compelling that there is a consistent bias in the model due to the omission of workplace size as an explanatory variable. However, the possibility of such bias cannot be ruled out, and the Commission will continue to investigate this issue after the 2025 Review as further data become available.
- 48 The Commission considered using Average Weekly Earnings in the 2020 Review. It concluded that, without controls for basic human capital underpinning the Mincer model, a model based on Average Weekly Earnings would be overly affected by omitted variable bias.⁶ Some differences in labour market composition can be controlled for by industry in an Average Weekly Earnings based model. However, differences within industries between states due to workforce characteristics cannot be controlled for using Average Weekly Earnings data.
- 49 To evaluate the bias present in a model using Average Weekly Earnings data, the Commission constructed a model in the Characteristics of Employment Survey, controlling for only the information available in Average Weekly Earnings (gender, industry, and basic hours controls). This model resulted in lower overall model fit, higher standard errors on state coefficients and systematically different estimates to the proposed model. This systematic difference in state estimates indicates the existence of systematic bias due to omitted variables in the model. Excluding variables in the Characteristics of Employment Survey, but not in the Average Weekly Earnings, would systematically increase the estimated wage coefficients for New South Wales and Victoria and reduce them for all other states (Figure 2).

⁶ Chapter 27, paragraph 75, 2020 Review Report.

Figure 2 Bias introduced by removing variables not in ABS Average Weekly Earnings



Source: Commission calculation.

Commission draft position

50 The Commission proposes to continue to use the ABS Characteristics of Employees survey as the data source to measure differences in wage pressures between states.

Q4. Do states agree the Commission should use hourly wages rather than weekly wages as the dependent variable?

State views

51 Most states did not express concerns with the use of hourly wages rather than weekly wages. Following advice from a report it commissioned, Queensland preferred weekly wages for 3 reasons.⁷

- Hourly wages may lead to spurious correlation, especially if measures of hours or other variables correlated with hours of work are included as regressors.
- The use of hourly wages is better suited to samples in which workers vary their hours of work, while weekly wages are more appropriate where workers' hours are comparable. The rationale of the assessment is to measure differences in the earnings of comparable private sector workers, which is better aligned with the 2020 Review approach (estimating weekly wages)

⁷ C. Rose, L. Yu and A. Rambaldi, 'Modelling Public Wages Expenses Across States and Time Using Survey data', University of Queensland, 2023.

- A switch to hourly wage from weekly wage decreases the explanatory power of the model.

Commission response

- 52 A standard approach in the literature is to estimate a weekly wage when no information on hours worked is available.⁸ This is usually accompanied by a restriction to full-time workers, which ensures workers are comparable along the lines of hours of work. Using weekly wages is not favoured when detailed information on hours of work is available, since it reduces sample size significantly and will produce a result that is not informative of wage differences for part-time workers (who are prevalent in the public sector).
- 53 As discussed in the wages consultation paper, the decrease in explanatory power (R-squared) associated with a switch to hourly wages is not a real reduction in explanatory power. Weekly wages are much more variable than hourly wages, and a great deal of this variation can be directly explained by hours worked per week. Switching to hourly wage removes the variation that is explained directly by hours worked, so while the proportion of variation explained is reduced, the total unexplained variation remains the same. This change results in identical estimates on all coefficients other than logarithm of hours.
- 54 The report commissioned by Queensland said that if state of residence is correlated with hours of work, this may bias state coefficients.⁹ This bias may affect a model predicting hourly wage as a ratio of weekly pay to hours worked, such as the proposed model, but not a model predicting weekly wage, such as the 2020 Review model.
- 55 The Commission tested this concern by including hours recorded on payslip in the proposed model in a form that makes it functionally equivalent to a weekly wage model. Inclusion of this variable did not improve the model fit, or substantively change state coefficients. This indicates that there is no bias to the state coefficients arising from the use of hourly wage.

Data concerns

- 56 Using hourly wage as the outcome variable requires measuring hours of work using the number of hours recorded on each individual's payslip rather than their usual hours. In the 2021 survey data, first used in the 2023 Update, there were many workers stood down due to COVID-19 lockdown measures, and the link between usual hours and weekly wages was broken. In that situation the Commission used hours recorded on payslips to remove the bias. Large scale weather events, strikes

⁸ A. Preston, Wage Costs Consultant Report, Commonwealth Grants Commission, 2023.

⁹ R.A. Kronmal, 'Spurious Correlation and the Fallacy of the Ratio Standard', *Journal of the Royal Society Series A*, 1993, 156(3):379-392.

or plant shutdowns could also lead to similar biases. An advantage of the new approach is that estimates will be robust to disruptions of this nature.

57 In the 2020 survey data however, there was a different bias due to stage 4 COVID-19 lockdowns in Melbourne combined with JobKeeper payments. This resulted in many workers being paid their usual salary, while their payslips showed reduced working hours. Under the weekly wage model with usual hours the JobKeeper bias was removed by removing workers earning exactly \$750 per week, as for other workers their weekly wage reflected their usual hours of work.

58 Under the hourly wage model there is no easy way to remove the bias arising from this combination of JobKeeper payments and lockdowns. The relative state hourly wage estimates from the 2020 survey data are extreme outliers from the average, with a known cause of bias. The Commission proposes to remove the 2020 survey data from the methods used to estimate relative state wages.

Commission draft position

59 The Commission proposes to use hourly wages rather than weekly wages as the dependent variable, and to disregard the biased estimates from 2020 when constructing relative state wage costs.

Q5. Do states support including usual hours of work in the model as 3 categories, part-time, full-time and more than full-time hours?

State views

60 No state disagreed with this approach, however several asked for further justification. The ACT said that full-time and long-hours workers may have similar earning potential and therefore only a part-time control is needed.

61 Queensland did not oppose investigation into this method. However, it questioned the conceptual basis for an hours control - in particular, the notion that an individual's hourly pay may depend on their hours of work.

Commission response

62 There are conceptual reasons for such a control. For example, an individual who usually works fewer hours is likely to accrue lower job-specific human capital with the same level of tenure, and therefore, hourly earnings may increase with hours of work. Conversely, an individual who regularly works overtime is likely to experience more rapid human capital accumulation.

- 63 Part-time and long-hours effects have been identified in the literature.¹⁰ These effects display a similar pattern to coefficient estimates from the model, where part-time workers earn a lower hourly wage and long-hours workers earn a higher wage.
- 64 The ACT's concern that hourly wages may not vary between full-time and long-hours workers is not supported by the data. The coefficients for these variables differ significantly, indicating that these workers have significantly different wage levels, after controlling for all other differences.

Commission draft position

- 65 The Commission considers that hours worked can affect a person's hourly wage, and proposes to include three categories of usual working hours in the model to capture this.

Q6. Do states support replacing imputed work experience and imputed work experience squared with 5-year age groups?

State views

- 66 No state disagreed with this approach. Queensland noted differing opinions on the best functional form between the Commission's proposed approach, the Commission's consultant's report, and its consultants from the University of Queensland as rationale for a discount.

Commission draft position

- 67 The Commission proposes to replace work experience and work experience squared with 5-year age groups. Uncertainty regarding the ideal functional form is addressed in the Commission's draft position on responses to question 10.

Q7. Do states agree with the Commission's proposed criteria for including control variables in the model?

State views

- 68 Most states agreed with this approach. New South Wales agreed that a variable must change state coefficients and have a strong conceptual basis. However, it disagreed that it must improve overall fit and decrease standard errors of state coefficients.
- 69 Victoria agreed with the criteria, but did not consider that a sufficient conceptual case for each change has been demonstrated. It requested analysis, such as log-likelihood tests and information criteria, to ensure the model is not overfitted.

¹⁰ A. Bick, A. Blandin and R Rogerson, 'Hours and Wages', *The Quarterly Journal of Economics*, 2022, 137(3):1901-1962.

- 70 South Australia said that the criteria must be weighed against each other as a trade-off, rather than a list of requirements that must be completely satisfied.

Commission response

- 71 The Commission provided diagnostic tests, including the Akaike information criterion and the Bayesian information criterion (Attachment B of the [Addendum to wages consultation paper](#)). The Commission has not proposed the addition of variables that are shown to increase the risk of overfitting.
- 72 The Commission agrees with South Australia that these criteria must be weighed against each other. For instance, a variable with a strong conceptual basis that changes state coefficient estimates and decreases standard errors may still be included in the model even if it does not improve the overall model according to the information criteria.
- 73 The motivation for considering both movement in state coefficients and decreased standard errors is to balance the need to eliminate omitted variable bias, and the associated risk of overfitting. The selected conditions must accurately capture this trade off.
- 74 The Commission and states agree that decreased volatility is an important goal in model selection. Omitting conditions 3-4 would disregard volatility or overfitting completely. Therefore, the Commission proposes to continue to evaluate its model with reference to overall fit and state standard error, to appropriately mitigate the risk of overfitting resulting from a more complex model.

Commission draft position

- 75 The Commission proposes to maintain its suggested criteria for including control variables in the model, and to weigh these criteria against each other when considering a variable that does not strictly meet all criteria.

Q8. Do states support using a less complex model by replacing industry group categories with industry division categories and removing the interaction terms with gender and every other independent variable?

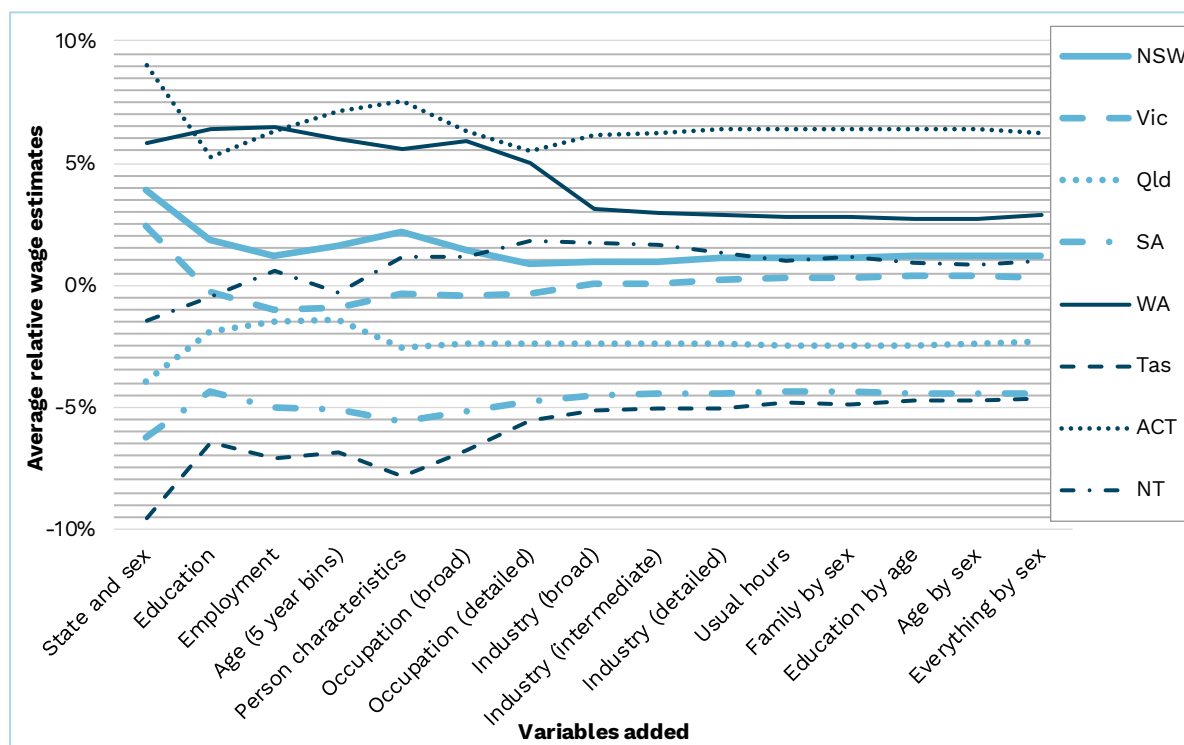
State views

- 76 Most states agreed, but New South Wales said that the exclusion of detailed industry categories leads to omitted variable bias, and detailed industry categories should be included in the model. New South Wales argued that a move to a model that includes detailed industry categories leads to material distributional effects.
- 77 Victoria suggested that occupation could be specified at a lower level of detail, in line with the specification of industry.

Commission response

- 78 Using a pooled sample from 2018 to 2022, the Commission developed stepwise models, progressively adding variables in the order suggested by New South Wales.
- 79 Including detailed industry categories at any stage in the stepwise regression will increase the standard errors for state coefficients, implying the introduction of random variation in the estimates. By including this element earlier in the stepwise regression, valuable information using the family characteristics and usual hours of work would also be disregarded in the selected model. Figure 3 shows average estimates from these models, which show only minimal deviation after New South Wales' proposed model (the vertical blue line).

Figure 3 Average state coefficients when including additional control variables in the regression model (2018–22)



Notes: Horizontal gridlines represent the approximate amount of change that would materially affect the GST distribution for an average state.

Employment includes a permanent/casual indicator and tenure in current job.

Person characteristics include marital status, migrant status and having dependent children.

Family by sex allows for marital status and dependent children to have a different effect on male and female wages.

Individuals working fewer than 5 hours or 60 or more hours are excluded from the model.

Source: Commission calculation.

Table 1 Average standard errors of state coefficients when including additional control variables in the regression model (2018–22)

	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Average
State and sex	0.0102	0.0102	0.0107	0.0116	0.0129	0.0145	0.0237	0.0210	0.0144
Education	0.0095	0.0097	0.0100	0.0108	0.0120	0.0137	0.0225	0.0205	0.0136
Employment	0.0093	0.0088	0.0095	0.0110	0.0117	0.0130	0.0223	0.0199	0.0132
Age (5 year bins)	0.0092	0.0088	0.0095	0.0106	0.0119	0.0130	0.0213	0.0197	0.0130
Person characteristics	0.0089	0.0087	0.0095	0.0103	0.0114	0.0124	0.0201	0.0185	0.0125
Occupation (broad)	0.0088	0.0081	0.0088	0.0101	0.0107	0.0119	0.0190	0.0180	0.0119
Occupation (detailed)	0.0085	0.0081	0.0085	0.0101	0.0100	0.0116	0.0175	0.0172	0.0114
Industry (broad)	0.0084	0.0082	0.0086	0.0098	0.0098	0.0116	0.0177	0.0169	0.0114
Industry (intermediate)	0.0084	0.0083	0.0088	0.0098	0.0095	0.0113	0.0178	0.0172	0.0114
Industry (detailed)	0.0084	0.0083	0.0090	0.0102	0.0099	0.0116	0.0182	0.0176	0.0117
Usual hours	0.0083	0.0082	0.0090	0.0101	0.0098	0.0116	0.0181	0.0178	0.0116
Family by sex	0.0083	0.0082	0.0090	0.0102	0.0098	0.0115	0.0181	0.0177	0.0116
Education by age	0.0084	0.0080	0.0091	0.0103	0.0098	0.0113	0.0180	0.0176	0.0116
Age by sex	0.0084	0.0080	0.0090	0.0103	0.0098	0.0114	0.0181	0.0177	0.0116
Everything by sex	0.0087	0.0083	0.0093	0.0105	0.0100	0.0116	0.0189	0.0178	0.0119

Notes: Minimum average standard errors for each column are in bold.

See notes to Figure 1.

Source: Commission calculation.

Table 2 Average model fit statistics of regression models including additional variables (2018–22)

	R ²	R ² (adj)	log Likelihood	AIC	BIC	States with consistent movements
State and sex	0.0198	0.0193	-12,863	25,747	25,823	
Education	0.1345	0.1336	-11,878	23,790	23,920	6
Employment	0.1832	0.1823	-11,422	22,881	23,027	7
Age (5 year bins)	0.2402	0.2389	-10,853	21,763	21,985	5
Person characteristics	0.2592	0.2575	-10,652	21,378	21,661	7
Occupation (broad)	0.3116	0.3097	-10,075	20,237	20,574	5
Occupation (detailed)	0.3563	0.3503	-9,545	19,385	20,513	4
Industry (broad)	0.3671	0.3605	-9,411	19,152	20,418	6
Industry (intermediate)	0.3750	0.3655	-9,311	19,098	20,917	0
Industry (detailed)	0.3870	0.3711	-9,160	19,114	22,158	2
Usual hours	0.3893	0.3735	-9,129	19,057	22,117	4
Family by sex	0.3913	0.3754	-9,105	19,013	22,087	2
Education by age	0.3993	0.3810	-9,000	18,935	22,522	1
Age by sex	0.4016	0.3829	-8,969	18,894	22,557	2
Everything by sex	0.4232	0.3894	-8,682	19,101	25,757	2

Notes: Optimal model based on each statistic is in bold.

“States with consistent movements” counts the number of state coefficients which move in a consistent direction in all years when including additional control variables in the regression model.

See notes to Figure 1.

Source: Commission calculation.

- 80 The addition of “Industry (detailed)” immediately following “Industry (broad)” results in an increase in standard errors for all states, and on average (Table 1). This also results in a sharp increase in Bayesian Information Criterion, a statistic designed to penalise overfitting (Table 2). In this series, both Bayesian Information Criterion and average standard errors are minimised by the model “Industry (broad)”.
- 81 Under the proposed criteria for evaluating models, detailed industry is supported by a strong conceptual case and results in some movement in state coefficients. However, these changes are inconsistent in direction, resulting from the higher uncertainty. As such, the Commission does not believe that this is a reliable result, or that the inclusion of detailed industry is justified.
- 82 With this stepwise ordering, the selected model under the proposed criteria would be “Industry (broad)”. This ordering prevents the addition of further variables such as “Usual hours” without the inclusion of detailed industry.
- 83 The Commission notes Victoria’s concern that the specification should only include 1-digit occupation controls, to achieve parsimony and avoid overfitting, noting the similar proposed treatment of industry. The Commission proposes to maintain 3-digit occupation controls for reasons outlined in the addendum to the wage costs consultation paper. Detailed occupation has a strong conceptual case for inclusion, moves state coefficients, decreases average standard errors for all states, and

improves average fit based on all fit statistics considered. 3-digit industry did not meet these criteria, and since industry and occupation are separate variables, they do not need to be included at the same level of detail.

Commission draft position

- 84 The Commission proposes to maintain its ordering of stepwise inclusion of variables in the model and exclude detailed industry controls from the model and remove the gender interaction terms.

Q9. Do states agree with the proposed approach to combine estimates of relative differences in states' wages across years?

State views

- 85 All states agreed with the proposal to implement a smoothing/pooling method to reduce volatility and improve the reliability of annual estimates. Support for the proposed method was mixed. South Australia and the ACT explicitly preferred the variance-weighted average approach to a pooled approach. The Northern Territory supported the approach, but preferred an implementation that would not lead to revisions (only using data older than the year in question when combining estimates for a given assessment year).
- 86 Victoria, Western Australia and South Australia were not concerned with the validity of the proposed method, but expressed concerns that the complexity may not warrant its use over the simpler pooled regression approach.
- 87 New South Wales did not support the proposed approach, instead supporting pooling. It expressed concerns with complexity and said that the differences in standard errors between years are not significant enough that heterogeneous weighting leads to a substantially more reliable estimate. It also expressed concerns with potential revision effects.
- 88 Queensland similarly did not support the variance-weighted average method, expressing concerns that the weights placed on certain years appear arbitrary and are not transparent. It argued that statistical power is decreased when compared to a true pooling method and expressed concerns that correct standard errors are difficult to compute.
- 89 Tasmania did not support the variance-weighted average method, expressing concerns that as the series of estimates become longer, estimates become less responsive to current labour market conditions.

Commission response

- 90 The Commission's proposed approach to smoothing reduces volatility more than using a 3-year pooled sample. This is shown in Table 3. It does this by using a

sample that covers a longer time period than in the 3-year pooled sample, including all the historic estimates back to 2016–17.

Table 3 Magnitudes of GST effects from updating relative state wages under different approaches to smoothing

	Average state			Biggest mover		
	U2022	U2023	U2024	U2022	U2023	U2024
	\$pc	\$pc	\$pc	\$pc	\$pc	\$pc
R2020 methods	46	37	57	112	109	184
Pooled model	34	30	39	129	70	68
Weighted averages	21	9	13	105	24	23

Note: These changes include minor revision effects due to ABS sample reweighting.

Source: Commission calculation.

- 91 Regarding Tasmania’s view that the proposed method compromises contemporaneity, the Commission recognises that estimates become less influenced by newer years of data. However, insofar as wage movements are reflected in the ABS’s Wage Price Index, all indexed estimates for a single year are reflective of the relative wage levels for that year.
- 92 Queensland raised concerns that the proposed approach would reduce statistical power and be somewhat arbitrary. The Commission notes that the proposed approach applied to only 3 years, and without indexation, would produce identical results to the pooled approach. However, using additional years increases the statistical power, and indexation ensures they are contemporaneous.
- 93 The Commission recognises that the method proposed in the consultation paper would introduce revision effects as each new year of data is used to recalibrate estimates from previous years. To address these concerns about revision effects the Commission agrees with New South Wales and the Northern Territory and will not incorporate newer years of data into previous estimates, avoiding revision effects as new years of data become available.

Commission draft position

- 94 The Commission proposes to smooth data over time using the proposed method, but not to incorporate newer years of data into earlier estimates to avoid revision effects.

Q10. Do states agree that a 12.5% discount remains appropriate?

State views

- 95 State views on the appropriate level of discounting were mixed. Victoria agreed that a 12.5% discount remains appropriate, and Queensland agreed that at least a 12.5% discount is appropriate. New South Wales, Western Australia, the ACT and the Northern Territory said no discount is required. South Australia and Tasmania said a 25% discount is appropriate.

- 96 In the wage costs assessment, the 12.5% discount is due to uncertainty from the model, rather than correcting a systematic bias of state coefficients away from zero. New South Wales said that given no evidence of systematic bias, the reliability of the Characteristics of Employment survey, the extent of econometric controls, and the strength of the private sector proxy, a discount is not warranted.
- 97 The Northern Territory said that the wages assessment already underestimates differences in cost pressures, which will be made worse by a discount.
- 98 Western Australia and the ACT said that, as the proposed changes will improve both reliability and volatility, the need for a discount on these grounds would no longer be warranted if these changes are implemented.
- 99 In supporting the removal of the discount, New South Wales and Western Australia drew attention to Professor Preston’s endorsement of the private sector proxy. Western Australia additionally drew attention to New South Wales’ consultant Professor Morley’s review, which made no criticism of the strength of the proxy.¹¹
- 100 Queensland said that due to issues with the private sector proxy, differing views between the Commission and Professor Preston in the modelling approach, and small sample sizes in the Characteristics of Employment survey, a discount of at least 12.5% remains appropriate.
- 101 University of Queensland consultants conducted econometric analysis, selecting the largest discount that would not significantly bias state coefficients towards zero in each year. This demonstrated that a discount of 12.5% does not introduce measurable bias.
- 102 South Australia said that, due to compositional differences between the public and private sectors, differences in outcomes between the sectors and possible differences in remote working between the sectors, the weakness of the conceptual case for the private sector proxy warrants a discount of 25%.
- 103 Tasmania also said that due to differing private and public sector outcomes, and small sample size, a 25% discount is appropriate. In addition, Tasmania said that the modelling approach may not account for non-geographic biases and said that a 25% discount is applied in the urban transport assessment for a similar level of uncertainty due to the use of a proxy and reliability of data.

Commission response

- 104 The changes proposed by the Commission are expected to improve the reliability and reduce the volatility of the wages assessment. However, uncertainty from the use of private sector proxy data, as identified in the Commission’s consultant’s report, remains. This continues to warrant some discounting. The Commission does not

¹¹ J. Morley, ‘Report on CGC Estimates of State-Specific Wage Costs’, *The University of Sydney*, 2022.

consider that the strength of the private-sector proxy has weakened such that the size of the discount needs to be increased. On balance, the Commission considers the existing 12.5% discount remains appropriate.

Commission draft position

- 105 The Commission proposes to maintain a 12.5% discount, reflecting continuing general uncertainty about measurement issues and the use of the private sector wages proxy.

Other issues raised by states

Wage to non-wage costs

- 106 Victoria raised concerns about the calculation of the proportion of state expenses that are wage related, in particular in the housing, roads and transport assessments.
- 107 The Commission classifies spending as wage, non-wage or other and calculates wages as a proportion of wage and non-wage costs and extrapolates that to all spending. Victoria said this approach results in an overstatement of the wage proportion of expenses. For example, direct grants to remote communities which subsidise the provision of electricity and water are classified as 'other' and hence have an assumed embedded wage cost.
- 108 State recurrent spending on housing, roads and transport has a very low proportion of wages, largely reflecting the high use of contractors in these areas. Government Finance Statistics (GFS) on the wage proportion in these categories are an unreliable proxy for the overall local wage share. The Commission currently sets the wage share for these categories as equal to the average of all other categories. Victoria said that these components are more capital intensive than the average of other assessments, and as such, should have a lower-than-average wage cost proportion.
- 109 Victoria pointed to Bureau of Infrastructure and Transport Research Economics data, which suggest local labour costs make up 34% of spending on roads, lower than the 63% average proportion. Victoria requested the Commission remove the adjustment to GFS data or consider alternative data sources for adjustment if GFS data are not satisfactory.

Commission response

- 110 Expenses attributed as other expenses (neither wage nor non-wage) generally relate to direct grants that are generally for the provision of state type services. For example, a state may give a grant to a not-for-profit to provide services. The Commission considers that in this scenario, the not-for-profit would be expected to face the same wage to non-wage mix and pressures. While this will not be the case in all circumstances, including direct grants as non-wage costs in the calculation of proportions would understate the wage cost proportion.

- 111 In housing, roads and transport, the majority of expenses in GFS data are attributed as other expenses. This generated uncertainty about the actual wage proportion of expenses in these categories. In the 2020 Review method the wage proportion of these categories was extrapolated as the average proportion of all other categories.
- 112 The Commission has analysed ABS national account Input-Output table data. Local labour makes up less than the average proportion in housing, roads and transport.
- 113 Instead of imputing the categories with higher levels of unattributed spending, the Commission proposes to impute unattributed spending in all categories based on the ratio of total known wage and non-wage spending, just as it does for other categories.
- 114 The comparison of these methods can be seen in Table 4. By splitting the unattributed expenses in each category by the total known wage to non-wage proportions, all categories move closer to the average. This effect is more pronounced in categories with a higher proportion of unattributed expenses.

Table 4 Wage costs by category, 2018–19 to 2021–22 averages

	Wage	Non-wage	Unattributed	Wage ratio	R2020 method	Proposed method
	\$m	\$m	\$m	%	%	%
Schools	33,969	12,108	2,551	73.7	73.7	73.0
Post-secondary education	3,587	2,809	1,430	56.1	56.1	56.7
Health	55,159	30,509	2,920	64.4	64.4	64.2
Housing	628	1,144	3,203	35.4	62.5	50.7
Welfare	3,947	6,939	12,191	36.3	36.3	48.4
Services to communities	3,331	4,511	4,394	42.5	42.5	48.5
Justice	17,143	7,137	529	70.6	70.6	70.4
Roads	1,874	5,009	3,053	27.2	62.5	37.1
Transport	1,196	8,028	6,323	13.0	62.5	31.8
Services to industry	3,087	3,448	9,376	47.2	47.2	54.3
Other expenses	10,536	10,955	6,931	49.0	49.0	51.5

Source: Commission calculations using ABS Government Financial statistics data.

Commission draft position

- 115 The Commission proposes to treat all categories in the same manner, and to estimate wage costs by applying the ratio of overall total wage to non-wage expenses to the other expenses in every category.

Indicative distribution impacts

- 116 The impact on the GST distribution in 2024–25 from the proposed method changes is shown in Table 5. This includes the effects of the amended regression model, the smoothing of annual estimates and the change to the way the wage/non-wage split is calculated from the GFS data.
- 117 To avoid double counting of method changes in the analysis in this report, changes to the wage costs assessment have not been included in the changes shown in the category specific chapters.

Table 5 Indicative impact on GST distribution (difference from an equal per capita distribution), 2024–25

	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Total Effect
	\$m	\$m	\$m	\$m	\$m	\$m	\$m	\$m	\$m
U2024 using R2020 methods	807	-217	-736	813	-639	-322	176	118	1,914
U2024 using draft R2025 methods	678	21	-719	466	-517	-215	202	85	1,452
Effect of draft method changes	-129	238	17	-348	122	107	26	-33	510
	\$pc	\$pc	\$pc	\$pc	\$pc	\$pc	\$pc	\$pc	\$pc
U2024 using R2020 methods	95	-31	-131	275	-338	-555	366	459	70
U2024 using draft R2025 methods	79	3	-128	157	-274	-371	420	331	53
Effect of draft method changes	-15	34	3	-118	64	184	54	-129	19

Note: This includes the effects of applying the new wage assessment methods to all expense categories, after other method changes have been applied within each category.
 The GST pool and population estimates are equivalent to those used in the 2024 Update.
 The data included in the table have not been subject to full quality assurance processes and as such, should be treated as indicative only.
 Indicative GST impacts are provided for illustrative purposes only and should not be used to predict impacts on GST distribution for 2025–26.
 The impact of the U2024 using R2020 methods line does not match the comparable line included in Table 2-10 from the 2024 Update. This is for 2 reasons. Firstly, the wage costs assessment also feeds into the cost of construction line under investment in Table 2-10. Both these effects are included here. Secondly, these are the effects of U2024 wage methods after applying other R2025 method changes.

- 118 The proposed smoothing approach replaces an annual estimate with the long-term trend estimate. States with assessment year wage cost estimates below their long-term trend levels had their estimates increased, increasing their GST distribution and vice versa. In the long-term, the average impact of this method change should be negligible for all states.
- 119 Changes to the regression model included moving from weekly to hourly pay, reducing the level of detail in the industry classification and removing the interaction terms between gender and every other variable. For the years under consideration, the combined effect of these changes was to increase the GST distribution for Victoria, South Australia, Tasmania and the ACT, and to reduce it for the other states.
- 120 There has been a reduction in the estimated labour share of total costs in housing, transport and roads, and an increase in welfare, services to communities and services to industry. These changes have affected the impact of wages costs on

states, depending on their relative need for spending in different areas, and their relative wage levels. For example, Western Australia has above average wage costs and the net effect of changes to estimated labour share increases the total labour share of Western Australia’s assessed expense needs, increasing their GST distribution.

Table 6 Indicative impact on GST distribution of proposed method changes (disaggregated), 2024–25

	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Total Effect
	\$m	\$m	\$m	\$m	\$m	\$m	\$m	\$m	\$m
Smoothing	-151	57	151	-177	60	80	-27	7	355
New model	-1	296	-177	-308	89	76	77	-52	538
New wage/non-wage split	22	-114	43	137	-27	-49	-24	11	214
Total	-129	238	17	-348	122	107	26	-33	510
	\$pc	\$pc	\$pc	\$pc	\$pc	\$pc	\$pc	\$pc	\$pc
Smoothing	-18	8	27	-60	32	137	-56	28	13
New model	0	42	-32	-104	47	130	161	-201	20
New wage/non-wage split	3	-16	8	46	-14	-84	-50	45	8
Total	-15	34	3	-118	64	184	54	-129	19

Note: This includes the effects of applying the new wage assessment methods to all expense categories, after other method changes have been applied within each category.
The GST pool and population estimates are equivalent to those used in the 2024 Update.
The data included in the table have not been subject to full quality assurance processes and as such, should be treated as indicative only.
Indicative GST impacts are provided for illustrative purposes only and should not be used to predict impacts on GST distribution for 2025-26.