THE GST DISTRIBUTION MODEL — A MATHEMATICAL PRESENTATION

1 The Commission recommends to the Treasurer how GST revenue should be distributed among the States to accord with the principle of horizontal fiscal equalisation.

2 It approaches this task in two parts.

- Firstly it assesses the GST distribution required in each of the three most recent historical years for which data are available (referred to as the assessment years) that would provide each State with the same fiscal capacity. (Part A — Equalising the Assessment years.)
- Secondly, these historical distributions are used as a guide to the appropriate GST distribution in the year for which the Commission is making its recommendations (referred to as the application year). (Part B — From Assessment to Application year.)

3 The procedure and arithmetic rules used by the Commission to derive a recommended GST distribution is called the distribution model. This paper sets out that model and explains the steps involved. The Attachment provides an alternative presentation.

PART A: EQUALISING THE ASSESSMENT YEARS

4 There are two aspects to the equalisation task. One considers the budget, or fiscal, outcome of the States, while the other relates to the standard of services and associated infrastructure a State provides, along with the revenue capacity it has to meet this level of service provision. The recommended GST distribution will equalise both fiscal outcomes and the capacity to deliver services if States make the same revenue effort. These twin aspects of equalisation have been in place since the Commission's earliest inquiries.

5 In the 2015 Review the Commission decided that the equalised fiscal outcome it sought to achieve was for States to have the capacity to have an equal holding of financial worth per capita. Service delivery equalisation is achieved by giving States the capacity to provide services and the associated infrastructure at the same standard, if each made the same effort to raise revenue from its own sources and operated at the same level of efficiency.

6 The assessed GST requirements are calculated in a sequential way. The process includes:

- compiling the adjusted budget to obtain average State net lending, average expenses on State services and average State investment, average revenues for State own-source revenues and from other Commonwealth payments for specific purposes (Commonwealth payments)
- equalising State fiscal outcomes by calculating how much each State needs to save or borrow to give it the average stock of financial assets (assessed net lending)
- equalising service delivery capacity and revenue effort by
  - calculating, for each State expense, how much more or less than the average each State would need to spend to deliver the average service (assessed expense)
  - calculating how much each State would need to invest to give it the average stock of infrastructure, recognising differences between States in the quantity they require and its costs (assessed investment)
  - calculating, for each State revenue, how much more or less than the average each State would raise if it adopted the average revenue raising policy of the States (assessed revenue)
  - observing the level of other Commonwealth payments received by States.

7 Once these individual assessments are made, the Commission derives the GST each State needs to leave it with the average stock of net financial assets after having provided the average level of services, acquired the associated infrastructure and made the average effort to raise revenue.

8 The model used in these calculations is summarised by the following equations:

The budget identity:

$$(\mathrm{G_s} + \mathrm{O_s} + \mathrm{R_s}) - (\mathrm{E_s} + \mathrm{I_s}) = \mathrm{N_s} \qquad (1)$$

This identity occurs in all State budgets and says that the revenue States receive (from the GST, Other Commonwealth payments and from their own sources) that they do not use (as recurrent expenses or on new infrastructure) is saved.

The budget identity can be rearranged to make the GST the dependent variable:

$$\mathrm{G_s} = \mathrm{N_s} - \big((R_s + O_s) - (\mathrm{E}_s + \mathrm{I}_s)\big) \qquad (2)$$

From equation (2) it can be seen that for each State, the assessed GST revenue a State needs can be calculated as the difference between what it needs to save each year to give it the average fiscal outcome and what it would save if it delivered the average level of services and made the same revenue effort (with no GST revenue):

$$\mathrm{AGSTR_i} = \mathrm{AN}_i - \big((\mathrm{AR}_i + \mathrm{O}_i) - (\mathrm{AE}_i + \mathrm{AI}_i)\big) \qquad (3)$$

This can be expressed differently by recognising, for example, that a State's assessed expenditure is its assessed per capita expenditure times its population, and in turn that its assessed per capita expenditure is some proportion of the observed average per capita expenditure by all States:

$$\mathrm{AGSTR_i} = \mathrm{P_i}\,\frac{\mathrm{N_s}}{\mathrm{P_s}}\,\varepsilon_\mathrm{i} + \mathrm{P_i}\,\frac{\mathrm{E_s}}{\mathrm{P_s}}\,\gamma_\mathrm{i} + \mathrm{P_i}\,\frac{\mathrm{I_s}}{\mathrm{P_s}}\,\delta_\mathrm{i} - \ \mathrm{P_i}\,\frac{\mathrm{R_s}}{\mathrm{P_s}}\,\rho_\mathrm{i} - \mathrm{O_i} \qquad (4)$$

Where:

i, s	subscripts used to denote an individual State (i) or all States (s)
P	population
N, E, I, R	net lending, expense, net investment and own-source revenue respectively
ε, γ, δ, ρ	assessed disability factors for net lending, expense, net investment, and own-source revenue respectively
G	GST revenue
O	other Commonwealth payments. These include Payments for Specific Purposes (PSPs) which the Commission has decided should impact on relativities. They may also include Commonwealth own-purpose outlays which the Commission treats as impacting on relativities.
AN,AE,AI,AR	assessed net lending, expense, net investment and own-source revenue respectively
AGSTR	assessed GST revenue requirement. The Commission's approach ensures States' assessed GST revenue requirement sums to the total GST revenue available ($\sum_\mathrm{i} \mathrm{AGSTR_i} = \mathrm{G_s}$)

9 These equations show expenses ($\mathrm{E_s}$), own-source revenues ($\mathrm{R_s}$) and all other Commonwealth payments ($\mathrm{O_s}$) as single items. In practice, they are the sum of the expenses for each service, the revenue from each tax or charge and the revenue from each Commonwealth payment. These equations also show aggregate disability factors (ε_i, γ_i, δ_i and ρ_i) being applied to average net lending, expenses, net investment, and revenues. In practice, separate calculations are made for each expense and revenue. The aggregate disability factors for total expenses and total revenue are weighted averages of those for the individual expense and revenue categories.

10 Note that, from equation (1), if States' expense and investment exceed own-source revenue, GST and all other Commonwealth payments, then net lending will be negative. In this case, States are on average net borrowers, as they must borrow, or reduce financial assets, thereby reducing net financial worth. Where this is the case,

then net lending (N_s) in equation (2) can be thought of as another source of funds to meet a State's expenditure requirement.[1]

The adjusted budget

11 The adjusted budget is used to derive the average revenue and spending of the States used in the budget identity and associated equations. The adjusted budget is compiled using data from the annual operating statements of the States' general government sectors sourced from the ABS Government Finance Statistics. Additional information is obtained from the States and their budget documents including information about State housing and urban transport public non-financial corporations (PNFCs).[2]

12 Where necessary, the figures for each State are adjusted to ensure they reflect common financial and accounting practices before they are brought together to form the all State totals. Transactions are also classified on a common functional basis — that is, E_s and R_s are split into categories of services provided and revenue collected.

13 The averages in Equation (4) are the average per capita total GST revenue, total State net lending, total expense, total investment, total own-source revenue and other Commonwealth payments from the adjusted budget. They are calculated as follows:

- average GST revenue per capita is the total GST revenue received by all States divided by their total population, or

$$\frac{G_s}{P_s} = \frac{\sum G_i}{\sum P_i}$$

- average net lending per capita is the total net lending of all States divided by their total population, or

$$\frac{N_s}{P_s} = \frac{\sum N_i}{\sum P_i}$$

- average expense per capita is the total expense of all States divided by their total population, or

$$\frac{E_s}{P_s} = \frac{\sum E_i}{\sum P_i}$$

- average net investment per capita is the total net investment of all States divided by their total population, or

$$\frac{I_s}{P_s} = \frac{\sum I_i}{\sum P_i}$$

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1 Net borrowing is negative net lending. This was the presentation adopted in the Commission's *2015 Report, Volume 2, Attachment 6, Calculation of GST relativities*.

2 For more information on the scope of the adjusted budget see Attachment 3 to Volume 2 of the Report on GST Revenue Sharing Relativities, 2015 Review.

- average revenue per capita is the total own-source revenue of all States divided by their total population, or

$$\frac{R_s}{P_s} = \frac{\sum R_i}{\sum P_i}$$

- average other Commonwealth payments per capita is the total of the SPPs and NPPs received by all States (and which are treated as impacting on relativities) divided by their total population, or

$$\frac{O_s}{P_s} = \frac{\sum O_i}{\sum P_i}$$

14 A separate category average is calculated for each expense or revenue category in the adjusted budget. The categories used in the 2015 Review are shown in Table 1.

Table 1 Adjusted budget categories in the 2015 Review

Expenses	Revenue	Capital	Other Commonwealth payments
Schools education	Payroll tax	Net investment	Payments for Specific Purposes
Post-secondary education	Land tax	Net lending	
Health	Stamp duty		
Housing	Insurance tax		
Welfare	Motor taxes		
Services to communities	Mining revenue		
Justice	Other revenue		
Roads			
Transport			
Services to industry			
Depreciation			
Other expenses			

Assessed budget

15 Equation (3) shows the total GST revenue a State would require in an assessment year to ensure it had the capacity to make the savings (or borrowings) necessary to finish a year with the average per capita net financial worth after:

- providing the average level of services
- making the investment necessary to finish the year with the disability adjusted average level of infrastructure required to provide the average level of services
- making the average effort to raise revenue from their taxes and charges
- deducting actual Commonwealth payments treated as impacting on relativities

- operating at an average level of efficiency in providing services and collecting revenue.

16 Each term is defined as follows:

- Assessed net lending — the net lending (or borrowing) a State would need to finish the year with its population share of the State total net financial worth. That is, States' fiscal outcomes are equalised so as to hold the same net financial assets per capita.
- Assessed expense — the expenses a State would incur if it provided the average standard of State services and did so at the average level of operational efficiency. A State's total assessed expense is the sum of its assessed amount for each expense category in the adjusted budget.
- Assessed investment — the net investment in physical assets a State would require if it provided the average standard of State services with the disability adjusted average level of infrastructure and did so at the average level of operational efficiency.
- Assessed revenue — the revenue a State would collect from taxes and charges if it applied the average tax rates to its revenue bases, defined in accordance with the average tax policy. A State's total assessed revenue is the sum of its assessed amount for each revenue category in the adjusted budget.
- Assessed other Commonwealth payments — the Commonwealth payments (other than GST) a State receives that are treated as impacting on relativities.

17 Differences between States in their actual per capita net lending, expense, net investment and revenue may be attributed to:

- policy differences affecting net lending, levels of service, investment and revenue raising effort
- differences in operating efficiency
- disabilities (unavoidable non-policy differences) in net lending, costs of providing the average level of services, investment requirements and revenue capacities arising from differences in State circumstances, such as:
  - population characteristics
  - geography and physical environments
  - economies.[3]

However, only the unavoidable non-policy differences are captured by the Commission in its assessments.

18 Once State averages are established each State's assessed saving, revenues, expenses and investment is calculated based on how each disability affects its individual

[3] The Commission does not aim to achieve precise equalisation because not all disabilities are included, either because they cannot be reliably measured or they have an immaterial impact.

circumstances.[4] Identifying and measuring the impact of those disabilities is the main task in estimating a State's assessed GST requirement.

Estimating assessed net lending

19 This assessment equalises States' fiscal outcomes. Assessed net lending is the amount a State saves (or would need to borrow during a year) to ensure it finishes the year with the average per capita net financial worth. The assessment reflects the average per capita net lending and differences between States in population growth from one year to the next.

20 A State's assessed net lending in a year is calculated by subtracting its population share of the total net financial worth at the start of the year from its population share of total net financial worth at the end of the year. Its per capita assessed net lending is derived by dividing this amount by its population in that year.

$$\text{State i's assessed net lending per capita} = \left(P_{it} \frac{F_{st}}{P_{st}} - P_{i(t-1)} \frac{F_{s(t-1)}}{P_{s(t-1)}} \right) / P_{it}$$

Where:

F is the level of total State net financial worth

21 The level of net financial worth at the end of the year (F_{st}) is the financial assets less liabilities of the State general government sector and State housing and urban transport corporations.

22 The Commission calculates the value of net financial worth at the start of the year ($F_{s(t-1)}$) by subtracting net lending in the year (N_s) from the end of year figure. This approach ensures the sum of States' assessed net lending equals total net lending in the year.

$$\sum_i \text{Assessed net lending}_i = \sum_i \left(P_{it} \frac{F_{st}}{P_{st}} - P_{i(t-1)} \frac{F_{s(t-1)}}{P_{s(t-1)}} \right) = N_s$$

23 In the assessed GST revenue requirement equation (equation 4), a State's assessed disability factor (ε_i) for net lending is its assessed net lending per capita divided by the average net lending per capita.

Estimating assessed expenses

24 The assessments of expenses, net investment, revenues and other Commonwealth payments collectively provide States with the same capacity to provide services.

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[4] However, State policies on revenue efforts, levels of service, investment and operating efficiency affect the Australian averages (because they are an average of what States do) and may indirectly influence equalisation outcomes for all States.

25 A State's assessed expense for a category is estimated by multiplying the average expense per capita by its category disability factor (γ_i) and its population.[5] Thus, for each category:

$$\text{State i's assessed expense} = P_i \frac{E_s}{P_s} \gamma_i$$

26 The category disability factor captures the impact on a State's service delivery costs of its non-policy influences (or disabilities) relative to the Australian average impact. If there was only one non-policy influence, the category disability could be represented as:

$$\gamma_i = \frac{X_i}{P_i} \Big/ \frac{X_s}{P_s}$$

Where:

X_i, X_s	are measures of the non-policy influence for State i and the total of the non-policy influence for all States
X_i/P_i	is the per capita measure of non-policy influences for State i
X_s/P_s	is the Australian per capita measure of non-policy influences or the average non-policy influence for all States

27 In practice, more than one non-policy influence can affect spending on a given service. Different influences may affect the spending on different services and different influences may affect the spending on different parts of the same service. Expense categories are dissected into components and a State's category disability factor is calculated by weighting its factor for each component — the weights are the proportions of the category average attributable to each component. Within each component, individual disability factors are combined either multiplicatively or additively depending on the nature of the disability involved.

28 The use of components within expense categories ensures individual disability factors are applied only to those expenses they affect. Components minimise unintended interactions of disability factors, and achieve a better equalisation result.[6]

29 A more detailed description of the assessment methods for State expenses is in Attachment B.

30 There are two special cases for assessed expenses, as follows.

- Where the Commission considers every State can provide the average level and quality of service at the same per capita expense (any cost differences that exist

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5 Alternatively, it can be regarded as multiplying the State's population share of the category expenses by its category disability ratio or cost of service provision ratio (γ_i).

6 For all disabilities, where the Commission considers the quality of data is low but the data are usable, it may apply a discount in line with its assessment of data quality when quantifying the effect of a disability.

are attributable to State policies, not to disabilities), it sets each State's assessed expense to the per capita average expense — that is, the equal per capita (EPC) method is applied.

- Where the Commission considers that differences in the per capita costs of providing a standard service are due wholly to non-policy influences, it sets each State's assessed expenses to its actual per capita expense — that is, the actual per capita (APC) method is applied.

Estimating assessed net investment

31 States invest in infrastructure/physical assets to provide services. A State's assessed net investment is the amount it would invest in a year to ensure it finishes that year with the average infrastructure, as adjusted for the disabilities it faces which affect the quantity of infrastructure required and the cost of acquiring it. A State's assessed net investment is driven by the average per capita level (or stock) of physical assets/infrastructure, changes to the average per capita stock (that is, by the average investment per capita), its population and other characteristics which affect the need for infrastructure.

32 Assessed investment in a year is calculated by subtracting the assessed level of infrastructure required at the start of the year from the assessed level of infrastructure required at the end of the year and multiplying the result by the State's unit cost disability (α_i).

$$\text{State i's assessed net investment} = \left(K^*_{it} - K^*_{i(t-1)}\right) \alpha_i$$

Where:

K^*	is the assessed level of State infrastructure
t, (t-1)	represent two periods of time — t is the end of the year and (t-1) is the start of the year
α_i	is the unit cost disability of State i

33 The assessed level of infrastructure at the end of a year is calculated by applying the disabilities affecting the quantity of infrastructure the State requires to deliver the average services to the average per capita infrastructure at that time.

$$K^*_{it} = P_{it} \frac{K_{st}}{P_{st}} \varpi_{it}$$

Where:

K	is the level or stock of State infrastructure
ϖ_{it}	is a weighted average of State i's expense disability factors affecting the quantity of infrastructure in period t. The weights are each service's share of total stock of assets in a year.

34 The assessed level of infrastructure at the start of a year is calculated in the same way:

$$K^{*}_{i(t-1)} = P_{i(t-1)} \frac{K_{s(t-1)}}{P_{s(t-1)}} \varpi_{i(t-1)}$$

35 The Australian level of infrastructure at the end of a year (K_{st}) is the level of infrastructure held by the State general government sector and State housing and urban transport corporations. The Commission calculates the level of infrastructure at the start of the year ($K_{s(t-1)}$) by subtracting Australian net investment in the year (I_s) from the Australian end of year level of infrastructure. The use of a start of the year net infrastructure derived in this way, rather than the published figure for the end of the previous year, ensures the change in the stock of infrastructure is only caused by total actual net investment in the year. Other changes, such as those caused by asset revaluations, are not captured in the assessment. This approach ensures the sum of States' assessed investment equals total net investment in the year.

$$\sum_{i} \text{Assessed net investment}_i = \sum_{i} \left(K^{*}_{it} - K^{*}_{i(t-1)}\right) \alpha_i = I_s$$

36 In the assessed GST revenue requirement equation (equation 3), a State's assessed disability factor (δ_i) for net investment is its assessed net investment per capita divided by the average net investment per capita.

Estimating assessed revenue

37 A State's assessed revenue for a category is an estimate of how much it could raise from its own revenue base (Y_i) if it applied the average revenue raising effort (generally represented by the Australian average effective rate of tax, τ_s). Thus, for each category:

$$\text{State i's assessed revenue} = \tau_s Y_i$$

Where:

τ_s is average effective rate of tax or $\sum R_i / \sum Y_i$

38 The calculation of assessed revenue can also be expressed in terms of revenue raising disability factors, such that:

$$\text{State i's assessed revenue} = P_i \frac{R_s}{P_s} \rho_i$$

Where:

ρ_i is State i's per capita tax base divided by the average per capita tax base

$$\rho_i = \frac{Y_i}{P_i} \Big/ \frac{Y_s}{P_s}$$

39 A more detailed description of the assessment methods for State revenue is in Attachment C.

40 There are two special cases for assessed revenues, as follows.

- Where the Commission considers every State has the same ability to raise revenue (any tax base differences that exist are attributable to State policies, not to disabilities), it will set each State's assessed revenue to the per capita average revenue — that is, the equal per capita (EPC) method is applied:

$$\frac{Y_i}{P_i} = \frac{Y_s}{P_s} \text{ , so } \rho_i = \text{unity}$$

- Where the Commission considers differences in the per capita revenue are due wholly to non-policy influences, it will set each State's assessed revenue to its actual per capita revenue — that is, the actual per capita (APC) method is applied.

Treatment of other Commonwealth revenue payments

41 National SPPs, National Partnership Payments and, in some cases, Commonwealth own purpose outlays can contribute to a State's capacity to finance its government services. When the Commission considers such payments contribute to a State's capacity, it will include the payment as a revenue source and include the expense financed by it as a State expense.

42 The Commission examines each operating and capital payment on a case by case basis to decide whether they contribute to a State's fiscal capacity. It decides the treatment of each payment[7] on the basis of equalisation principles, after following any directions in the terms of reference. The size of a payment does not influence its treatment. Payments which support State services, and for which expenditure needs are assessed, will impact the relativities.

Payments not made to States

43 The Australian Government also makes payments (including Commonwealth own-purpose outlays) to State PNFCs, non-government agencies and individuals. These payments are not included in our measures of State revenue or expenses. However, they can indirectly affect State fiscal capacities by reducing the call for State provided services. For example, Commonwealth payments to individuals (such as the Medicare rebates) may reduce the quantity of community health services States need to provide.

44 A State with an above average amount of these payments may need to spend less than the average per capita amount in providing its government services. Similarly, a

[7] Including many payments to the States and certain payments not made to States that may indirectly affect State fiscal capacities by reducing the call for State provided services.

State with a below average amount of these payments may be required to spend more. Any such indirect effects on State fiscal capacities may be recognised and assessed as a disability if they are material and can be reliably measured.

Backcasting

45 The Commission may adjust the distribution of an Australian Government payment and the related expense when it is evident that the Commonwealth-State funding arrangements in the application year will be different from those in the assessment period. This procedure is known as backcasting. Its aim is to ensure that, as far as possible, the relativities reflect the Commonwealth-State arrangements expected to apply in the year the relativities are used. Backcasting is not used to adjust for changes in economic circumstances or State policies.

Assessed GST

46 Having calculated each part of the right hand side of equation (4), the Commission can assess the GST each State would need to achieve fiscal equalisation and determine an appropriate distribution of GST in the assessment year being examined.

47 Because of the way each assessed part of State finances are calculated (for example by using positive and negative percentage deviations from the average) the distribution model ensures that for each the sum of the assessed equals the total observed in the adjusted budget. In particular the sum of the assessed GST amounts equals the GST distributed in the year.

PART B: FROM ASSESSMENT TO APPLICATION YEAR

48 Once each assessment year has been examined the Commission will have three GST distributions on which to base a recommended distribution for some future application year.

49 The Commission approaches this task by recognising that a State's share of the GST distribution would change for two reasons:

- its population share could change
- the impact of innate non-policy differences among the States which affect their fiscal circumstances (for example the recorded socio-economic profile) changes.

50 To separately identify each element the recommended GST share of a State can be seen as

$$\frac{\mathrm{AGSTR_i}}{\mathrm{G_s}} = \frac{P_i f_i}{\sum P_i f_i}$$

51 In this equation f_i is a State's relativity. A State's relativity summarises its overall fiscal capacity relative to the average capacity of all States. It brings together in one figure all its financial advantages or disadvantages arising from its revenue raising and spending activities and its Commonwealth payments.

52 If States had common economic, social and demographic features and Commonwealth payments were distributed uniformly among them, the Commission would recommend each State receive the same (average) GST per resident and it would assess a relativity of one for each State. If however, one State differed, the Commission would recommend a distribution which offset the impact of that difference on the State's fiscal circumstances. If the State had a weaker than average tax base, the Commission would recommend the State receive more than the average GST per resident, that is it would assess the State to have a relativity above one. If the State had a stronger than average tax base, the Commission would recommend the State receive less than the average GST per resident, that is it would assess the State to have a relativity below one.

53 The relativity the Commission recommends for the application year for each State is computed as the simple average of the three assessment year relativities.[8] For example, the relativities recommended in the 2015 Review, which were used in 2015-16, were based on data for 2011-12 to 2013-14. Three year averaging captures the differences in capacities among the States, which mostly change only slowly over time and reduces year to year volatility in the GST revenue distribution due to exceptional circumstances in any particular assessment year.

54 If accepted, the recommended relativities are used, in conjunction with State populations in the application year, to determine a GST distribution for that year. The method for calculating State GST shares in the application year can be seen in the Australian Government Budget Paper No. 3.

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8 A State's relativity represents the proportion of the average GST per person it should receive if it is to have the average fiscal capacity. It does not measure how much of the GST raised in the State should be returned to it.

ATTACHMENT A

THE ASSESSED DIFFERENCE PRESENTATION

1 Equations (3) and (4) in paragraph 8 show one presentation of the assessment year GST distribution and associated relativity, but there is another arithmetically equivalent presentation.

2 The first presentation was expressed in terms of absolute amounts of State spending and revenue, this second presentation (called the assessed difference presentation) is expressed in terms of redistributions from the average. It has the following form:

$$\frac{AGSTR_i}{P_i} = \frac{G_s}{P_s} + \frac{N_s}{P_s}(\varepsilon_i - 1) + \frac{E_s}{P_s}(\gamma_i - 1) + \frac{I_s}{P_s}(\delta_i - 1) + \frac{R_s}{P_s}(1 - \rho_i) + \frac{O_s}{P_s}(1 - \phi_i)$$

3 This presentation can be derived from equation (4):

$$AGSTR_i = P_i \frac{N_s}{P_s}\varepsilon_i + P_i \frac{E_s}{P_s}\gamma_i + P_i \frac{I_s}{P_s}\delta_i - P_i \frac{R_s}{P_s}\rho_i - O_i$$

$$\frac{AGSTR_i}{P_i} = \frac{N_s}{P_s}\varepsilon_i + \frac{E_s}{P_s}\gamma_i + \frac{I_s}{P_s}\delta_i - \frac{R_s}{P_s}\rho_i - \frac{O_i}{P_i}$$

$$= \frac{N_s}{P_s}(\varepsilon_i - 1) + \frac{N_s}{P_s} + \frac{E_s}{P_s}(\gamma_i - 1) + \frac{E_s}{P_s} + \frac{I_s}{P_s}(\delta_i - 1) + \frac{I_s}{P_s} + \frac{R_s}{P_s}(1 - \rho_i) - \frac{R_s}{P_s} - \frac{O_i}{P_i}$$

$$= \frac{N_s}{P_s}(\varepsilon_i - 1) + \frac{N_s}{P_s} + \frac{E_s}{P_s}(\gamma_i - 1) + \frac{E_s}{P_s} + \frac{I_s}{P_s}(\delta_i - 1) + \frac{I_s}{P_s} + \frac{R_s}{P_s}(1 - \rho_i) - \frac{R_s}{P_s} + \frac{O_s}{P_s}(1 - \phi_i) - \frac{O_s}{P_s} \qquad (A.1)$$

Where:

ϕ_i is State i's implied disability factor for other Commonwealth payments. It is equal to the ratio of State I's per capita payment and the average per capita Commonwealth payment.

$$\phi_i = \frac{O_i}{P_i} \Big/ \frac{O_s}{P_s}$$

4 The rearranged budget identity, equation (2), is:

$$G_s = N_s + E_s + I_s - R_s - O_s$$

or

$$\frac{G_s}{P_s} = \frac{N_s}{P_s} + \frac{E_s}{P_s} + \frac{I_s}{P_s} - \frac{R_s}{P_s} - \frac{O_s}{P_s}$$

5 Substituting into equation (A.1):

$$\frac{AGSTR_i}{P_i} = \frac{G_s}{P_s} + \frac{N_s}{P_s}(\varepsilon_i - 1) + \frac{E_s}{P_s}(\gamma_i - 1) + \frac{I_s}{P_s}(\delta_i - 1) + \frac{R_s}{P_s}(1 - \rho_i) - \frac{O_s}{P_s}(1 - \phi_i)$$

Where:

$\frac{N_s}{P_s}(\varepsilon_i - 1)$	measures the difference between State i's per capita assessed net lending and the average per capita net lending. It is referred to as its assessed difference for net lending.
$\frac{E_s}{P_s}(\gamma_i - 1)$	measures the difference between State i's per capita assessed expense and the average per capita expense. It is referred to as the State's assessed difference for expenses.
$\frac{I_s}{P_s}(\delta_i - 1)$	measures the difference between State i's per capita net investment and the average per capita net investment. It is referred to as its assessed difference for net investment.
$\frac{R_s}{P_s}(1 - \rho_i)$	measures the difference between State i's per capita assessed revenue and the average per capita revenue. This difference is referred to as its assessed difference for revenue.
$\frac{O_s}{P_s}(1 - \phi_i)$	measures the difference between State i's per capita assessed other Commonwealth payments and the average per capita other Commonwealth payments. It is referred to as its assessed difference for other Commonwealth payments.

6 Assessed differences for expenses, investment and net lending (when it is positive) are positive when the State's relevant disability factors are greater than one (the average factor), negative when they are below one and are zero when they are equal to one.

7 Assessed differences for revenues, other Commonwealth payments and net lending (when it is negative, that is when States are net borrowers) are positive when the revenue raising disability factors are less than one (the average factor), negative when above one and are zero when they are equal to one.

8 The assessed difference presentation shows:

Assessed GST requirement	equals	average GST revenue requirement
	plus	assessed difference for net lending
	plus	assessed difference for expenses
	plus	assessed difference for investment
	plus	assessed difference for revenues
	plus	assessed difference for other Commonwealth payments

9 The per capita relativity equation, equation (4) is:

$$f_i = \frac{AGSTR_i}{P_i} \Big/ \frac{G_s}{P_s} = \frac{AGSTR_i}{\sum_i AGSTR_i} \Big/ \frac{P_i}{\sum P_i}$$

$$= \left(\frac{G_s}{P_s} + \frac{AD_i}{P_i}\right) \Big/ \frac{G_s}{P_s}$$

$$= 1 + \left(\frac{AD_i}{P_i} \Big/ \frac{G_s}{P_s}\right)$$

Where:

AD_i is the total assessed difference for State i. By definition, State i's per capita assessed difference (AD_i/P_i) equals:

$$= \frac{N_s}{G_s}(\varepsilon_i - 1) + \frac{E_s}{G_s}(\gamma_i - 1) + \frac{I_s}{G_s}(\delta_i - 1) + \frac{R_s}{G_s}(1 - \rho_i) - \frac{O_s}{G_s}(1 - \phi_i)$$

10 The assessed difference presentation expresses State i's assessed GST per capita as the sum of the average distribution per capita and variations from the average. These variations are State i's per capita assessed differences for net lending, expenses, net investment, revenues and other Commonwealth payments. They show how much GST revenue a State requires to offset the impact of disability factors on its fiscal capacity.

11 The assessed difference presentation shows the equal per capita relativity factor of one is adjusted up or down by the ratio of each State's total assessed differences per capita relative to the per capita pool. Or, a State's relativity equals one plus its total assessed differences relative to the pool, taking account of the size of its population, that is, its share of the total population.

ATTACHMENT B

EXPENDITURE ASSESSMENTS

1 The expense assessments estimate what it would cost each State to provide the average level of service in a particular year — its 'assessed expense'. The average level of service is represented by the average expenses per capita, which encapsulates the average policies, practices and circumstances of the States. This is a population weighted average, giving equal weight to each Australian's experience. Since more Australians experience the New South Wales level of service, it has more weight in the average.

2 The expense assessments start from a presumption that, if all things were equal, each State could provide the average level of service by spending the average amount per capita on it — in this case, assessed expenses per capita would equal the average expense per capita.

3 However, all things are not equal. The circumstances of the States are different and these differing circumstances lead to differences in:

- the use of services
- the cost of providing each unit of service.

4 The expense assessments adjust the average expenses up or down to allow for the financial impact of differences in State circumstances — but only to the extent that those circumstances are beyond the direct control of individual State governments.

5 Each State's assessed expenses therefore:

- are based on the average level of service
- only make allowances for the effects on the use or assessed unit cost of services that are due to influences beyond the control of individual States (called disabilities). These disabilities generally reflect differences in the demographic, economic and geographic circumstances of the States.

6 A State's assessed expenses mostly differ from its actual expenses because:

- it may decide not to provide the average level of service
- it may provide the service more or less efficiently than the average
- not all disabilities are included, either because they cannot be reliably measured or have an immaterial impact.

7 The assessed expenses do not take account of the effect a State's own decisions have on the level of services provided or how they are provided. Any additional expenses or any savings arising from a State's own decisions accrue entirely to it.

DISABILITY ASSESSMENT AND ASSESSED EXPENSES

8 Disabilities can be classified into two groups according to whether they affect:

- the use of services, or
- the unit cost of services.

Disabilities that mainly relate to use

9 These disabilities reflect the specific influences (such as the number of potential users or the size of a State's road network) which affect the use of services in a State. Where possible, data for all States are taken from a common database.

10 A State has an above average expense requirement if the proportion of potential service users in its population exceeds the average proportion for the States as a whole. The Commission assumes a direct link between the proportion of a State's population who are potential service users and the cost of providing it. For example, if the proportion of a State's population aged 15 to 64 (the user population for vocational education) is 10% above the average, it is assumed the State's expenses on vocational education would be 10% above average.

11 Box B-1 describes the two ways of presenting disability assessments.

Box B-1 Presenting disability assessments

The Commission uses two presentations of disability assessments:

- factor based approach
- State shares of disability measure.

A disability factor for a State is calculated by relating its position to the average position. For example, for post-secondary education, a State's relative disability factor is measured by comparing the proportion of its population aged 15 to 64 with the average proportion for the States as a whole. To derive assessed expenses for a State, the factor is multiplied by the average per capita expenses and then multiplied by the State's population.

The State shares of disability measure shows directly the State share of total expenses by multiplying a State share of the disability measure by total expenses. For example, to assess expenses for post-secondary education a State's share of the total population aged 15 to 64 is multiplied by the total expenses. The equivalence of the two presentations is shown below.

Equation (a), as discussed in the preceding section, shows the derivation of assessed expenses using factors.

$$\text{Assessed expenses}_{\text{i}} = \text{P}_{\text{i}} \frac{\text{E}_{\text{s}}}{\text{P}_{\text{s}}} \gamma_{\text{i}} \qquad \text{(a)}$$

Where:

i, s	subscripts used to denote an individual State (i) or all States (s)
P	population
E	expense
γ	assessed disability factor for an expense

The disability factor can be rewritten as the State ratio of the disability measure θ over the State population divided by the equivalent Australian total ratio, as shown in equation B.

$$\text{Assessed expenses}_{\text{i}} = \text{P}_{\text{i}} \frac{\text{E}_{\text{s}}}{\text{P}_{\text{s}}} \left(\frac{\theta_i}{\text{P}_i} \Big/ \frac{\theta_s}{\text{P}_s} \right) \qquad \text{(b)}$$

The terms in equation (b) can be rearranged as shown in equation (c).

$$\text{Assessed expenses}_{\text{i}} = \text{P}_{\text{i}} \frac{\text{E}_{\text{s}}}{\text{P}_{\text{s}}} \frac{\theta_i}{\text{P}_i} \frac{\text{P}_s}{\theta_s} \qquad \text{(c)}$$

The State and total populations of equation (c) cancel out and assessed expenses for a State can be expressed as total expenses multiplied by a State's share of the disability measure.

$$\text{Assessed expenses}_{\text{i}} = \text{E}_{\text{s}} \frac{\theta_i}{\theta_s} \qquad \text{(d)}$$

12 The way disability assessments are derived varies between categories:

- Where there is a single user group, the assessed expenses are equal to the State's share of that group.
- Where there are multiple user groups, each using the service more or less intensively, a more detailed approach is applied. The approach derives notional users for each State based on the average use for each user group. Assessed

expenses are derived for each user group using weighted shares of the use and then summed.

13 The calculations are based on average use to ensure they are not affected by an individual State's policy.

14 Another allowance is made if it is more costly to provide the service to particular sub-groups (such as people with low income or Indigenous people) and the States as a whole devote more resources to those sub-groups. This is done by applying the average unit cost weight[1] to the sub-group population. A State's assessed expense is its share of the cost weighted notional user population.

Disabilities that mostly affect unit costs

15 The effect of these disabilities (such as location) can vary from service to service because the proportion of the costs they affect varies across services. For example, wages are a higher proportion of the costs of some services than they are of others.

16 In each case, the Commission measures the underlying disability. But, before it is applied to a category, it is weighted to reflect the proportion of the total service costs it affects.

Interaction of disability assessments

17 The effects of many disability assessments interact or have a compounding relationship. For example, the age of the potential users of a service, their Indigenous status, their socio-economic status and the region in which they live can each influence costs and may do so in an interactive way. The age of a user may increase or reduce the cost of delivering a service and if the user also has a low socio-economic status, this may increase the cost more or less than proportionally.

18 A model that simply compounds the effects of separate measures of each influence could produce inappropriate interactions and double counting. This is avoided by measuring the joint effects of several influences. Where possible, this is done using data on the population and service users that are cross-classified according to the relevant characteristics (such as age, Indigenous status, socio-economic status (SES)).

19 Most socio-demographic composition assessments are calculated in this way; that is, average expenses (or separate use or cost weights) are assessed for each population sub-group with more than one common characteristic (such as 60 to 70 year old Indigenous people with low SES). A disability assessment is calculated by:

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[1] The cost weights reflect the extra (fewer) expenses incurred in providing services to each member of the sub-group relative to all users of the service. Where data are available, they are calculated as the average expenses per user for the relevant sub-group relative to average expenses per user across all users of the service. Where data are limited, the extra costs per member of the sub-group may be estimated.

- deciding which population sub-groups affect the expenses
- measuring the size of each sub-group, using estimated resident population data
- estimating State spending on each sub-group using administrative and / other data
- calculating average expense for each sub-group by dividing the estimated expenses by the number of people in the group
- calculating each State's assessed expenses by multiplying the average per capita expenses for each population sub-group by the number in the sub-group for each State.

INVESTMENT AND NET LENDING

20 The average policies the Commission seeks to reflect in the investment and net lending assessments relates to average asset holdings rather than average flows (such as average expenses). A State will need more or less than average investment, depending on how the average per capita level of assets, its population and other characteristics have changed from one period to the next. It will also depend on the changes in relative price levels States face.

21 Assessed investment in a year is calculated by subtracting the assessed per capita level of infrastructure required at the start of the year from the assessed per capita level of infrastructure required at the end of the year and multiplying the result by unit cost disabilities.

22 The assessed level of infrastructure at the end and the start of a year are calculated by applying the disabilities affecting the quantity of infrastructure the State requires to deliver the average services to the average per capita infrastructure at that time.

23 Explicitly recognising infrastructure investment in the year the investment occurred removes the need to assess differences in debt charges.

24 The assessed net lending for a State in a year is calculated by subtracting the average per capita level of net financial worth for the States as a whole at the start of the year from the average per capita level of net financial worth at the end of the year.

25 Equalising States' financial worth removes the need to assess differences in interest and dividend earnings.

26 The details of each expenditure assessment are provided in the expenditure assessment chapters in Volume 2 of the *Report on GST Revenue Sharing Relativities — 2015 Review*.

ATTACHMENT C

REVENUE ASSESSMENTS

1 The revenue assessments aim to measure the revenue each State would raise from its own sources if it made the average effort — that is, if each imposed taxes and charges at the average rate and collected them with the average effort and efficiency. The Commission makes separate assessments of the revenue base for each activity being taxed because it better captures differences in State capacities to raise revenue from the taxes available to them — it better reflects what States actually do.

2 The task of estimating assessed revenues for each revenue category involves:

- deciding whether differences in revenue capacity for a category reflect different disabilities (reflected in interstate differences in the per capita size of revenue bases) or are caused by differences in State policies
- identifying and measuring the policy neutral revenue base of each State
- measuring the assessed and average revenue capacities.

3 Tax bases are measured using data on the value or number of transactions or assets subject to a tax under conditions representative of those applied by the States in general — that is, they reflect the legal incidence of the tax. For example, the revenue base for Payroll tax is measured as the value of the wages bill in a State, excluding wages paid by small employers. Small employers are defined as those falling below the weighted average exemption level applied by the States.

4 The Commission uses the broadest measure possible of each revenue base that is consistent with the average tax policy.

5 Once each State's revenue base is measured, the average revenue raising effort (or the Australian average effective rate of tax[1]) is applied to it to calculate the State's assessed revenue. This is equivalent to sharing the total revenue raised in all States among them in proportion to their share of the tax base.

6 Box C-1 sets out the framework used to identify an appropriate policy neutral revenue base.

[1] Effective rates are the total revenue collected by the States divided by the total of their revenue bases.

Box C-1 Revenue assessment framework

Step 1. Determine what is being taxed

Review States' legislation and provisions to establish how the tax is levied—who pays it, on what activities or assets is it levied, and what exclusions from tax liability are allowed by the States.

Step 2. Establish the average policy.

The average policy reflects the average of what all States do regardless of how many States make a zero effort. If even one State raises a revenue, that becomes part of what States do collectively on a weighted basis. The Commission makes an assessment of this revenue if it has a material impact on the GST.

Step 3. Determine the best conceptual measure of the revenue base under the average policy

Where the tax policies of all States are virtually the same, the actual revenue raised by each could be an appropriate measure of its relative ability to raise revenue. In this case (referred to as the actual per capita method), it would not be necessary to measure the revenue base itself, all differences in observed revenue per capita can be attributed to differences in States' revenue raising capacities.

More often, observed differences in per capita revenue are due to differences in revenue effort (policy) and in revenue bases (which are assumed to arise from influences beyond the direct control of States). The aim is to measure the revenue base in terms of the value of transactions (for example the value of conveyances) or assets (for example, the value of land) that would be taxed if the average tax policy was applied in each State.

Where differences between each State's policy and the average policy are large, and a policy neutral revenue base cannot be determined, the Commission uses State population as its revenue base. This method (referred to as the equal per capita method) implies each State has the same per capita ability to raise revenue. It attributes all interstate differences in observed per capita revenues to policy differences and does not cause any redistribution of GST shares.

Step 4. Adjust the revenue base.

Adjustments may be made to exclude activities that are exempt from tax under the average policy, if there is reliable evidence that they represent a materially different proportion of the tax base in each State. Adjustments may also be made to make the revenue base more comparable across States. This is necessary if revenue base data are obtained from States and there are differences between them in the scope of activities taxed.

Step 5. Derive the average effective tax rate.

This is done by dividing the total revenue collected in all States by the total of the measured revenue base for each State.

Step 6. Calculate each State's assessed revenue.

This is done by applying the average effective tax rate to each State's measured revenue base.

Equivalently, assessed revenue can be calculated by sharing the total revenue collected according to States shares of the measured revenue base.

7 The revenue bases and adjustments used in each assessment are described in the revenue assessment chapters in Volume 2 of the *Report on GST Revenue Sharing Relativities — 2015 Review*.