# C Model implementation of the exit scenario

This appendix sets out the variable shocks and model closure changes used for modelling the exit scenario.

## C.1 Exit scenario modelled

The MMRF modelling reported in chapters 2 to 4 involved running the same exit scenario under two different modelling environments:

* a longer‑run *comparative‑static* modelling environment to estimate the longer‑run effects of the cessation of passenger motor vehicle manufacturing in Australia and the consequential impacts on supply chain activities and the broader economy
* a *recursive‑dynamic* environment to project the timescale over which the impacts are likely to occur (year‑to‑year impacts).

These modelling environments and parameter settings are detailed in appendix A.

The common variables shocked and associated closure changes used in the comparative-static and dynamic modelling are listed in table C.1. The scenario specific closure changes and model shocks to account for differences in the longer‑term and year‑to‑year modelling environments are discussed later in this appendix.

#### Exit of passenger motor vehicle manufacturers

The closure of Australian passenger motor vehicle manufacturing plants is modelled as a 98 per cent reduction in the *use* of locally produced passenger motor vehicles. It is assumed that, at the regional level, imported passenger motor vehicles fill the gap left by domestic production (implemented via a demand ‘twist’ towards imports). As a result, domestic demand for passenger motor vehicles remains unchanged.

Table C.1 Modelling of the exit scenario

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Closure change and rationale | Exogenous variable | Endogenous variable | Victoria | South Australia | All other states |
| **Passenger motor vehicle manufacturing** | | | | | |
| Sales to households are targeted to simulate the reduction in sales of domestically produced cars in each state. A twist term adjusts so that sales of domestically produced cars are replaced by imports. | Sales of domestically produced cars to households (x3c) | Twist term for household demand towards imported cars (twistsrc3) | ‑98% | ‑98% | ‑98% |
| Sales to investors are targeted to simulate the reduction in sales of domestically produced cars in each state. A twist term adjusts so that sales of domestically produced cars are replaced by imports. | Sales of domestically produced cars to investors (x2\_car) | Twist term for investment demand towards imported cars (twistsrc2) | ‑98% | ‑98% | ‑98% |
| State exports of cars are targeted to reflect the cessation of major domestic production of cars. An export demand shift term adjusts to accommodate the change. | Export sales of domestically produced cars (x4r) | Volume shift in export demand (f4q) | ‑98% | ‑98% | na |
| Final use of Victoria’s business services are targeted to reflect the continued provision of head office, design and marketing functions to the offshore parent company and designated as export demand in the modelling. | Exports sales of business services (x4r) | Volume shift in export demand (f4q) | +30% | na | na |
| **Automotive component manufacturing** | | | | | |
| Employment in the automotive component industry targeted to simulate the reduction in sales by component producers that sell to local PMV production. A twist term adjusts so that remaining demand is met by imports. | Employment in the automotive components industry (x1emp\_o) | Twist term for industry demand towards imported automotive components (twistsrc1) | ‑58% | ‑58% | NSW: ‑2.4 |
| Intermediate demand in other states for automotive components supplied by Victoria and South Australia is targeted to simulate the reduction in sales by component producers that sell to local PMV production. A twist term adjusts so that remaining demand is met by alternative sources. | Intermediate demand for automotive components supplied by producers in Victoria and South Australia (x1\_carparts) | Twist term for industry demand towards automotive components supplied by other states (twistdom) | na | na | ‑58% |

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Table C.1 (continued)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Closure change and rationale | Exogenous | Endogenous | Victoria | South Australia | All other states |
| **Budgetary outlays** |  |  |  |  |  |
| Federal government subsidies to the automotive industry cease with the exit of the domestic car production. | Federal government grants to private industry (d\_wgfse\_500(“Federal”)) | Shift term on federal government grants to private industry (f\_wgfse\_500 (“Federal”)) | See table C.2 | | |
| **Other closure changes** |  |  |  |  |  |
| The budget position is held fixed as a share of GDP or gross state product through the use of lump‑sum transfers to, or from, households. | Change in net lending/ borrowing balance fixed as a share of GDP  (d\_wgfsbudGDP(Govt) | Lump‑sum transfers to, or from, households (d\_wgfse\_800 (Govt)) | na | na | na |

**na** Not applicable.

The exit scenario allows some small‑scale motor vehicle manufacturing activity to remain after the closure of large‑scale vehicle manufacturing activity (assumed to be 2 per cent of current output). This is based on the possibility that the existing manufacture of some specialised and bespoke vehicles might continue (for example, TomCar Australia, sub. 32).

The exit scenario also allows for the retention of some of the design and engineering, head office, sales and marketing functions, by the three passenger motor vehicle manufacturers, modelled as an increase in export demand for ‘business services’. The retention of these service functions is assumed to correspond to the business service output equivalent of 20 per cent of current employment in the passenger motor vehicle industry, with the activity centred in Victoria, the head office state of the current producers. The retention of these activities implies that the overall reduction in employment as a consequence of passenger motor vehicle manufacturing plant closures is around 80 per cent from current levels.[[1]](#footnote-1)

As stated in chapter 6 of the Commission’s report, it is assumed that 40 per cent of all automotive components manufacturing employees (as classified by the Australian Bureau of Statistics) nationally lose their jobs. This implies much larger reductions in Victoria and South Australia reflecting their greater reliance on sales to passenger motor vehicle manufacturing. With industry employment (and by implication output) determined exogenously, there is a ‘twist’ in favour of imported automotive components to fill the gap between demand and supply.[[2]](#footnote-2) In the modelling, it is assumed that output by manufacturers of automotive components (for example for the aftermarket and bus and truck assembly) in states other than Victoria, South Australia and New South Wales (the main states that supply automotive components to passenger motor vehicle production) moves in line with gross state product.[[3]](#footnote-3)

#### Budgetary assistance

With the closure of large scale passenger motor vehicle manufacturing, industry‑specific budgetary assistance, which has been focused on the operations of Ford, Holden and Toyota and their upstream component suppliers, is also assumed to end. The comparative static modelling estimates the impact of the total (that is, cumulative value) of industry‑specific budgetary support that would not be paid due to the closure of large‑scale passenger motor vehicle manufacturing.

Changes in industry‑specific budgetary assistance are estimated based on funding caps for the Automotive Transformation Scheme (ATS) that incorporate savings set out in the Government’s 2013‑14 Mid‑Year Economic and Fiscal Outlook (MYEFO) estimates, as well as projected assistance under other industry‑specific schemes (annex). The consequential reduction in industry‑specific budgetary assistance modelled amounts to $656 million in total (table C.2). The dynamic modelling estimates the impact of the reduction in assistance in the respective years in which they were budgeted to be paid.

As noted in chapter 1, this illustrative approach to modelling changes in budgetary assistance should *not* be interpreted as a quantification of the effect of government policy decisions. Maintaining a motor vehicle manufacturing industry in Australia would have required significant and (if historic trends were to continue) ever increasing levels of assistance through tariffs or budgetary assistance. Given the decisions of the three motor vehicle manufacturers to cease their local manufacturing, the level of assistance that would have been necessary to sustain local manufacturing is hypothetical, uncertain and has not been modelled.

Table C.2 Changes in Australian Government industry‑specific budgetary assistance consequential on the closure of passenger motor vehicle manufacturing plants in Australia

$ million (current prices)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Description of direct impact | 2016‑17 | 2017‑18 | 2018‑19 | 2019‑20 | 2020‑21 |
| Scheduled Australian Government assistance to the domestic car industrya | ‑178 | ‑187 | ‑175 | ‑92 | ‑25 |
| Cumulative Australian Government assistance to the domestic car industry | ‑178 | ‑365 | ‑540 | ‑632 | ‑656 |

a Australian Government payments to the domestic car industry to fall with the exit of claimants. Assistance estimates account for savings to the ATS included in the Australian Government’s 2013‑14 MYEFO. In longer‑run simulations, the reduction is estimated as the value of funding scheduled under current arrangements had the businesses remained, that is, the accumulated scheduled assistance over the years 2016‑17 to 2020‑21, inclusive. This assistance was adjusted for the effect of price changes to align with the reference year in the MMRF database (based on the average rate of growth in the CPI between the June quarters 2006 and 2012 of 2.6 per cent per annum).

*Source*: Commission estimates based on information provided by the Department of Industry.

The automotive industry also receives non‑budgetary assistance in the form of a 5 per cent import tariff (since 1 January 2010). The modelling assumes that this rate remains unchanged after the ending of passenger motor vehicle manufacturing.

### Modelling the timescale over which the impacts may occur

#### Closure changes to model the decommissioning of capital stocks

In addition to the variable swaps and model shocks set out in table C.1, estimating the timescale of effects in the recursive‑dynamic modelling framework required closure changes to ensure that the remaining capital stocks of exiting vehicle and components producers change in proportion to the exogenous changes in their output (table C.3).[[4]](#footnote-4),[[5]](#footnote-5)

Table C.3 Additional model closure changes to assess the timescale over which the impacts of closing of passenger motor vehicle manufacturing plants in Australia in 2016‑17 may occur

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Closure change and rationale | Exogenous variable | Endogenous variable | Victoria | | South Australia | All other states | |
| Turn‑off the MMRF theory linking the change in investment the change in the capital stock for the Victorian and South Australian passenger motor vehicle and automotive components manufacturing industries | Industry and state‑specific change in the ratio of investment to capital stock (r\_inv\_cap) | Industry and state‑specific shift term in investment equation (d\_feeqror) | 0 | 0 | | | na |
| Turn‑off the MMRF capital accumulation theory for Victorian and South Australian passenger motor vehicles and automotive components manufacturing industries | Change in capital growth rate (d\_k\_gr) | Shift term in capital growth rate equation (d\_fk\_gr) | 0 | 0 | | | na |
| Reduce the use of capital in production by the Victorian and South Australian passenger motor vehicle and automotive component manufacturing industries in proportion to outputa | Capital productivity by industry and state (x1capprod) | Mid‑year capital stock used in production (f\_x1cap2) | 0 | 0 | | | na |

**na** Not applicable. a Fixing capital productivity at zero ensures that the use of capital in production in the Victorian and South Australian industries changes proportionately with their output.

#### Change in unemployment

Recognising that the closure of large‑scale passenger motor vehicle manufacturing in Victoria and South Australia and the consequent contraction in the supply chain will have implications for state labour markets, the dynamic modelling allows state unemployment rates to vary. This is modelled as commencing in 2016‑17.

The modelling assumes ‘partial adjustment’ in the labour market. Initially, adjustment takes the form of changes in the quantity of labour employed (resulting in additional unemployment) in those states with passenger motor vehicle manufacturing, automotive components and other input‑supplying industries. Gradually, the labour market adjustment shifts towards changes in the price, rather than quantity, of labour (implying changes in real wages).

The rate at which this adjustment is assumed to occur is based on analysis of the duration of unemployment by people previously employed in the Australian manufacturing sector (appendix C of the Commission’s inquiry report). These estimates are based on the first eleven waves of the Housing, Income and Labour Dynamics in Australia (HILDA) survey. This analysis indicates that, on average, 17 per cent of manufacturing employees surveyed found a job within one month and two‑thirds had found some form of employment within one year. After 12 months or more, the transition probabilities are similar to the experience following the closure of Mitsubishi’s Lonsdale engine manufacturing plant in 2004.

The MMRF modelling focuses on the rate at which state labour markets adjust over time and it is assumed that these labour markets continue to adjust at the same rate as the former manufacturing employees did over the first year, as outlined above. This is achieved by fitting a curve to the transition probabilities for re‑employment.[[6]](#footnote-6) The resulting transition path implies that 84 per cent of the aggregate labour market adjustment has occurred after twenty‑four months, 95 per cent after thirty‑six months and 100 per cent after forty‑eight months (figure C.1). While the modelling does not assume each person retrenched will be reemployed (and reemployed at the same wage), it does assume that aggregate unemployment will return to base levels after a period of adjustment, as reflected in the estimated transition path.

Figure C.1 Labour market transition probabilities used in formulating the changes in state unemployment modelled

Probability of finding employment

|  |
| --- |
|  |

*Source*: Productivity Commission estimates based on appendix C of volume 1 of this report.

Further, the Commission’s modelling is based on the assumption that the closure of passenger motor vehicle plants will not have any effect on economywide labour participation rates. The Commission’s analysis of HILDA data indicates that some retrenched employees are likely to leave the workforce altogether — about 20 per cent of unemployed manufacturing employees left the workforce within two years of becoming unemployed. However, the effect on aggregate participation rates is uncertain, as it is unclear how many of these people would have left the workforce anyway (for example, they might have retired).

The number of employees that will lose their jobs as a result of the closure of the three passenger motor vehicle manufacturers ceasing manufacturing operations in Victoria and South Australia will depend on a range of factors, including the inter‑linkages between industries and the extent to which input suppliers can find alternative markets utilising their manufacturing capabilities after the closure of large‑scale passenger motor vehicle manufacturing (which together determine the extent of flow‑on effects to employees in input‑supplying and related activities). The extent to which retrenched employees subsequently become ‘unemployed’ will depend on the opportunities open to these people (which will, in turn, depend on the underlying strength of the economy and local job markets), their skills and their willingness to accept alternative employment opportunities. Such factors are difficult to gauge in advance.

Recognising these uncertainties, two unemployment scenarios are modelled.

* A ‘higher’ job loss scenario, which is based on:
* an 80 per cent reduction with respect to current employment in the passenger motor vehicle manufacturing industry, reflecting:
* 98 per cent reduction in passenger motor vehicle manufacturing employment as such, with
* 20 per cent of existing employment remaining to undertake the head office, design and marketing functions and specialised and bespoke passenger motor vehicle manufacturing that will continue (equivalent to 2270 people)[[7]](#footnote-7)
* 40 per cent of employees nationally in the automotive components manufacturing industry (as defined by the ABS) lose their jobs (informed by the Commission’s assessment that employment in the automotive components industry will decline by about 40 per cent with the ending of large‑scale passenger motor vehicle manufacturing — chapter 1)
* an estimate of the flow‑on effects to all other direct‑input suppliers of manufactured inputs *and* services to passenger motor vehicle manufacturing (assumed to be in proportion to the share of their sales to the Victorian and South Australian passenger motor vehicle manufacturing industries).[[8]](#footnote-8)
* A ‘lower’ job loss scenario, which is based on:
* announcements by the three major passenger motor vehicle manufacturers that 6600 employees would be retrenched (out of a workforce of 11 500)
* 40 per cent of employees nationally in the automotive components manufacturing industry becoming retrenched (as in the higher job‑loss scenario)
* an estimate of the flow‑on effects to direct‑input suppliers of manufactured inputs (but *not* service inputs) to passenger motor vehicle manufacturing.[[9]](#footnote-9),[[10]](#footnote-10)

The implied higher and lower bound estimates of unemployment are 33 000 and 16 000, respectively. The resulting estimates of the number of employees potentially affected are provided in tables C.4 and C.5 (upper panel). Monthly transition probabilities described above are then applied to derive the number of retrenched former employees in each scenario that have not found employment (tables C.4 and C.5, middle panel).

Finally, annual unemployment *rate* shocks are derived from the number of retrenched former employees seeking employment immediately and then after twelve, twenty‑four, thirty‑six and forty‑eight months. This approach means that, in 2016‑17, all retrenched former employees are assumed to become unemployed. The estimated *changes* in the state unemployment rates (tables C.4 and C.5, lower panel) were applied uniformly across occupations to the MMRF variable d\_unro.

This approach assumes a worst‑case scenario in which all job losses occur at once. As noted in the inquiry report, in reality job losses will be staggered over several years. Ford, Holden and Toyota have given advance notice of their intention to close their manufacturing plants and some employees might leave before the closures. The timing of retrenchments at firms supplying the motor vehicle manufacturers will also vary, depending on the circumstances facing individual firms.

Table C.4 Assumed changes in unemployment rates by state attributable to closing passenger motor vehicle manufacturing plants in Australia: higher estimatea,b

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Victoria | South Australia | New South Wales | Australia |
| **Employees initially assumed to be retrenched following the end of large‑scale manufacturing (persons)** | | | | |
| Total | 24 150 | 8 390 | 70 | 32 610 |
| *Of which:* |  |  |  |  |
| Passenger motor vehicle manufacturing | 6 860 | 2 220 | 0 | 9 080 |
| Input‑supply industriesc | 17 290 | 6 170 | 70 | 23 530 |
| **Retrenched employees that are assumed to remain unemployed following the end of major passenger motor vehicle manufacturing (persons)**d | | | | |
| 2016‑17 | 24 150 | 8 390 | 70 | 32 610 |
| 2017‑18 | 8 190 | 2 850 | 20 | 11 060 |
| 2018‑19 | 3 890 | 1 350 | 10 | 5 250 |
| 2019‑20 | 1 330 | 460 | 0 | 1 790 |
| 2020‑21 | .. | .. | .. | .. |
| **Change in state unemployment rate by occupation (percentage points)** | | | | |
| 2016‑17 | +0.8420 | +1.0108 | +0.0018 | na |
| 2017‑18 | ‑0.5564 | ‑0.6674 | ‑0.0013 | na |
| 2018‑19 | ‑0.1499 | ‑0.1807 | ‑0.0003 | na |
| 2019‑20 | ‑0.0893 | ‑0.1072 | ‑0.0003 | na |
| 2020‑21 | ‑0.0464 | ‑0.0554 | .. | na |

**..** Zero or less than 10 people. The numbers of persons unemployed have been rounded to the nearest 10. a Assuming 98 per cent reduction in passenger motor vehicle manufacturing and allowing for the retrenchment of employees in all input‑supplying industries in proportion to the share of their sales accounted for by the passenger motor vehicle manufacturing industry (assuming full pass through). b While some employment losses may occur owing to some interstate interlinkages, employment losses in Queensland and Western Australia are assumed to be zero for modelling purposes. c All industries supplying inputs to the domestic passenger motor vehicle manufacturing industry (including automotive components suppliers). d The number of employees initially retrenched that are assumed to remain unemployed based on the estimated transition probabilities.

*Source*: Commission estimates.

Table C.5 Assumed changes in unemployment rates by state attributable to closing passenger motor vehicle manufacturing plants in Australia: lower estimate**a,b**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Victoria | South Australia | New South Wales | Australia |
| **Employees initially assumed to be retrenched following the end of large‑scale manufacturing (persons)** | | | | |
| Total | 11 980 | 3 930 | 70 | 15 980 |
| *Of which:* |  |  |  |  |
| Passenger motor vehicle manufacturing | 5 000 | 1 600 | 0 | 6 600 |
| Input‑supply industriesc | 6 980 | 2 330 | 70 | 9 380 |
| **Retrenched employees that are assumed to remain unemployed following the end of major passenger motor vehicle manufacturing (persons)**d | | | | |
| 2016‑17 | 11 980 | 3 930 | 70 | 15 980 |
| 2017‑18 | 4 060 | 1 330 | 20 | 5 410 |
| 2018‑19 | 1 930 | 630 | 10 | 2 570 |
| 2019‑20 | 660 | 220 | .. | 880 |
| 2020‑21 | .. | .. | .. | .. |
| **Change in state unemployment rate by occupation (percentage points)** | | | | |
| 2016‑17 | +0.4177 | +0.4735 | +0.0018 | na |
| 2017‑18 | ‑0.2761 | ‑0.3132 | ‑0.0013 | na |
| 2018‑19 | ‑0.0743 | ‑0.0843 | ‑0.0003 | na |
| 2019‑20 | ‑0.0443 | ‑0.0494 | ‑0.0003 | na |
| 2020‑21 | ‑0.0230 | ‑0.0265 | .. | na |

**..** Zero or less than 10 people. The numbers of persons unemployed have been rounded to the nearest 10. a Assuming that passenger motor vehicle manufacturers reduce employment in‑line with their stated intentions and allowing for the retrenchment of employees in manufacturing industries that supply inputs to the passenger motor vehicle manufacturing industry in proportion to the share of their sales accounted for by the passenger motor vehicle manufacturing industry. b While some employment losses may occur owing to some interstate interlinkages, employment losses in Queensland and Western Australia are assumed to be zero for modelling purposes. c Manufacturing industries supplying inputs to the domestic passenger motor vehicle manufacturing industry (including automotive components suppliers). d The number of employees initially retrenched that are assumed to remain unemployed based on the estimated transition probabilities.

*Source*: Commission estimates.

## C.2 Model code and related changes

The MMRF model code (CoPS forthcoming) was modified to enable the scenarios presented in this paper to be modelled. These additions to the model code are listed in box C.1.

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| --- |
| Box C.1 Code added to the MMRF model for this inquiry |
| *Import-domestic twist term on investment demand for passenger motor vehicles*  **Variable** (**all**,c,COM)(**all**,q,REGDST) twistsrc2(c,q) *# Investor twist in ratio of imports to domestically‑produced inputs #*;  **Equation** E\_x2a *# Demand for c from s for investment in state q, User 2 #* (**all**,c,COM)(**all**,s,ALLSRC)(**all**,i,IND)(**all**,q,REGDST) x2a(c,s,i,q) = **IF{**s **ne** *"imp"*,  x2c(c,i,q) - SIGMA2C(c)\***[**p2a(c,s,i,q) - p2c(c,i,q)**]}** + **IF{**s **eq** *"imp"*,  x2o(c,i,q) - SIGMA2O(c)\***[**p2a(c,*"imp"*,i,q)-p2o(c,i,q)**]**+  (V2PURT(c,*"domestic"*,i,q)/(TINY + V2PURO(c,i,q)))\*  (twistsrc2(c,q) + twistsrc(c,q) + twistsrc\_c(q) + nattwistsrc\_c)**}**;  **Equation** E\_x2c *# Demand for domestic composite, User 2 #* (**all**,c,COM)(**all**,i,IND)(**all**,q,REGDST) x2c(c,i,q) = x2o(c,i,q) ‑ SIGMA2O(c)\***[**p2c(c,i,q) ‑ p2o(c,i,q)**]** ‑  **[**V2PURT(c,*"imp"*,i,q)/(TINY + V2PURO(c,i,q))**]**\*  (twistsrc2(c,q) + twistsrc(c,q) + twistsrc\_c(q) + nattwistsrc\_c);  *Import-domestic twist term on household demand for passenger motor vehicles*  **Variable** (**all**,c,COM)(**all**,q,REGDST) twistsrc3(c,q) *# Household twist in ratio of imports to domestically‑produced inputs #*;  **Equation** E\_x3a *# Demand for goods by source, User 3 #* (**all**,c,COM)(**all**,s,ALLSRC)(**all**,q,REGDST) x3a(c,s,q) = **IF{**s **ne** *"imp"*,  x3c(c,q) ‑ SIGMA3C(c)\***[**p3a(c,s,q) ‑ p3c(c,q)**]}** + **IF{**s **eq** *"imp"*,  x3o(c,q) ‑ SIGMA3O(c)\***[**p3a(c,*"imp"*,q) ‑ p3o(c,q)**]** +  (V3PURT(c,*"domestic"*,q)/(TINY+V3PURO(c,q)))\*  (twistsrc3(c,q) + twistsrc(c,q) + twistsrc\_c(q) + nattwistsrc\_c)**}**; |
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| --- |
| Box C.1 (continued) |
| **Equation** E\_x3c *# Demand for domestic composite, User 3 #* (**all**,c,COM)(**all**,q,REGDST) x3c(c,q) = x3o(c,q) ‑ SIGMA3O(c)\***[**p3c(c,q) ‑ p3o(c,q)**]** ‑  **[**V3PURT(c,*"imp"*,q)/(TINY + V3PURO(c,q))**]**\*  (twistsrc3(c,q) + twistsrc(c,q) + twistsrc\_c(q) + nattwistsrc\_c);  *Domestic demand for passenger motor vehicles in investment*  **Set** REG\_Car *# Regions producing cars #* (VIC, SA) ;  **Subset** REG\_Car **is** **subset** **of** REGDST ;  **Set** COM\_Car *# PMV commodity #* (Cars) ;  **Subset** COM\_Car **is** **subset** **of** COM ;   **Subset** COM\_Car **is** **subset** **of** IND ;  **Set** Not\_Car = IND - COM\_car ;  **Variable** (**all**,c,COM\_Car)(**all**,q,REGDST) x2\_car(c,q) *# Demand for domestic cars in investment #*;  **Equation** E\_x2\_car *# Demand for domestic cars in investment #* (**all**,c,COM\_Car)(**all**,q,REGDST) **ID01[sum{**s,REG\_Car,**sum{**i,IND, V2PURA(c,s,i,q)**}}]**\*x2\_car(c,q) =  **sum{**s,REG\_Car,**sum{**i,IND, V2PURA(c,s,i,q)\*x2a(c,s,i,q)**}}**;  *Intermediate demand for automotive components supplied by Victoria and South Australia*  **Set** CarParts (CarParts) ;  **Subset** CarParts **is** **subset** **of** COM ;  **Variable** (**all**,c,CarParts)(**all**,q,REGDST) x1\_carparts(c,q) *# Demand for domestic cars in production #*;  **Equation** E\_x1\_carparts *# Demand for Vic & SA car parts in production #* (**all**,c,CarParts)(**all**,q,REGDST) **ID01[sum{**s,REG\_Car,**sum{**i,Not\_Car, V1PURA(c,s,i,q)**}}]**\*x1\_carparts(c,q) =  **sum{**s,REG\_Car,**sum{**i,Not\_Car, V1PURA(c,s,i,q)\*x1a(c,s,i,q)**}}**; |
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| Box C.1 (continued) |
| *Domestic-domestic twist term on intermediate demand for automotive components*  **Set** NotREG\_Car = REGSRC - REG\_Car ;  **Set** DOMSOURCE *# Aggregated domestic sources #* (REG\_Car,NotREG\_Car);  **Coefficient** (**all**,c,COM)(**all**,d,DOMSOURCE)(**all**,i,IND)(**all**,q,REGDST) V1PURD(c,d,i,q) *# Purchase value for current production: Two domestic sources #*;  **Formula** (**all**,c,COM)(**all**,i,IND)(**all**,q,REGDST) V1PURD(c,*"REG\_Car"*,i,q) = **sum{**s,REG\_Car, V1PURA(c,s,i,q)**}**;  **Formula** (**all**,c,COM)(**all**,i,IND)(**all**,q,REGDST) V1PURD(c,*"NotREG\_Car"*,i,q) = **sum{**s,NOTREG\_Car, V1PURA(c,s,i,q)**}**;  **Variable** (**all**,c,COM)(**all**,q,REGDST) twistdom(c,q) *# Intermediate twist in ratio of SA & Vic to other domestic inputs #*;  **Variable** (**all**,c,COM)(**all**,i,IND)(**all**,q,REGDST) p1a1(c,i,q) *# Price of domestic composite from REG\_Car, User 1 #* ;  **Equation** E\_p1a1 *# Price of domestic composite, User 1 #* (**all**,c,COM)(**all**,i,IND)(**all**,q,REGDST) **ID01[**V1PURD(c,*"REG\_Car"*,i,q)**]**\*p1a1(c,i,q) =  **sum{**s,REG\_Car, V1PURA(c,s,i,q)\*(p1a(c,s,i,q) + a1a(c,s,i,q))**}**;  **Variable** (**all**,c,COM)(**all**,i,IND)(**all**,q,REGDST) p1a2(c,i,q) *# Price of domestic composite from NotREG\_Car, User 1 #* ;  **Equation** E\_p1a2 *# Price of domestic composite, User 1 #* (**all**,c,COM)(**all**,i,IND)(**all**,q,REGDST) **ID01[**V1PURD(c,*"NOTREG\_Car"*,i,q)**]**\*p1a2(c,i,q) =  **sum{**s,NOTREG\_Car, V1PURA(c,s,i,q)\*(p1a(c,s,i,q) + a1a(c,s,i,q))**}**; |
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| --- |
| Box C.1 (continued) |
| **Equation** E\_x1a *# Demand for c from s by industry i in q #* (**all**,c,COM)(**all**,s,ALLSRC)(**all**,i,IND)(**all**,q,REGDST) x1a(c,s,i,q) - a1a(c,s,i,q) = IF**{**c **ne** *"CarParts"*,  IF**{**s **ne** *"imp"*,  x1c(c,i,q) - SIGMA1C(c)\***[**p1a(c,s,i,q) + a1a(c,s,i,q) - p1c(c,i,q)**]}** +  IF**{**s **eq** *"imp"*,  x1o(c,i,q) - SIGMA1O(c)\***[**p1a(c,*"imp"*,i,q) + a1a(c,*"imp"*,i,q) - p1o(c,i,q)**]** +  (V1PURT(c,*"domestic"*,i,q)/(TINY+V1PURO(c,i,q)))\*  (twistsrc1(c,q) + twistsrc(c,q) + twistsrc\_c(q) + nattwistsrc\_c)}} + IF**{**c **eq** *"CarParts"*,  IF**{**s **ne** *"imp"*,  IF**{**s **eq** *"VIC"* **or** s **eq** *"SA"*,  x1c(c,i,q) - SIGMA1C(c)\***[**p1a1(c,i,q) - p1c(c,i,q)**]** + (V1PURD(c,*"NotREG\_Car"*,i,q)/(TINY+V1PURT(c,*"domestic"*,i,q)))\*  (twistdom(c,q))**}** +  IF**{**s **ne** *"VIC"* **and** s **ne** *"SA"*,  x1c(c,i,q) - SIGMA1C(c)\***[**p1a2(c,i,q) - p1c(c,i,q)**]** - (V1PURD(c,*"REG\_Car"*,i,q)/(TINY+V1PURT(c,*"domestic"*,i,q)))\*  (twistdom(c,q))**}}** +  IF**{**s **eq** *"imp"*,  x1o(c,i,q) - SIGMA1O(c)\***[**p1a(c,*"imp"*,i,q) + a1a(c,*"imp"*,i,q) - p1o(c,i,q)**]** +  (V1PURT(c,*"domestic"*,i,q)/(TINY+V1PURO(c,i,q)))\*  (twistsrc1(c,q) + twistsrc(c,q) + twistsrc\_c(q) + nattwistsrc\_c)**}}** ;  *Import-domestic twist term on intermediate demand for automotive components*  **Variable** (**all**,c,COM)(**all**,q,REGDST) twistsrc1(c,q) *# Intermediate twist in ratio of imports to domestically‑produced inputs #*;  **Equation** E\_x1c *# Demand for domestic composite, User 1 #* (**all**,c,COM)(**all**,i,IND)(**all**,q,REGDST) x1c(c,i,q) =  x1o(c,i,q) - SIGMA1O(c)\***[**p1c(c,i,q) - p1o(c,i,q)**]** -  (V1PURT(c,*"imp"*,i,q)/(TINY+V1PURO(c,i,q)))\*  (twistsrc1(c,q) + twistsrc(c,q) + twistsrc\_c(q) + nattwistsrc\_c); |
|  |
|  |

## Annex C1 Budgetary assistance to the automotive industry

Actual and projected budgetary assistance to the automotive manufacturing industry indicates a future decline in budgetary outlays to the industry (table C1.1). This assistance includes the ATS, the Green Car Innovation Fund and the Automotive New Markets Initiative, as well as conditional grants to passenger motor vehicle manufacturers (detailed in chapter 5 of the Commission’s inquiry report).

Capped ATS assistance amounts are based on available funding under that part of the scheme (rather than expected payments), and account for savings included in the Australian Government’s 2013‑14 Mid‑Year Economic and Fiscal Outlook. In a given year, actual ATS payments can differ substantially from the annual cap due to unallocated funding.

Table C1.1 Actual and projected budgetary assistance to the automotive manufacturing industrya

$ million (current prices)

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 2010‑11 | 2011‑12 | 2012‑13 | 2013‑14 | 2014‑15 | 2015‑16 | 2016‑17 | 2017‑18 | 2018‑19 | 2019‑20 | 2020‑21 |
| **Passenger motor vehicle manufacturing** | | | | | | | | | | | |
| ATS – capped assistancea | 82 | 163 | 154 | 178 | 110 | 69 | 83 | 101 | 96 | 50 | 14 |
| ATS – uncapped assistance | 55 | 87 | 63 | 58 | 37 | 25 | 11 | 3 | .. | .. | .. |
| Green Car Innovation Fund | 63 | 126 | 47 | 6 | 1 | .. | .. | .. | .. | .. | .. |
| Automotive Supply Chain Development Program | 2 | 2 | 3 | .. | .. | .. | .. | .. | .. | .. | .. |
| Automotive Market Access Program | 1 | 1 | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Investment incentive for Ford | .. | 34 | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Investment incentive for Holden | .. | .. | .. | 36 | 51 | 113 | 16 |  | .. | .. | .. |
| Investment incentive for Toyota | .. | .. | .. | 7 | 19 | 1 | 1 | 1 | .. | .. | .. |
| **Total** | **203** | **412** | **268** | **285** | **218** | **207** | **111** | **105** | **96** | **50** | **14** |

(Continued next page)

Table C1.1 (continued)

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 2010‑11 | 2011‑12 | 2012‑13 | 2013‑14 | 2014‑15 | 2015‑16 | 2016‑17 | 2017‑18 | 2018‑19 | 2019‑20 | 2020‑21 |
| **Automotive components** |  |  |  |  |  |  |  |  |  |  |  |
| ATS – capped assistanceb | 65 | 130 | 123 | 142 | 88 | 55 | 66 | 81 | 77 | 40 | 11 |
| Automotive Industry Structural Adjustment Program | 14 | 9 | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Automotive Supply Chain Development Program | ‑ | ‑ | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Automotive New Markets Initiative |  |  | 3 | 11 | 9 | 7 |  |  |  |  |  |
| **Total** | **80** | **139** | **126** | **153** | **97** | **61** | **66** | **81** | **77** | **40** | **11** |
|  |  |  |  |  |  |  |  |  |  |  |  |
| **Other industries**c |  |  |  |  |  |  |  |  |  |  |  |
| ATS – capped assistance | 2 | 3 | 3 | 4 | 2 | 1 | 2 | 2 | 2 | 1 | – |
| Automotive Supply Chain Development Program | 3 | 3 | 1 | .. | .. | .. | .. | .. | .. | .. | .. |
| Automotive New Markets Initiative |  |  | 1 | 1 | 1 | 1 |  |  |  |  |  |
| Automotive Market Access Program | 1 | 1 | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| **Total** | **6** | **7** | **5** | **5** | **3** | **2** | **2** | **2** | **2** | **1** | **–** |
|  |  |  |  |  |  |  |  |  |  |  |  |
| **Total (all industries)** | **288** | **558** | **399** | **443** | **318** | **271** | **178** | **187** | **175** | **92** | **25** |

**..** Estimated to be zero. **–** Less than $0.5 million. a Totals may not be the sum of components due to rounding. b Figures for 2010‑11, 2011‑12 and 2012‑13 estimated using actual payments for the 2010, 2011 and 2012 calendar years. Figure for 2013‑14 estimated using updated cap that accounts for unallocated funding rolled forward. All other figures estimated using capped funding profile that accounts for savings outlined in 2013‑14 Mid‑Year Economic and Fiscal Outlook c Including other manufacturing activities, business and government services.

*Sources*: Information provided by the Department of Industry; Commission estimates.

1. Ford, Holden and Toyota have announced that plant closures will directly affect about 6600 of their employees. This represents about 60 per cent of their current workforce. For Ford and Toyota, announced job losses only relate to manufacturing employees, so a greater number of retrenchments could occur if there are also reductions in design and engineering, head office, sales and marketing positions at these two firms. [↑](#footnote-ref-1)
2. This approach is used as the model database does not differentiate between automotive components manufactured for aftermarket use from those used in passenger motor vehicle manufacturing. The modifications made to the model code to achieve this are detailed in box C.1. [↑](#footnote-ref-2)
3. Implemented by shocking the exogenous variable x1emp\_o for each relevant state, making the twist term twistsrc1 endogenous. [↑](#footnote-ref-3)
4. The capital use closure changes avoid maintaining capital stocks at pre-closure levels in the exit scenario. [↑](#footnote-ref-4)
5. Ideally, these closure changes would also be applied to the buildings and equipment that are effectively being transferred from the passenger motor vehicle manufacturing industry to the Victorian business services industry. However, this was not done due to the difficulty in quarantining the capital stock being transferred from the wider use of capital stock by the Victorian business services industry. [↑](#footnote-ref-5)
6. The fitted curve takes the form , where *t* is the time in months since displacement. [↑](#footnote-ref-6)
7. This remaining employment is re-classified in the modelling to the business service industry in Victoria, the location of the head offices of the major manufacturers, on account of its input structure being closer to those of the remaining head office functions than passenger motor vehicle manufacturing. [↑](#footnote-ref-7)
8. Sales shares to the passenger motor vehicle manufacturing industry are applied to the level of industry employment in the MMRF‑Auto14 database to give an estimate of the initial number of job losses. The total number of jobs lost in each jurisdiction is the sum of jobs lost across all input-supplying industries. [↑](#footnote-ref-8)
9. For example, 1.3 per cent of Victorian metal products employment is assumed to be lost as a result of the end of large‑scale passenger motor vehicle manufacturing in Victoria (370 employees out of 28 700), as the Victorian passenger motor vehicle manufacturing industry uses 1.3 per cent of domestically produced metal products in the MMRF‑Auto14 database. [↑](#footnote-ref-9)
10. It is assumed that this unemployment occurs in the region in which the passenger motor vehicle manufacturing or vehicle components manufacturing industries are located. To the extent that these inputs are sourced from other jurisdictions, the resulting estimates of employees retrenched in the state in which the vehicle manufacturing or component manufacturing occurs will be overstated, and correspondingly understated in the supplying region. [↑](#footnote-ref-10)