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**Liberalization and Structural Change in Australian Automotive Industry: An Analysis
of trade and Productivity Performance: 1962-2008**

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Abstract

This paper investigates the effects of policy liberalization on structural change in the Australian automotive industry, with a focus on trade and productivity performance. While there has been a rise in exports and imports, productivity fell significantly. The post-liberalization fall in productivity may signal the beginning of a turnaround, but only if the small size of domestic market is tackled. This proposition is validated by the econometric evidence which suggests that economies of scale can be a source of productivity improvement in increasingly competitive business environment.

Key words: Liberalization, structural change, productivity, exports, imports

Liberalization and Structural Change in Australian Automotive Industry: An Analysis of trade and Productivity Performance: 1962-2008

The history of the Australian automotive industry (AAI) goes back to 1897 when the first Australian built car was launched in the market behind highly protective trade barriers. The secure domestic market led to the development of the industry which soon saturated with the end of the gold rush. By the late 1970s, it was increasingly obvious that automotive industry in Australia was not competitive, paving the way for reform. Within this environment, the government began reviewing its automotive industry policy and gradually open up the market. Increased openness, together with the first oil shock in the mid-1970s, brought major structural change in the Australian automotive industry as the demand for Australia's large cars dropped, while imported smaller cars became popular, forcing number of domestic producers to restructure their operation. For instance, Nissan Motor Company Ltd ceased its vehicle assembly operations (in 1992), while Ford Australia discontinued its Laser production line (in 1994) and Mitsubishi Motors Australia Ltd closed down its vehicle production (in March 2008). While the effects of liberalisation on export and import performance of the Australian automotive industry is well-documented, studies investigating the impact on total factor productivity (TFP) growth are sparse.¹ This is not surprising given that estimates of TFP growth require extensive data which are not readily available. Fortunately, we have access to a rich database to investigate issues at hand. The aim of this study is to investigate structural change in the Australian automotive industry in the historical context, with a focus on total factor productivity growth.

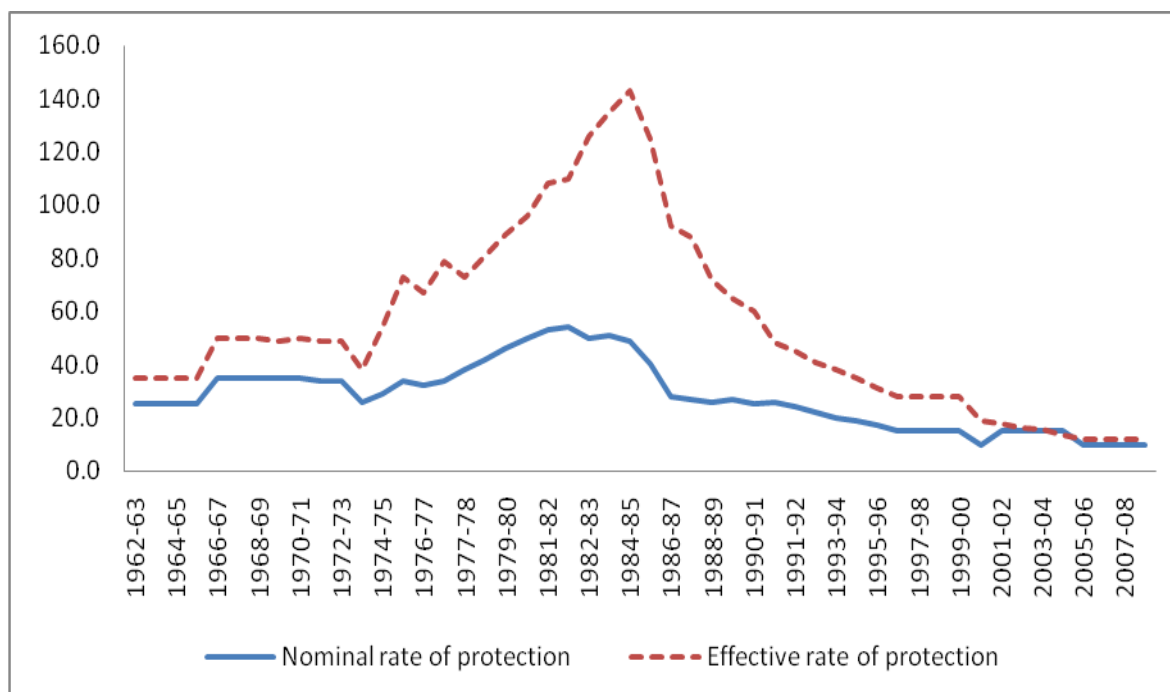
¹ See, Lionel 2010 and literature cited therein for studies examining trade performance of the AAI. While Sanidas and Jayanthakumaran (2007) document TFP growth in the AAI, their study, unlike ours, is not based on the time series analysis.

The paper is organised as follows: Section II outlines the nature of policy regime, while section III presents an analysis of structural change, with a focus on total factor productivity growth. Section IV documents the econometric evidence on the determinants of productivity growth. Paper concludes in section V with policy remarks.

II. Policy in the Past and Recent Changes

The history of protection of the Australian automotive industry goes back to the early 1990s when the first tariff protection was introduced in 1907. In addition to high tariff, government also used quotas and subsidies to protect the industry, making the effective rate of protection (ERP) as high as 140 percent by 1984-85—the second highest after textile, clothing and footwear industry (Productivity Commission, 2009). By 1985-86, it became obvious that excessive protection had made the automotive industry highly uncompetitive, paving the way for reform. This section documents the history of protection and liberalization attempts. As shown in figure 1, the industry has gone through a highly protective regime until 1985-86 and then moving towards an increasingly liberal and open regime since 1986-87. Our discussion in this section is based on the nature of policy regime with particular reference to the pre-reform (until 1985-86) and post-reform (from 1986-87) periods.

Figure 1: Nominal and effective rate of protection in the AAI (%), 1960-2010



Source: Productivity Commission (2002 & 2009).

(a) Pre-reform era (until 1985-86)

The development of automotive industry in Australian began in 1907 when government imposed high tariffs and introduced quotas on imported motor vehicles and parts. There was a combination of both flat rate and ad valorem tariffs in addition to quotas and subsidies (Stubbs, 1971). Not only did the country have high tariffs, but also the rates vary significantly between trading partners (Lloyd, 2008).² Prior to the 1960s, vehicle producers who undertook measures to increase local content were awarded with preferential import licences to help ease a balance of payment crisis (Truett and Truett, 1997). In 1965, the

² For instance, a preferential tariff was introduced for imports of motor cars from the United Kingdom in 1907 which continued until 1974.

government even introduced an incentive to reward vehicle producers that achieved a minimum local content with the right to import the remaining components duty free.³ In a highly protective trading environment where domestic producers were protected from import competition, the requirement to use local content led to the development of inefficient and relatively high cost automotive industry.

In response to a rise in imports of completely built-up (CBU) motor vehicle, government increased passenger motor vehicle (PMV) tariff to 45 per cent in 1966, which further rose to 57.5 per cent in 1975. This tariff rate remained effective until 1987. In addition to high tariff, there was also an excessive use of quotas. While import quotas were phased down from 1984 and abolished completely in 1988, an introduction of a 100 percent duty quota in 1984, resulted in an increase in the effective rate of protection to 140 per cent by the mid 1980s—highest in the history of the AAI (see figure 1).⁴ By this time, it was increasingly evident that protectionist policies were counterproductive given the small size of domestic market and the industry was global uncompetitive.

(b) Post-reform (from 1986-87) period

The 1980s witnessed a major policy shift with the announcement of the Button Plan in 1984.⁵ It re-defined the institutional framework and set out several objectives. These included (i) increasing efficiency to enable the industry to compete with imports at lower levels of

³ For example, until 1975 manufacturers that meet the 85% local content requirement were allowed duty free imports of components to 15% of the value of motor vehicle production.

⁴ The estimates of the effective rate of protection consider all forms of assistance offered to an industry including tariffs on inputs, export subsidies and import quotas.

⁵ Following a review of the automotive industry undertaken between the late 1970s and early-1980s, Australian Government's Automotive Plan was introduced in 1984. This plan later came to be known as the Button Plan, named after the federal minister for trade and industry John Button who was the architect of the plan.

government assistance, (ii) providing better quality products for consumers at reduced prices, and (iii) minimizing disruption to production and employment during the transition period. Following the announcement of the Button Plan, the Automotive Industry Authority (AIA) was established in 1984. Within a year of its establishment, quantitative quotas were replaced with tariff quotas, but the level of protection granted to passenger motor vehicle remained very high. To make the industry outward looking, government introduced the *acceptable volumes of production rules* in 1986, which penalized manufacturers with models that did not produce at least 30,000 units a year from 1989 onwards⁶ and at the same time announced the abolition of import quota on cars (in 1988) and introduced export facilitation scheme (in 1989).

While the new policy calculus aimed at improving competitiveness and achieving economies of scale (by reducing the number of models produced domestically) attracted severe criticism, government continued with reform process. For instance, local content scheme was abolished in 1989, and motor vehicle tariff was reduced to 45 per cent, with further annual reductions of 2.5 per cent to become 35 per cent in 1992. However, in 1997, due to the pressure from industry groups, tariff reduction was delayed and held at 15 per cent from 2000 to 2004. Tariffs were reduced to ten per cent in 2005 and to five per cent in 2010 (DIISR, 2008).

In an attempt to make the industry internationally competitive, the government replaced export facilitation scheme with the Australian Competitiveness and Investment Scheme (ACIS) in 2001 to provide transitional assistance.⁷ The Scheme aims to promote investment

⁶ Penalties for low volume production did not continue after 1996. Nine producers who produced the models, which did not achieve a sanction volume of at least 30,000 units a year from 1989, were subject to penalty. The penalty withdrew eligibility for the 15 per cent duty free imports.

⁷ The Scheme makes import duty credits based on automotive production, and investment in plant and equipment, and R&D. The duty credits can be used to discharge customs duty on eligible automotive

in plants and equipment, and research and development (Sohal, et. al, 2001). In February 2008, the government conducted a review of the Australian car industry (known as the Bracks Review), which provided the basis for *A New Car Plan for a Greener Future*. The New Car Plan was announced with a 13-year long commitment to make the industry globally competitive and environmentally sustainable. Under the plan funding support for restructuring the automotive industry is provided, so that it will become economically and environmentally sustainable while generating high-skill, high-wage employment opportunities.

III. Structural Changes in the Australian Automotive Industry

The Australian automotive industry has witnessed structural change over the period of 1962-2008. Growing competitive pressure brought about by policy liberalization appears to have made some impact on industry's trade and productivity performance. Both exports and imports grew following liberalization. For instance, exports, which were negligible until the mid 1980s, rose to \$5,053 million by the late 1990s, although declined since 2004 partly due to the appreciation of the Australian Dollar. Despite this, automotive is one of Australia's top 10 export earners and the largest manufacturing export earners (ABS, 2010). Meanwhile imports continue to rise from \$4,495 million in 1994 to \$15,007 million by 1999 (in constant 2007-2008 prices, see appendix I for trends in exports and imports since 1962). The abolition of the mandatory local content scheme, reduction of import duties on parts and components, and the introduction of the export facilitation scheme appear to have contributed to a rise in exports until 2003, while an increase in imports seems to be largely due to import liberalization and growing popularity of smaller cars. Consumers are increasingly switching

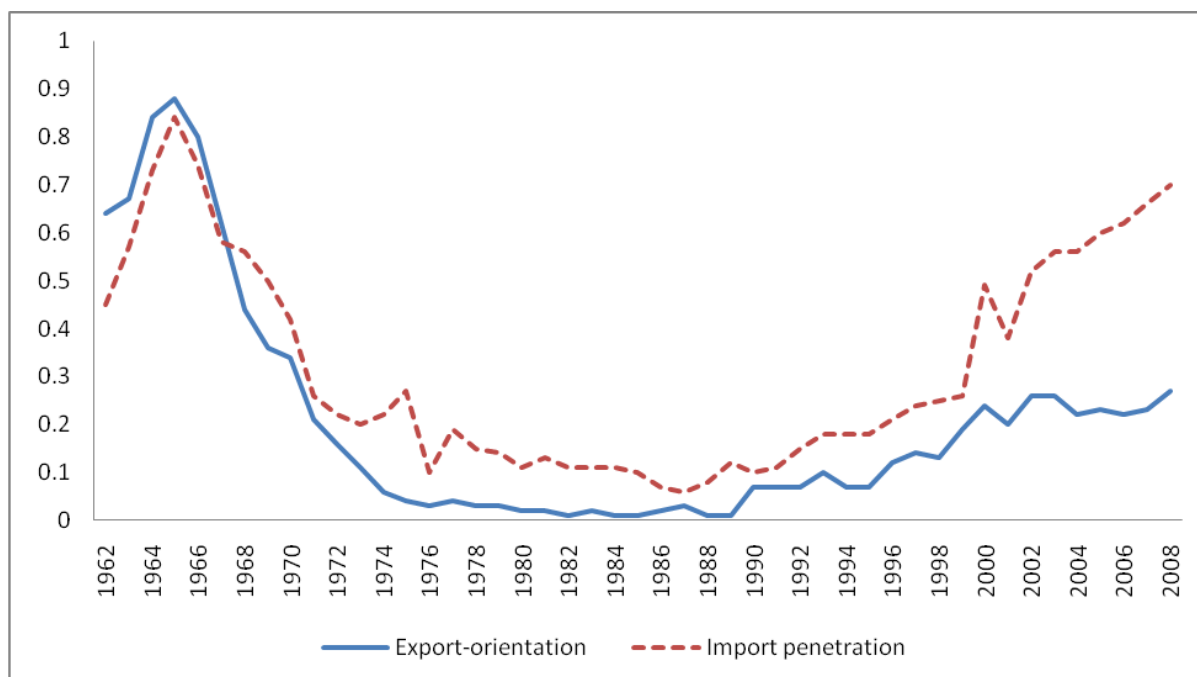
imports, or can be sold or transferred. Under the current settings the scheme will cease on 31 December 2015.

towards fuel efficient smaller imported cars in response to a rise in fuel price, which rose by 33 percent since 2004, although the appreciation of the Australian dollar in recent years has helped ease some pressure. As fuel efficient imported cars become popular, the market share of the Australian made motor vehicles falls-- from 30 percent in 2002 to 19 percent in 2007 and this trend continues (Bracks, 2008).

Figure 2 presents trends in export-orientation and import penetration in the Australian automotive industry during the period from 1962 to 2008.⁸ Over the years, there have been significant fluctuations in both export-orientation and import penetration ratios. Export-orientation ratio, which was as high as 0.80 in the mid 1960s, became almost nil by the mid 1980s, while the import penetration ratio fell from 0.90 to about 0.10 in the same period. From mid 1970s to mid 1980s, both export-orientation and import penetration ratios were at their lowest ebb, which appear to be largely due to the effects of oil shocks (figure 2). However, since the early 1990s these ratios have shown rising trends, although growth in import penetration ratio has been far greater than export-orientation, suggesting a strong competitive pressure in the market.

⁸ Export-orientation or export intensity is defined as the export to output ratio, while import penetration is defined as the ratio of total automotive imports to the total automotive market in Australia (in 2007-08 prices).

Figure 2: Export-orientation and import penetration in Australian motor vehicle industry, 1962-2008



Source: Authors' calculation based on data from the AAI (various sources).

When the entire study period is grouped into the pre- and post-reform periods, it became evident that in the latter period both exports and imports grew rapidly, but employment declined (see, Table 1). Employment fell from 81,662 to 62,894 in the post-reform period. While both exports and imports rose sharply, imports were far greater than exports, leading to an expansion in trade deficit from \$1.6 billion in the pre-reform period to \$9.6 billion in the post-reform period (average annual). Trade deficit, as a percentage of value added, rose from 134 percent to 201 percent in the post-liberalisation period. This 67 percent rise in trade deficit in the post-reform period seems to suggest that the industry lacks competitiveness, although labour productivity, while imperfect indicator of productivity, shows significant improvements (see, Table 1). Labour productivity, as measured by value added per worker in

2007-08 constant prices, rose from \$15 to \$76 in the post-reform period. So, what has been the impact on total factor productivity growth?

Table 1: Key Indicators of Australian Automotive Industry: Average Annual Performance
(2007–08 Prices unless otherwise stated)

	Entire Study Period (1962-2008)	Pre-Reform (1962-84)	Post-Reform (1985-2008)
Exports (\$ millions)	2,089.42	575.57	3,604.27
Imports (\$ millions)	7,732.38	2,230.62	13,234.14
Trade deficit (\$ millions)	5,642.46	1,655.05	9,629.87
Value added (\$ millions)	3,005.57	1,233.28	4,777.87
Trade deficit % of value added	188.08	134.19	201.55
Employment (persons)	72,278	81,662	62,894
Labour productivity (\$)	45.50	15	76
NRP (%)	36.85	46.6	27.1

Sources: Authors estimate based on AAI (various issues).

Total factor productivity (TFP) growth, which can be decomposed as the difference between the logarithmic of value added and the weighted averages of the logarithmic values of labour and capital, where the weights are the average value shares of each input.⁹ It can be expressed as follows:

$$TFP_{(t)} - TFP_{(t-1)} = \{ \ln VA_{(t)} - \ln VA_{(t-1)} \} - \{ V_{Lt} (\ln L_{(t)} - \ln L_{(t-1)}) + V_{Kt} (\ln K_{(t)} - \ln K_{(t-1)}) \} \quad (1)$$

⁹ Total factor productivity growth can be estimated in value added or gross output term. In the study our estimate is based on value added term as intermediate data input data are not available.

Where

TFP_t = total factor productivity

VA_t = total value added

L_t = total labour input

K_t = total capital input

t = the point of time in consideration

We obtain the value shares of each input as follows:

$$V_{Lt} = (L_t) / (VA_t)$$

$$V_{Kt} = (K_t) / (VA_t)$$

where

V_{Lt} = value share of labour input

V_{Kt} = value share of capital input

Under constant returns to scale the value shares of the two inputs sum to one i.e., $V_{Lt} + V_{Kt} = 1$. The methodology assumes perfect competition and under this assumption the elasticity of output with respect to each input is equal to its value share in value added.

It must be mentioned that this approach to TFP growth not only captures technical efficiency but also improvements in capacity utilization, better management practices, improvements in the work-place environment, training and learning by doing. Since there has been a good deal of capacity underutilization in the Australian automotive industry, the implications of

not making such corrections is that TFP growth estimates reflect in part changes in capacity utilization. The estimates growth rates, strictly speaking, should therefore be interpreted as the rates of improvement in the overall efficiency of resources (including fixed factor of production), rather than as ‘pure’ rates of technical progress. Table 2 presents total factor productivity growth in the Australian automotive industry for the entire study period as well as for the pre- and post-reform periods. Appendix II discusses data issues and sources of data for TFP growth estimates.

Table 2: Growth (%) in Value Added, Labour, Capital, Weighted Labour, Weighted Capital and TFP in the Australian Automotive Industry: 1962-2008

Growth in	Entire Study Period (1962-2008)	Pre-Reform (1962-84)	Post-Reform (1985-2008)
Value added	5.89	9.64	2.15
Labour	9.52	14.62	4.42
Capital	7.14	10.44	3.84
Weighted Labour	3.52 (59.76)	4.57 (47.41)	2.47 (114.88)
Weighted Capital	0.83 (14.09)	1.06 (10.99)	0.60 (27.91)
TFP	1.5 (26.14)	4.00(41.49)	-0.91(-42.32)

Note: Figures in parentheses are percentage contributions of factor inputs and TFP to growth in value added. Sources: Authors estimate based on ABS and AAI (various issues).

As shown in table 2 above, automotive industry in Australia has experienced an absolute fall in productivity following liberalization in the mid 1980s. Total factor productivity, which grew at a rate of 4% per annum in the pre-liberalization period, dropped to -0.91% per annum in the post-liberalization period. In the entire study period, TFP grew at 1.5 % per annum. The significant decline in productivity growth in the post-liberalization period appears to be due to under utilization of capacity brought about by intense import competition from fuel

efficient smaller cars. While excess production capacity is a common problem in many advanced economies mainly due to import competition from the newly industrialised economies (NIEs), Australia is further disadvantaged due to its small domestic market and geographic isolation from major markets.¹⁰

Not only did TFP fell but also value added declined significantly—from just over 9% to about 2% per annum in the post-reform period (Table 2). Table 2 also indicates that the contribution of labour input to value added has been far greater than that of capital regardless of the nature of policy regime, mainly due to excessive underutilized capacity due to policy-led distortions in the past. While TFP growth contributed positively to value added in the entire study period (26.14 % per annum) as well as in the pre-liberalization period (41.49% per annum), its contribution fell dramatically following liberalization (-42.32% per annum).

V. Conclusion

This paper investigates the effects of policy liberalization on structural change in the Australian automotive industry, with a focus on trade and productivity performance. There is a clear evidence of structural change in automotive industry during 1962-2008 periods. While the magnitude of exports and imports expanded, productivity growth fell substantially following liberalization. Productivity growth dropped from 4 percent to -0.91 percent per annum in the post-liberalization period. The post-liberalization fall in productivity may signal the beginning of a turnaround, but only if the small size of domestic market is tackled. The

¹⁰ These NIEs include China, South Korea, Brazil, India, Russia, Thailand and Mexico. They are increasingly moving up the value chain and actively developing full spectrum of capabilities to host a complete car industry from design to full production. This shift is characterised by intensification of cost cutting measures (Bracks, 2008).

absolute fall in productivity appears to have been linked with the excess production capacity brought about by import competition. While our results are interesting, they must be interpreted with some degree of caution. For instance, often, the effects of policy reform on productivity growth come with the passage of time.

Appendix I: Key Performance of the Australian Automotive Industry: 1962–2008
(2007–08 Prices)

Year	Labour - \$ mil	Capital - \$ mil	Employment Persons	Imports - \$ mil	Exports - \$ mil	Value Added - \$ mil	Turnover - \$ mil	Global market share	Nominal Rate of Protection
1962	48.97	34	58,623	422.29	400.00	336.94	691.41	0.02	35.0
1963	53.79	32.92	69,722	688.33	500.00	313.4	810.38	0.02	35.0
1964	64.12	36.16	75,516	785.75	600.00	334.79	986.91	0.02	35.0
1965	65.35	40.19	81,920	1,195.87	659.74	394.76	1,065.12	0.02	35.0
1966	63.29	44.8	80,834	1,058.06	581.14	442.26	1,109.22	0.01	45.0
1967	71.49	50.88	82,122	1,108.42	551.11	469.21	1,226.79	0.02	45.0
1968	82.31	53.71	87,218	1,746.16	466.32	520.11	1,380.05	0.02	45.0
1969	94.49	56.53	80,626	1,800.34	423.56	602.43	2,045.94	0.02	45.0
1970	124.74	69.3	85,996	1,762.05	800.50	822.01	2,638.03	0.02	45.0
1971	256.3	77.52	87,819	2,071.99	979.97	1,037.35	2,895.25	0.01	45.0
1972	275.59	68.9	89,641	1,931.61	933.78	1,104.20	2,484.17	0.01	45.0
1973	302.62	68.45	90,631	1,953.86	715.62	930.33	2,507.43	0.01	33.8
1974	398.54	83.18	99,663	3,082.23	583.42	910.85	3,154.02	0.01	45.0
1975	445.34	105.15	89,419	2,834.52	379.57	1,102.85	3,894.73	0.01	45.0
1976	637.67	129.9	84,604	3,084.13	329.37	1,327.76	4,550.81	0.01	45.0
1977	653.06	160.56	87,488	2,561.54	309.63	1,495.56	5,958.89	0.01	45.0
1978	755.76	173.66	81,350	3,137.55	407.67	1,926.81	6,032.60	0.01	57.5
1979	795.82	184.02	85,013	2,596.48	399.95	1,916.45	6,465.55	0.01	57.5
1980	920.86	208.91	84,396	3,038.71	442.61	2,024.29	7,696.65	0.01	57.5
1981	895.22	237.91	76,776	3,481.92	620.50	2,369.97	7,867.17	0.01	57.5
1982	1,124.89	276.65	80,351	2,842.88	621.64	2,341.85	9,615.32	0.01	57.5
1983	1,173.13	297.56	71,704	3,624.63	765.47	2,835.62	9,618.42	0.01	57.5
1984	1,219.99	337.98	66,800	4,495.01	766.56	2,805.71	10,216.62	0.01	57.5
Pre-Ref Average	457.54	122.99	81,662	2,230.62	575.57	1,233.28	4,126.59	0.01	46.6
1985	1,604.31	399.51	70,100	4,858.47	842.56	2,898.14	13,490.89	0.01	57.5
1986	1,837.89	524.54	68,400	4,275.27	857.94	3,762.38	15,777.22	0.01	57.5
1987	1,831.92	603.93	66,700	3,584.92	1,324.71	4,299.12	15,530.72	0.01	57.5
1988	1,988.94	619.49	68,876	4,564.55	1,008.50	4,135.24	16,901.37	0.01	45.0
1989	2,163.70	609.32	75,100	7,141.58	1,232.13	4,380.95	18,199.89	0.01	45.0
1990	2,331.30	602.26	77,311	6,373.17	1,674.34	4,639.32	19,414.60	0.01	40.0
1991	2,382.58	624.33	66,238	5,528.13	1,946.36	4,891.37	18,394.62	0.01	37.5
1992	2,243.64	660.93	58,081	7,258.08	2,140.34	4,556.56	16,529.22	0.01	32.5
1993	2,375.05	717.02	54,445	8,194.96	2,492.89	3,996.62	15,701.81	0.01	30.0
1994	2,594.04	783.89	53,915	9,994.34	2,500.33	3,656.51	18,726.64	0.01	27.5
1995	2,580.49	826.98	55,044	10,158.49	2,625.68	4,300.72	19,993.54	0.01	25.0
1996	2,749.51	889.29	55,817	10,829.21	3,339.74	4,443.40	19,948.56	0.01	22.5
1997	2,936.44	903.5	55,232	12,597.64	4,053.65	4,824.65	20,765.51	0.01	20.0
1998	2,728.31	942	55,358	14,027.95	3,673.51	5,836.77	21,052.92	0.01	20.0
1999	2,891.68	986.46	51,520	15,007.00	5,053.37	6,543.22	22,475.90	0.01	17.5
2000	3,804.51	995.23	54,483	15,591.07	5,808.13	6,050.63	22,793.57	0.01	15.0
2001	3,519.60	965.53	63,652	14,934.57	6,158.22	4,447.42	30,007.47	0.01	15.0
2002	3,950.91	929.27	61,886	16,995.06	6,299.69	5,241.76	24,866.77	0.01	15.0
2003	3,940.71	948.05	66,414	19,409.31	6,399.71	4,913.59	25,827.86	0.01	15.0
2004	4,010.63	920.53	70,551	21,875.11	6,037.84	5,647.91	27,597.61	0.01	15.0
2005	3,992.13	901.17	70,804	23,877.39	5,972.53	6,002.26	27,597.72	0.01	10.0
2006	4,037.53	878.4	64,155	23,416.77	4,914.78	5,606.18	24,817.74	0.00	10.0
2007	4,028.20	889	67,384	27,944.00	5,112.00	4,895.15	24,727.00	0.00	10.0
2008	3,525.36	848.91	58,000	29,182.75	5,033.60	4,699.08	21,622.22	0.00	10.0
Post-Ref Average	2,918.72	790.40	62,894	13,234.16	3,604.27	4,777.87	20,948.39	0.01	27.1

Sources: Authors' estimate based on ABS, AAI and DIISR (various issues)

Appendix II: Data Issues and Sources

In the absence of readily available data a considerable amount of time was spent in collecting data and developing database. For instance, exports, imports and value added data were obtained from *Automotive Key Statistics* (various issues) and the Australian Bureau of Statistics (1974 to 1984), while Production Statistics were collected from *Automotive Industry Matters* (AIM May 1968 to July 1981), *Report on the State of the Automotive Industry* (DISSR 1986 to 2003), Industries Assistance Commission and Productivity Commission (various issues). Employment data were compiled from the Australian Bureau of Statistics and *Australian Automotive Intelligence Yearbook*, while sources of NRP data were Industries Assistance Commission and Productivity Commission (various issues).

Using appropriate price deflators output, wages and salaries, value added, imports and exports data were deflated (2007/08 = 100). Price deflators were obtained from the Reserve Bank of Australia and the Australian Bureau of Statistics.

It is worth mentioning that from 1968 to 2003, the Australian Bureau of Statistics compiled automotive data that did not have a consistent ANZSIC classification. As a result, the comparability of the Australian Bureau of Statistics data over the period from 1968 onwards was problematic. We therefore developed a concordance to ensure consistency in data. The concordances are available on request from the authors.

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