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Foreword

Waterline reports on trends in container handling productivity on the waterfront in Australia as well as the cost of importing and exporting containers. It covers both the unloading of container ships and the transport of containers from container terminals. This *Waterline* provides the latest data available on stevedoring productivity and landside performance. This journal is published by the Bureau of Infrastructure, Transport and Regional Economics (BITRE) and provides information on freight movements on both the wharf side and the landside of five Australian major port terminals: Brisbane, Sydney, Melbourne, Adelaide and Fremantle. This *Waterline* covers port terminal activity up to the June quarter 2011.

Waterline is prepared in the Infrastructure, Surface Transport and Road Safety Statistics Section by Adam Malarz.

BITRE is particularly grateful for the assistance of the following in the provision of data used to prepare this issue of *Waterline*:

- Ports Australia
- individual port authorities and corporations
- shipping lines
- customs brokers
- road transport operators
- pilot, tug and mooring operators; and
- stevedoring companies: Patrick and DP World.

Waterline is published twice a year in a streamlined format to ensure that timely data remain available.

This issue of *Waterline* and back issues, including selected time series data in spreadsheet format, is available from www.bitre.gov.au.

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In-brief

Coverage of performance indicators

Shipping lines operating in Australian ports keep employing larger, more efficient ships and gradually withdraw smaller vessels from service. As a result, the number of vessels in the smallest size category of container ship reported so far in *Waterline* has become too small to be monitored in a statistically unbiased way. Beginning with this issue, two new sizes of container ships will be reported: 5 000–20 000 and 50 000–55 000 GT. They represent respectively the smallest but still important category of container ships visiting Australia and the largest category of ship which is increasing in the number of visits and share in container operations. More indicators will be provided for these new categories as more data becomes available.

Container ships within the category of 35 000–40 000 GT will continue to be reported as previously.

Land-side performance indicators

Container throughput at Australia's largest five container ports increased by 2.8 and 7.1 per cent in March and June quarters of 2011, as compared with the same period of 2010.

Productivity in terms of truck turnaround in five ports worsened from 31.6 minutes in March quarter of 2010 to 32.9 minutes in March quarter of 2011. Shift work in trucking containers, as measured by the vehicle booking system, indicated an increase of evening, night and weekend work from 213.6 thousand timeslots used in June quarter 2010 to 295.9 thousand in June quarter 2011. In the same period, an increase in day shift share was noted from 582.4 to 712.3 thousand timeslots in the respective June quarters of 2010 and 2011. The number of total trucks used increased strongly by 11.3 per cent in March and 12.4 per cent in June quarters of 2011, as compared with respective periods of 2010.

Wharf-side productivity

The number of containers handled in five Australian ports increased more strongly in June than in March quarters 2011 (by 7.1 and 2.8 per cent respectively). This was particularly pronounced in Melbourne (0.9 and -2.8 per cent) and Brisbane (10.9 and 3.2 per cent). Adelaide experienced strong growth in total containers handled 29.1 per cent in June quarter and – 25.9 per cent in March quarter 2011.

Container terminal performance rates in five ports, as measured by *vessel working rates*, decreased from 40.6 containers per hour in June quarter of 2010 to 39.4 containers per hour (-3.0 per cent) in June quarter of 2011. However, in Adelaide *vessel working rates* improved in the same period from 34.1 to 38.8 containers per hour (13.6 per cent) respectively.

Port-interface cost index

For imports by container ships in the 35 000–40 000 GT category the national port interface cost indices in January to June 2011 increased in nominal terms to 862 (0.6 per cent) from 857 in July to December 2010. The real price indices declined to 594 from 623 (-1.5 per cent).

For exports by the same category of ships, costs indices in January to June 2011 increased in nominal terms to 836 (0.7 per cent) from 830 in July to December 2010. The real export cost indices declined to 576 (-1.44 per cent) from 603.

For the ship category 35 000–40 000 GT the elapsed berth time declined in Fremantle (from 31 to 26 hours), Brisbane (from 26 to 25 hours) and Adelaide (from 26 to 25 hours) but increased in Sydney (from 44 to 45 hours) and Melbourne (from 31 to 32 hours) from the period July to December 2010.

In the smallest category of container ships of 5 000–20 000 GT between January and June 2011, the exchange of containers per ship visit was lowest in Adelaide (115 containers) and highest in Fremantle (1871 containers).

In the largest category of container ships of 50 000–55 000 GT between January and June 2011, the exchange of containers per ship visit was highest in Melbourne (2 500 containers) and lowest in Fremantle (1 280 containers).

Elapsed berth time for this ship category was longest in Sydney (42 hours) and shortest in Fremantle (27 hours).

Container ship visits

Between July 2010 and June 2011, the dominating ship size visiting Melbourne and Sydney was 25 000–30 000 GT, with 350 and 314 visits respectively, whereas for Fremantle the dominating size was 50 000–55 000 GT with 102 visits. The average TEUs exchanged per visit has declined in nearly all the ship categories except for the 55 000 GT and above visiting Australian ports where it increased slightly.

Port performance – non-financial indicators

Imports of containerised cargo in five ports, as measured by TEUs exchanged, increased by 6.6 per cent from 1.25 in January–June 2010 to 1.33 million TEUs in January–June 2011. The total container exchanged increased in all categories in the same period from 2.82 to 2.95 million TEUs (4.6 per cent).

Wharf and ship reliability

Cargo receival improved at Melbourne and Fremantle but worsened slightly at Brisbane and Sydney between April and June 2011, as compared with January and March 2011 quarters. The ship arrival indicator advice at 24 hours shows slight deterioration over April – June 2011, except for Adelaide.

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CHAPTER 1
Landside of the port terminal

Overview

Chapter 1 of Waterline reports on a list of landside of port terminal indicators at the five capital city port terminals: Brisbane, Sydney, Melbourne, Adelaide and Fremantle. The chapter covers three types of indicators:

- indicators of size of task at the landside of port terminals
- performance indicators
- indicators of activity in the vehicle booking system.

The size of task performed indicators include the total number of trucks, the number of containers and the number of twenty-foot equivalent units (TEUs) processed in a quarter. They also include the number of containers loaded on or unloaded from rail in a quarter.

The landside of port terminal performance indicators are the average number of containers per truck, the average TEUs per truck, container turnaround time and average truck turnaround time.

This chapter also discusses three Vehicle Booking System (VBS) indicators: the number of VBS slots available, the number of VBS slots used and the adjusted usage rates for vehicle booking system slots.

Landside of the port terminal indicators are presented in Table 1.1 and Figures 1.1 to Figure 1.14. The notes below provide explanation of the concepts being measured, the scope of the measurement and highlights any qualifications that should be borne in mind by users of the data. The variables are discussed in the order they appear in Table 1.1.

Explanatory notes

Five ports

Data under this heading relate to simple sums of, or other form of aggregation of data for the five capital city port terminals: Brisbane, Sydney, Melbourne, Adelaide and Fremantle.

Road – Total trucks

This is a count of trucks processed through the vehicle booking system and the trucks that perform bulk run deliveries at a container terminal. This indicator shows the total truck-related task performed at a port terminal in a quarter.

Road – Total containers

Counts are based on a combination of the throughput of the vehicle booking system (VBS) at the land interface and the bulk runs of containers outside the VBS. At this stage it is not possible to separate out the bulk runs from the operations under the VBS. Bulk runs tend to be at night; bulk runs also tend to use larger vehicles with higher container or TEUs per truck measures.

Road – Total TEUs

Number of twenty-foot equivalent units (TEUs) processed in a quarter. This task size indicator measures the number of standardised twenty foot equivalent units (TEUs) of containers processed on the landside of port terminals in a quarter.

Average truck turnaround time in the quarter

This is a measure of stevedoring efficiency and shows how fast (expressed in minutes) a stevedoring company processes trucks within a terminal. The indicator measures the length of time that a truck takes from the time it enters a port terminal to the time it exits the port terminal. This measure does not include time a truck waits outside before it enters the gate of the port terminal.

Containers per truck

Count of containers divided by the number of trucks.

TEUs per truck

Count of TEUs divided by the number of trucks. TEUs per truck are a measure of truck efficiency; it encapsulates the 40ft/20 ft dimension difference and is consistent with other wharf related TEU measures. For example, suppose on a given day:

- 10 trucks each make a trip to the port terminal empty but leave the terminal with 2 TEUs; and
- 10 trucks each make a trip to the port terminal with 2 TEUs but leave the terminal empty.

Total TEUs moved = 40; total number of trucks = 20. So average TEUs per truck (for a two way (in and out) trip is 2.

Average container turnaround time (minutes)

This indicator measures the efficiency in the handling of an individual container at a port terminal in a seven day period. This measure includes more than just the time it takes to bring a container from the container storage yard and put it on a truck or take it from the truck. It is related to the truck turnaround time as follows:

> Container turnaround time = (Average truck turnaround time in a quarter) divided by (the average number of containers on a truck in a quarter).

In this definition, average truck turnaround time (TTT) in the quarter is a measure of the efficiency with which trucks are processed within a given terminal. The TTT indicator measures the length of time (in minutes) that a truck takes from the time it enters a port terminal to the time it exits the port terminal. The time spent at the gate is not included in this measure. It also does not include time spent in queuing outside the terminal gate.

Container turnaround time (CTT) measures the port's container tracking operations measured in minutes. CTT improves (that is, it goes down) if either the vehicle utilisation rates improves, implying that the number of containers per truck increases, or the port terminal is faster in processing each truck.

Rail – total containers

Stevedoring companies count containers moved by rail only when they are hauled to an 'on dock' rail siding. They do not count containers moved by rail to a 'near dock' rail siding. "On dock" refers to situations where the rail siding is on dock in a port terminal. Near dock' rail sidings are in the neighbourhood of the port terminal but not on the dock. The rail sidings in Brisbane, Fremantle, Adelaide and DP World, Melbourne are near dock. The only complete rail figures are for the Sydney, Port Botany Container Terminal which has an on-dock rail siding.

Time slots for the vehicle booking system

The data for the vehicle booking system (VBS) is presented in Table 1.1 standardised for the day, evening and night shifts at the container terminals at the five ports for the following days of the week: Monday to Friday, Saturday and Sunday. Table 1.1 shows both the number of timeslots made available and the number of slots used. The stevedores at the five port container terminals do not have the same day, evening and night shifts. Thus data has been adjusted to fit into the standardised work shifts shown in Table 1.1 for comparative purposes.

Number of vehicle booking system timeslots available

Stevedoring companies make available a number of vehicle booking slots per day per time zone, based on the deployment of container handling equipment. The major driver of the availability of VBS time slots is the volume of containers and terminal resources available to receive and deliver containers over a 24 hour period, seven days a week.

When shipping schedules permit and volumes demand extra resources, additional labour and extra equipment can be deployed to the landside of a port terminal and extra time slots can be provided. Generally, resources are reallocated in this way one or two days in advance. The VBS indicators measure the supply of VBS time slots at port terminals.

Adjusted vehicle booking system usage rates

The supply of vehicle booking system time slots is not constant across time at any of the port terminals. More slots are supplied during high demand periods. For a given quarter, the usage rates for say the night time slot is given by dividing the total slots used at night by the total number of slots available in the quarter. The usage rates add up to 100 percent for each quarter.

Table 1.1 Container terminal landside performance indicators

Port/Indicator	Sep-09	Dec-09	Mar-10	Jun-10	Sep-10	Dec-10	Mar-11	Jun-11
Five ports								
Road								
Total trucks [a]	440 753	499 009	457 146	464 317	518 147	511 283	508 681	521 833
Total containers [d]	794 784	878 923	814 180	823 382	918 910	919 562	836 995	881 600
Total TEUS [d]	1 160 132	1 298 126	1 186 355	1 196 169	1 350 251	1 364 386	1 273 253	1 321 308
Truck turnaround time – mins. [e]	34.2	34.2	31.6	33.6	34.1	33.9	32.9	33.7
Containers per truck [e]	1.8	1.8	1.8	1.8	1.8	1.8	1.6	1.7
Avge. container turnaround time – mins. [e]	22.4	23.7	21.9	24.4	24.8	24.6	23.0	23.3
TEUS per truck [e]	2.5	2.4	2.3	2.3	2.3	2.3	3.0	2.9
Rail								
Total containers (excl. Adel. and Frem.)	97 279	97 926	83 539	86 894	80 844	74 251	65 632	77 239
Number of VBS timeslots available								
Overall total	623 485	644 167	616 067	644 087	729 379	686 826	774 146	822 736
Monday–Friday								
Day (0600–1800)	372 604	365 315	351 597	360 739	391 169	362 971	430 037	432 753
Evening (1800–2400)	133 834	135 007	133 163	142 925	165 639	153 571	171 426	180 633
Night (2400–0600)	75 701	77 795	72 690	78 749	93 019	84 309	90 640	98 908
Sub total	582 139	578 117	557 450	582 413	649 827	600 851	692 103	712 294
Saturday								
Day (0600–1800)	19 498	29 929	25 629	26 888	33 298	30 836	40 283	52 677
Evening (1800–2400)	1 822	4 610	4 539	5 398	7 567	5 274	7 118	11 611
Night (2400–0600)	3 986	6 357	6 934	7 238	6 983	25 183	3 608	5 558
Sub total	25 306	40 896	37 102	39 524	47 848	61 293	51 009	69 846
Sunday								
Day (0600–1800)	4 638	11 950	10 004	10 614	13 780	9 654	13 134	18 103
Evening (1800–2400)	5 488	6 346	5 851	5 988	9 206	8 071	8 806	9 967
Night (2400–0600)	5 914	6 858	5 660	5 548	8 718	6 957	9 094	12 526
Sub total	16 040	25 154	21 515	22 150	31 704	24 682	31 034	40 596
Number of VBS timeslots used								
Overall total	559 740	588 221	554 371	579 833	669 521	636 024	725 346	777 949
Monday–Friday								
Day (0600–1800)	352 221	348 291	334 119	338 163	371 454	346 342	412 836	418 712
Evening (1800–2400)	109 347	120 255	116 194	123 927	150 031	138 509	155 249	167 905
Night (2400–0600)	68 685	72 096	66 739	73 852	87 486	78 209	85 186	92 513
Sub total	530 253	540 642	517 052	535 942	608 971	563 060	653 271	679 130
Saturday								
Day (0600–1800)	12 933	22 689	17 593	21 360	27 308	26 380	35 788	48 341
Evening (1800–2400)	1 317	2 258	1 467	2 578	3 993	3 118	6 152	9 636
Night (2400–0600)	3 711	4 422	4 179	4 130	3 930	23 625	3 326	5 275
Sub total	17 961	29 369	23 239	28 068	35 231	53 123	45 266	63 252
Sunday								
Day (0600–1800)	2 486	7 921	5 339	6 632	9 771	7 296	10 606	15 428
Evening (1800–2400)	3 944	4 433	3 949	4 377	7 860	7 191	8 229	9 511
Night (2400–0600)	5 096	5 856	4 792	4 814	7 688	5 354	7 974	10 628
Sub total	11 526	18 210	14 080	15 823	25 319	19 841	26 809	35 567

Table 1.1 Container terminal landside performance indicators (continued)

Port/Indicator	Sep-09	Dec-09	Mar-10	Jun-10	Sep-10	Dec-10	Mar-11	Jun-11
Brisbane								
Road								
Total trucks	66 754	74 285	62 273	62 914	67 310	64 609	55 415	64 298
Total containers [d]	132 151	143 580	126 845	131 037	148 269	150 381	130 904	144 516
TEUS [d]	190 140	211 979	184 328	188 537	216 527	222 496	190 582	213 228
Truck turnaround time – mins. [b e]	39.1	38.2	33.8	37.6	40.0	32.9	33.3	37.4
Containers per truck [e]	2.0	1.9	2.0	2.1	2.2	2.3	2.4	2.2
Avge. container turnaround time – mins. [e]	20.9	21.9	19.7	21.5	22.7	18.8	18.9	21.1
TEUS per truck [e]	2.6	2.5	2.4	2.4	2.5	2.5	2.5	2.6
Rail								
Total containers [c]	12 510	13 277	6 603	13 303	15 134	9 164	05 130	10 542
Number of VBS timeslots available								
Overall total	75 718	77 642	84 371	95 820	114 221	127 105	126 873	127 193
Monday–Friday								
Day (0600–1800)	53 588	55 317	57 733	62 148	69 894	73 486	80 055	77 950
Evening (1800–2400)	15 826	16 246	20 268	24 763	29 825	33 757	31 615	33 032
Night (2400–0600)	2 182	2 484	2 590	3 915	6 677	9 027	5 613	6 233
Sub total	71 596	74 047	80 591	90 826	106 396	116 270	117 283	117 215
Saturday								
Day (0600–1800)	3 063	3 100	3 233	4 191	5 762	6 781	5 951	7 052
Evening (1800–2400)	0	0	38	286	439	440	525	435
Night (2400–0600)	0	0	0	0	0	0	0	0
Sub total	3 063	3 100	3 271	4 477	6 201	7 221	6 476	7 487
Sunday								
Day (0600–1800)								
Evening (1800–2400)	134	0	0	4	300	1 660	1157	538
Night (2400–0600)	541	459	509	511	737	637	908	506
Sub total	1 059	495	509	517	1 624	3 614	3114	2491
Number of VBS timeslots used								
Overall total	67 591	73 709	78 553	91 681	111 183	123 582	124 060	124 814
Monday–Friday								
Day (0600–1800)	50 512	53 777	55 771	60 005	68 414	71 917	78 856	76 710
Evening (1800–2400)	13 605	15 415	18 408	23 555	28 850	32 600	30 510	32 170
Night (2400–0600)	1 998	2 447	2 372	3 779	6 385	8 552	5 474	6 135
Sub total	66 115	71 639	76 551	87 339	103 649	113 070	114 840	115 015
Saturday								
Day (0600–1800)	850	1 622	1 519	3 582	5 513	6 538	5 652	6 904
Evening (1800–2400)	0	0	38	281	418	406	516	425
Night (2400–0600)	0	0	0	0	0	0	0	0
Sub total	850	1 622	1 557	3 863	5 931	6 944	6 168	7 329
Sunday								
Day (0600–1800)	103	36	0	2	580	1 310	1049	1447
Evening (1800–2400)	35	0	0	4	294	1 632	1137	522
Night (2400–0600)	488	412	445	473	729	626	866	501
Sub total	626	448	445	479	1 603	3 568	3052	2470

Table 1.1 Container terminal landside performance indicators (continued)

Port/Indicator	Sep-09	Dec-09	Mar-10	Jun-10	Sep-10	Dec-10	Mar-11	Jun-11
Sydney								
Road								
Total trucks	123 163	144 586	127 177	129 819	151 258	143 299	178 232	180 096
Total containers [d]	218 899	257 143	226 630	234 419	277 830	270 147	242 479	262 387
TEUS [d]	332 314	394 624	340 033	352 014	417 430	410 619	412 505	418 370
Truck turnaround time – mins. [e]	45.5	44.7	38.8	46.2	43.2	45.5	40.1	35.6
Containers per truck [e]	1.8	1.8	1.8	1.8	1.8	1.9	1.4	1.5
Avge. container turnaround time – mins. [e]	35.0	36.6	32.4	40.3	37.1	39.1	35.6	31.1
TEUS per truck [e]	2.4	2.3	2.3	2.3	2.2	2.2	4.3	4.1
Rail								
Total containers	63 498	62 900	56 772	53 938	50 752	49 699	48 872	49 768
Number of VBS timeslots available								
Overall total	164 745	181 402	166 464	178 200	201 727	155 426	241 417	267 581
Monday–Friday								
Day (0600–1800)	83 894	80 086	73 345	76 337	84 784	59 477	115 533	119 576
Evening (1800–2400)	34 100	36 182	31 969	34 874	40 490	27 227	46 951	50 955
Night (2400–0600)	30 075	31 027	28 593	30 399	34 821	23 981	38 959	43 169
Sub total	148 069	147 295	133 907	141 610	160 095	110 685	201 443	213 700
Saturday								
Day (0600–1800)	5 760	10 299	9 277	11 102	12 338	8 447	16 582	21 747
Evening (1800–2400)	8	2 642	3 102	3 392	3 473	1 525	3 899	5 720
Night (2400–0600)	1 658	4 566	4 372	5 540	5 478	23 701	2 272	3 529
Sub total	7 426	17 507	16 751	20 034	21 289	33 673	22 753	30 996
Sunday								
Day (0600–1800)	2 566	9 286	8 335	8 840	10 479	5 554	8 226	11 081
Evening (1800–2400)	3 877	4 378	4 453	4 680	6 302	3 740	4 901	5 873
Night (2400–0600)	2 807	2 936	3 018	3 036	3 562	1 774	4 094	5 931
Sub total	9 250	16 600	15 806	16 556	20 343	11 068	17 221	22 885
Number of VBS timeslots used								
Overall total	154 169	163 483	144 661	157 595	181 944	142 674	226 219	251 568
Monday–Friday								
Day (0600–1800)	81 772	77 442	69 502	71 372	80 702	56 109	110 642	115 042
Evening (1800–2400)	30 802	34 499	30 445	32 426	38 179	25 393	45 090	49 178
Night (2400–0600)	27 479	29 201	25 867	29 000	33 390	22 413	36 064	39 830
Sub total	140 052	141 141	125 815	132 797	152 272	103 914	191 796	204 050
Saturday								
Day (0600–1800)	5 347	7 872	6 256	9 091	10 009	7 095	14 601	19 773
Evening (1800–2400)	5	305	253	1 052	903	261	2 917	4 692
Night (2400–0600)	1 615	2 714	1 821	2 775	2 452	22 354	2 051	3 022
Sub total	6 967	10 891	8 330	12 918	13 364	29 710	19 569	27 487
Sunday								
Day (0600–1800)	1 868	6 170	4 924	5 998	7 669	4 336	6 757	9 448
Evening (1800–2400)	2 630	2 746	2 836	3 253	5 155	3 121	4 542	5 602
Night (2400–0600)	2 652	2 535	2 756	2 629	3 484	1 593	3 555	4 981
Sub total	7 150	11 451	10 516	11 880	16 308	9 050	14 854	20 031

Table 1.1 Container terminal landside performance indicators (continued)

Port/Indicator	Sep-09	Dec-09	Mar-10	Jun-10	Sep-10	Dec-10	Mar-11	Jun-11
Melbourne								
Road								
Total trucks [a]	181 341	203 071	195 108	201 035	220 245	221 538	199 857	200 625
Total containers	320 448	340 029	330 962	333 414	350 740	348 268	321 755	336 289
Total TEUS	460 103	492 353	476 200	479 041	511 430	512 081	467 319	489 840
Truck turnaround time – mins.	26.6	26.2	27.2	25.7	25.9	25.9	25.4	31.0
Containers per truck	1.8	1.7	1.7	1.7	1.6	1.6	1.6	1.7
Avge. container turnaround time – mins.	16.0	16.4	17.0	16.3	16.9	16.8	16.4	19.7
TEUS per truck	2.5	2.4	2.4	2.4	2.4	2.4	2.4	2.4
Rail								
Total containers [c]	21 271	21 749	20 164	19 653	14 958	15 388	11 630	16 929
Number of VBS timeslots available								
Overall total	257 447	259 023	243 045	245 377	279 323	267 200	265 130	285 647
Monday–Friday								
Day (0600–1800)	147 206	139 652	132 102	135 286	145 068	138 168	137 041	139 390
Evening (1800–2400)	48 147	49 635	48 128	47 758	56 157	53 336	54 104	56 979
Night (2400–0600)	42 030	43 281	41 171	43 331	49 505	47 941	44 600	47 900
Sub total	237 383	232 568	221 401	226 375	250 730	239 445	235 745	244 269
Saturday								
Day (0600–1800)	10 191	14 673	12 483	10 608	13 843	13 150	14 656	18 998
Evening (1800–2400)	1 814	1 968	1 399	1 720	3 655	3 309	2 694	5 251
Night (2400–0600)	2 328	1 791	2 562	1 698	1 505	1 482	1 336	2 029
Sub total	14 333	18 432	16 444	14 026	19 003	17 941	18 686	26 278
Sunday								
Day (0600–1800)	1 688	2 592	1 669	1 770	2 707	2 782	3 859	5 570
Evening (1800–2400)	1 477	1 968	1 398	1 270	2 522	2 577	2 748	3 502
Night (2400–0600)	2 566	3 463	2 133	1 936	4 361	4 455	4 092	6 028
Sub total	5 731	8 023	5 200	4 976	9 590	9 814	10 699	15 100
Number of VBS timeslots used								
Overall total	235 683	239 286	223 685	226 025	256 836	245 313	251 948	269 388
Monday–Friday								
Day (0600–1800)	138 390	132 104	125 420	128 080	136 825	131 423	133 935	136 211
Evening (1800–2400)	45 489	46 950	44 560	44 788	53 692	50 296	52 858	55 957
Night (2400–0600)	38 609	39 898	38 171	40 005	45 850	44 109	42 205	44 965
Sub total	222 489	218 953	208 152	212 874	236 367	225 827	228 998	237 133
Saturday								
Day (0600–1800)	6 551	12 077	9 295	7 817	10 573	10 322	12 853	17 266
Evening (1800–2400)	1 312	1 953	1 176	1 245	2 672	2 451	2 719	4 318
Night (2400–0600)	2 096	1 708	2 358	1 355	1 478	1 271	1 275	2 253
Sub total	9 959	15 738	12 829	10 417	14 723	14 044	16 847	23 837
Sunday								
Day (0600–1800)								
Evening (1800–2400)	1 279	1 687	1 113	1 087	2 329	2 307	2 550	3 333
Night (2400–0600)	1 956	2 909	1 591	1 647	3 417	3 135	3 553	5 085
Sub total	3 235	4 596	2 704	2 734	5 746	5 442	6 103	8 418

Table 1.1 Container terminal landside performance indicators (continued)

Port/Indicator	Sep-09	Dec-09	Mar-10	Jun-10	Sep-10	Dec-10	Mar-11	Jun-11
Adelaide								
Road								
Total trucks	19 754	19 924	20 230	20 409	24 930	25 134	23 798	25 762
Total containers [d]	30 697	32 029	30 692	31 061	38 691	39 837	38 642	40 105
TEUS [d]	42 709	44 621	41 719	42 222	52 939	55 295	52 542	55 827
Truck turnaround time – mins. [e]	32.8	34.2	28.3	28.6	32.5	41.4	31.8	26.9
Containers per truck [e]	1.6	1.6	1.5	1.5	1.6	1.6	1.6	1.6
Avge. container turnaround time – mins. [e]	21.1	21.3	18.6	18.8	20.9	26.1	19.6	17.3
TEUS per truck [e]	2.2	2.2	2.1	2.1	2.1	2.2	2.2	2.2
Rail								
Total containers	na	na	na	na	na	na	na	na
Number of VBS timeslots available								
Overall total	40 738	39 156	37 869	38 008	41 587	39 523	37 869	42 107
Monday–Friday								
Day (0700–1400)	23 869	23 491	22 324	22 355	24 542	23 523	22 324	24 896
Evening (1400–2200)	16 869	15 665	15 545	15 653	17 045	16 000	15 545	17 211
Night (2200–0700)	0	0	0	0	0	0	0	0
Sub total	40 738	39 156	37 869	38 008	41 587	39 523	37 869	42 107
Number of VBS timeslots used								
Overall total	27 541	28 797	27 400	27 490	33 891	34 232	27 400	34 885
Monday–Friday								
Day (0700–1400)	19 847	20 017	18 931	19 371	22 812	22 629	18 931	22 972
Evening (1400–2200)	7 694	8 780	8 469	8 119	11 079	11 603	8 469	11 913
Night (2200–0700)	0	0	0	0	0	0	0	0
Sub total	27 541	28 797	27 400	27 490	33 891	34 232	27 400	34 885

Table 1.1 Container terminal landside performance indicators (continued)

Port/Indicator	Sep-09	Dec-09	Mar-10	Jun-10	Sep-10	Dec-10	Mar-11	Jun-11
Fremantle								
Road								
Total trucks	49 741	57 143	52 358	50 140	54 404	56 703	51 379	51 052
Total containers [d]	92 589	106 142	99 051	93 451	103 380	110 929	103 215	98 303
TEUS [d]	134 866	154 550	144 075	134 355	151 925	163 895	150 306	144 043
Truck turnaround time – mins. [e]	28.3	30.7	29.2	31.9	37.3	34.6	33.8	34.6
Containers per truck [e]	1.9	1.9	1.9	1.9	1.9	2.0	2.0	1.9
Avge. container turnaround time – mins. [e]	17.2	19.1	18.2	19.7	23.1	21.1	20.4	20.7
TEUS per truck [e]	2.4	2.3	2.3	2.3	2.4	2.4	2.4	2.4
Rail								
Total containers	na	na	na	na	na	na	na	na
Number of VBS timeslots available								
Overall total	84 837	86 944	84 318	86 682	92 521	97 572	102 857	100 208
Monday–Friday								
Day (0600–1800)	64 047	66 769	66 093	64 613	66 881	68 317	75 084	70 941
Evening (1800–2400)	18 892	17 279	17 253	19 877	22 122	23 251	23 211	22 456
Night (2400–0600)	1 414	1 003	336	1 104	2 016	3 360	1 468	1 606
Sub total	84 353	85 051	83 682	85 594	91 019	94 928	99 763	95 003
Saturday								
Day (0600–1800)	484	1 857	636	987	1 355	2 458	3094	4880
Evening (1800–2400)	0	0	0	0	0	0	0	205
Night (2400–0600)	0	0	0	0	0	0	0	0
Sub total	484	1 857	636	987	1 355	2 458	3094	5085
Sunday								
Day (0600–1800)	0	36	0	2	7	1	0	5
Evening (1800–2400)	0	0	0	34	82	94	0	54
Night (2400–0600)	0	0	0	65	58	91	0	61
Sub total	0	36	0	101	147	186	0	120
Number of VBS timeslots used								
Overall total	73 642	80 717	79 329	75 280	82 233	85 493	91 476	90 921
Monday–Friday								
Day (0600–1800)	61 700	64 952	64 495	59 336	62 700	64 264	70 472	67 777
Evening (1800–2400)	11 757	14 611	14 311	15 039	18 231	18 617	18 322	18 687
Night (2400–0600)	0	0	0	0	0	0	0	0
Sub total	73 457	79 563	78 806	74 375	80 931	82 882	88 794	86 464
Saturday								
Day (0600–1800)	185	1 118	523	870	1 213	2 425	2682	4398
Evening (1800–2400)	0	0	0	0	0	0	0	0
Night (2400–0600)	0	0	0	0	0	0	0	0
Sub total	185	1 118	523	870	1 213	2 425	2682	4398
Sunday								
Day (0600–1800)	0	36	0	2	7	55	0	5
Evening (1800–2400)	0	0	0	33	82	131	0	54
Night (2400–0600)	0	0	0	0	0	0	0	0
Sub total	0	36	0	35	89	186	0	59

Notes to table 1.1

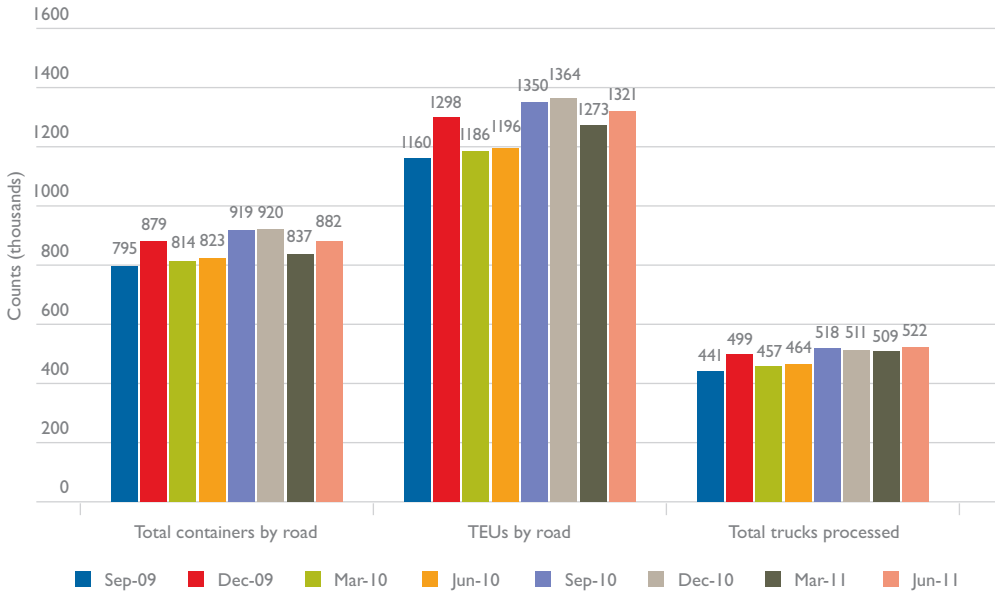
na	not available
VBS	stands for vehicle booking system.
a.	For Sydney, Brisbane, Adelaide and Fremantle, only trucks participating in VBS system are reported. For Melbourne, trucks working in bulk runs are reported and added to totals.
b.	Truck turnaround time in Brisbane includes some truck waiting time outside the terminal gate.
c.	This data is incomplete because stevedores do not collect all rail data.
d.	Contains both VBS and bulk runs.
e.	Based on VBS couns only.

Note:

1. The figures for total containers, total trucks, containers per truck, teus and teus per truck contain bulk runs.
2. Day, evening and night time slots have been standardised for comparative purposes.
   Start and cut-off times for shifts differ between stevedoring companies and between ports represent overall practice.
3. Stevedoring companies count containers moved by rail only when they are hauled to an 'on dock' rail siding.
   They do not count containers moved by rail to a 'near dock' rail siding.
   "On dock" refers to situations where the rail siding is on dock in a port terminal.
   'Near dock' rail sidings are in the neighbourhood of the port terminal but not on the dock.
   The rail sidings in Brisbane, Fremantle, Adelaide and DP World, Melbourne are near dock.
   The only complete rail figures are for the Sydney, Port Botany Container Terminal which has an on-dock rail siding.
4. The concepts used in compiling these indicators are defined in the explanatory notes.
5. All terminals are open Monday–Friday. Only Adelaide is not open on Saturday or Sunday.

Sources: Patrick, DP World.

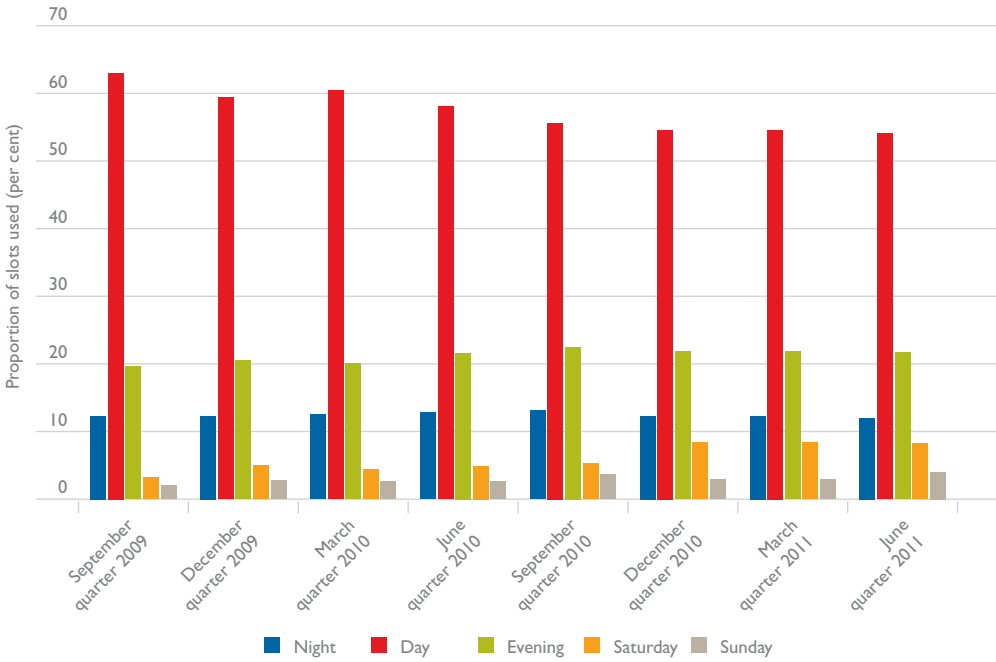
Figure 1.1 Five ports: landside of container terminal size of task indicators



Note : 1. The counts of containers by road, TEUs by road and trucks processed include operations under the vehicle booking system and bulk runs.
2. For Sydney BITRE estimates for Dec. quarter 2010 were used, as one of the stevedores landside data was not provided from the 7th Nov. to 31 Dec. 2010 due to computer problems.

Sources: Patrick and DP World.

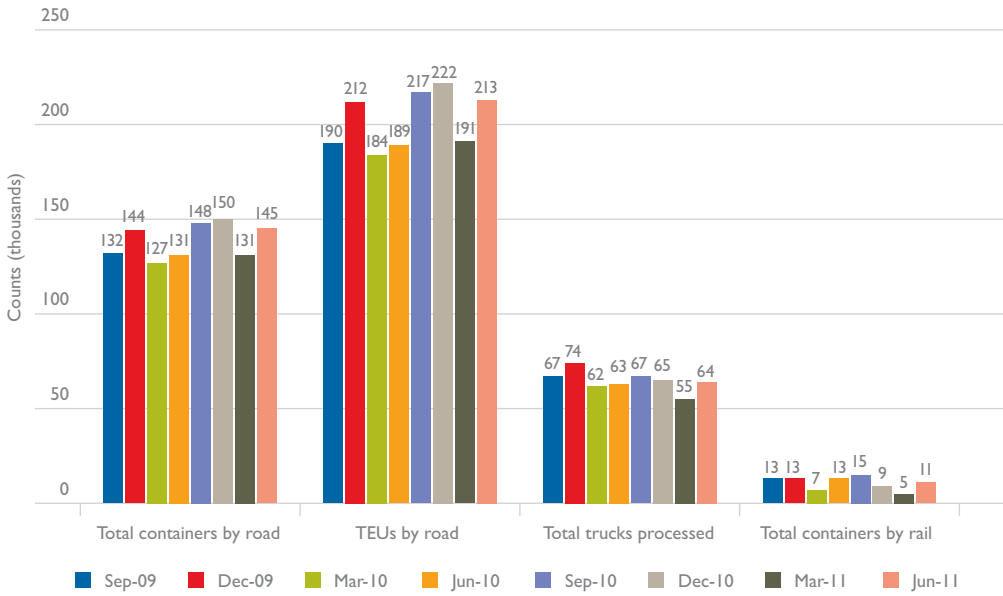
Figure 1.2 Five ports: adjusted vehicle booking system usage



Note: 1. The definitions of the time windows are as follows: Night (2400–0600 Monday to Friday), Day (0600–1800 Monday to Friday) and Evening (1800–2400 Monday to Friday).
2. For Sydney BITRE estimates for Dec. quarter 2010 were used, as one of the stevedores landside data was not provided from the 7th Nov. to 31 Dec. 2010 due to computer problems.

Sources: Patrick and DP World.

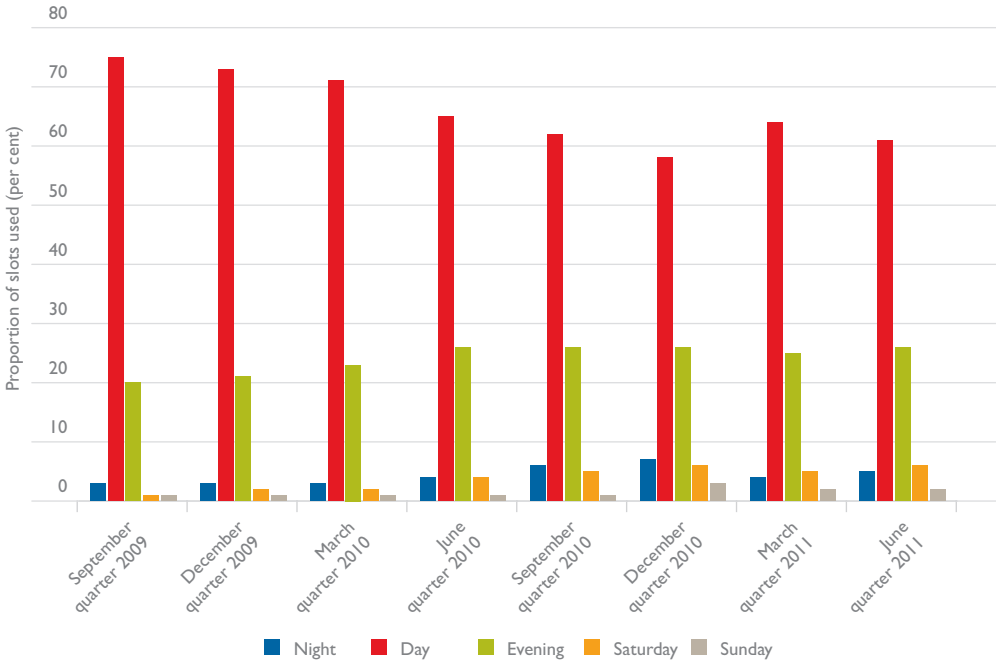
Figure 1.3 Brisbane: landside of container terminal size of task indicators



Note: 1. The counts of containers by road, TEUs by road and trucks processed include operations under the vehicle booking system and bulk runs.

Sources: Patrick and DP World.

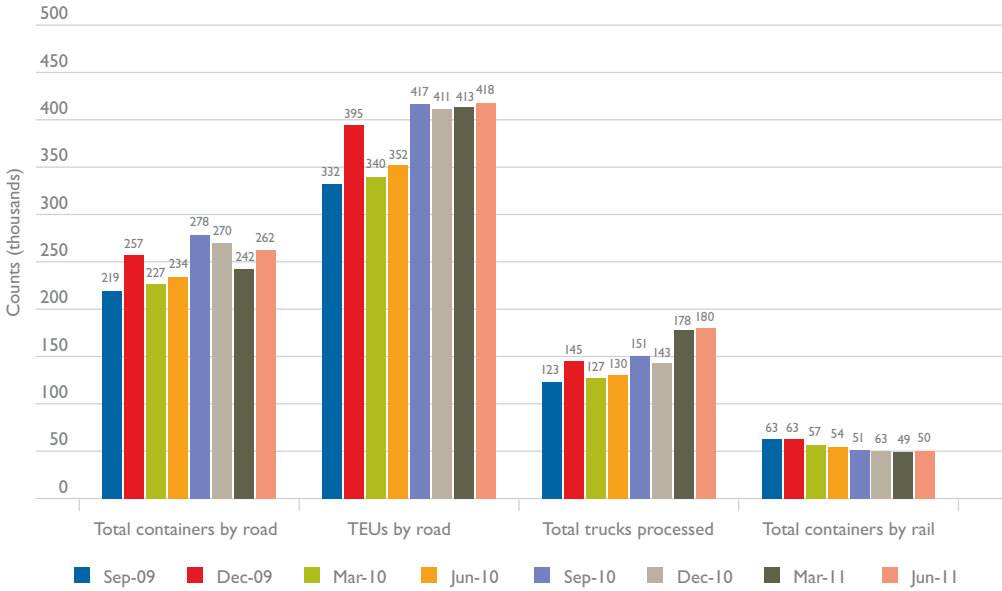
Figure 1.4 Brisbane: adjusted vehicle booking system usage



Note: The definitions of the time windows are as follows: Night (2400–0600 Monday to Friday), Day (0600–1800 Monday to Friday) and Evening (1800–2400 Monday to Friday).

Sources: Patrick and DP World.

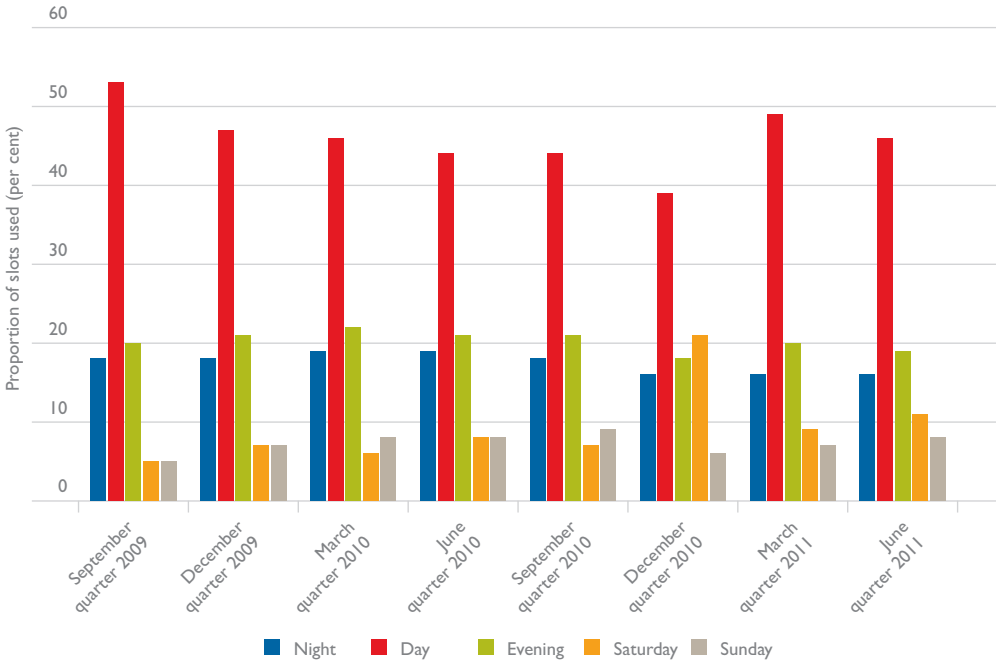
Figure 1.5 Sydney: landside of container terminal size of task indicators



Note: 1. The counts of containers by road, TEUs by road and trucks processed include operations under the vehicle booking system and bulk runs.
2. For Sydney BITRE estimates for Dec. quarter 2010 were used, as one of the stevedores landside data was not provided from the 7th Nov. to 31 Dec. 2010 due to computer problems.

Sources: Patrick and DP World.

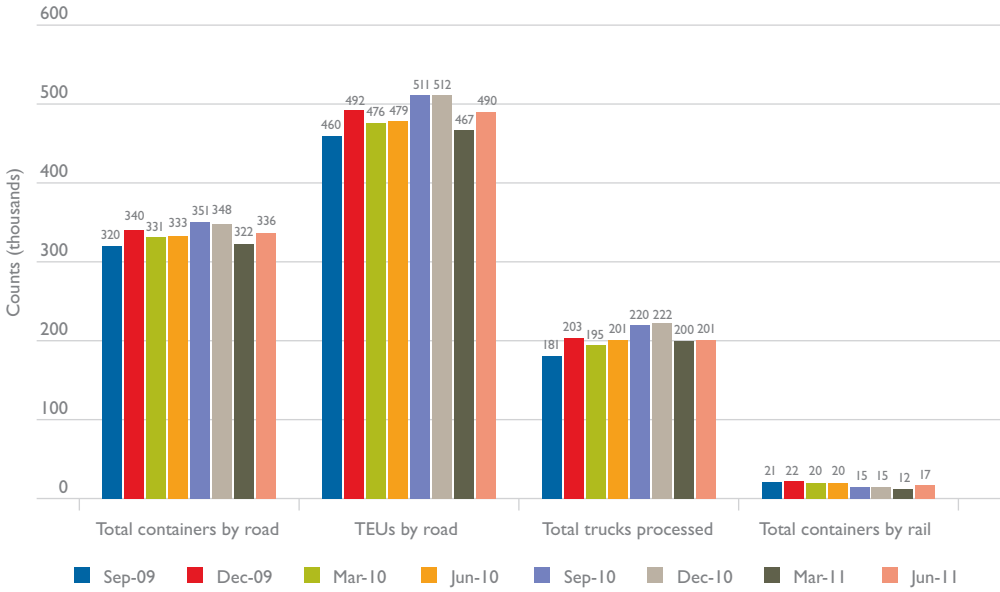
Figure 1.6 Sydney: adjusted vehicle booking system usage



Note: 1. The definitions of the time windows are as follows: Night (2400–0600 Monday to Friday), Day (0600–1800 Monday to Friday) and Evening (1800–2400 Monday to Friday).
2. For Sydney BITRE estimates for Dec. quarter 2010 were used, as one of the stevedores landside data was not provided from the 7th Nov. to 31 Dec. 2010 due to computer problems.

Sources: Patrick and DP World.

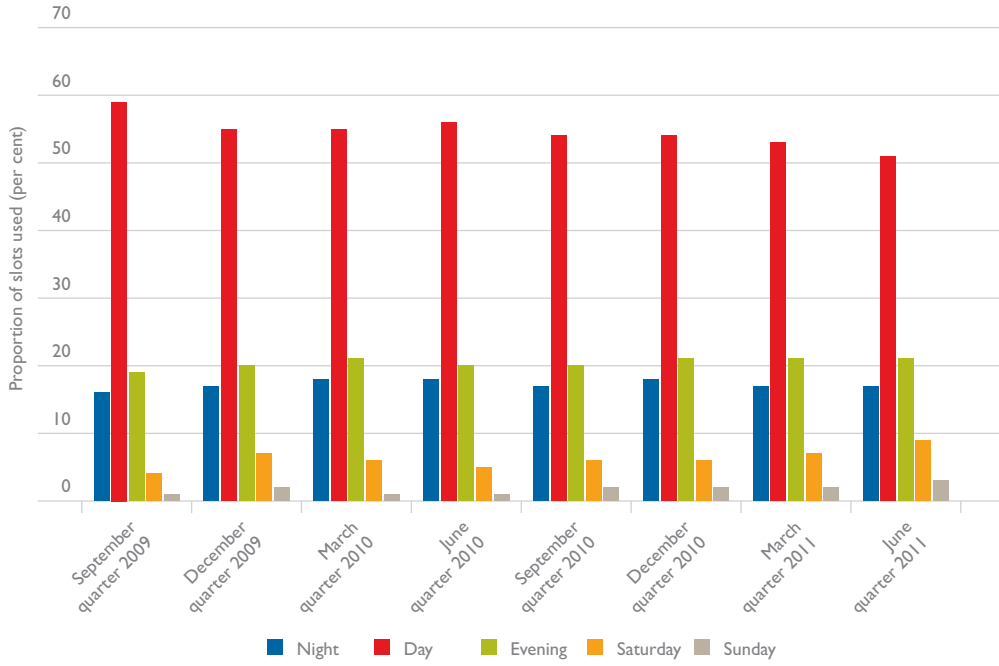
Figure 1.7 Melbourne: landside of container terminal size of task indicators



Note: The counts of containers by road, TEUs by road and trucks processed include operations under the vehicle booking system and bulk runs.

Source: Patrick and DP World.

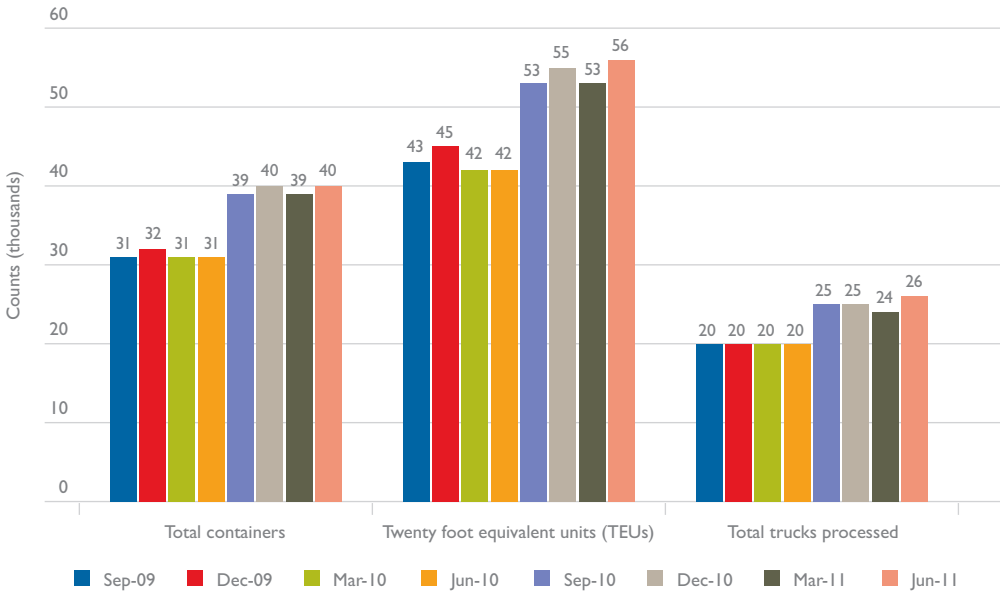
Figure 1.8 Melbourne: adjusted vehicle booking system usage



Note: The definitions of the time windows are as follows: Night (2400–0600 Monday to Friday), Day (0600–1800 Monday to Friday) and Evening (1800–2400 Monday to Friday).

Sources: Patrick and DP World.

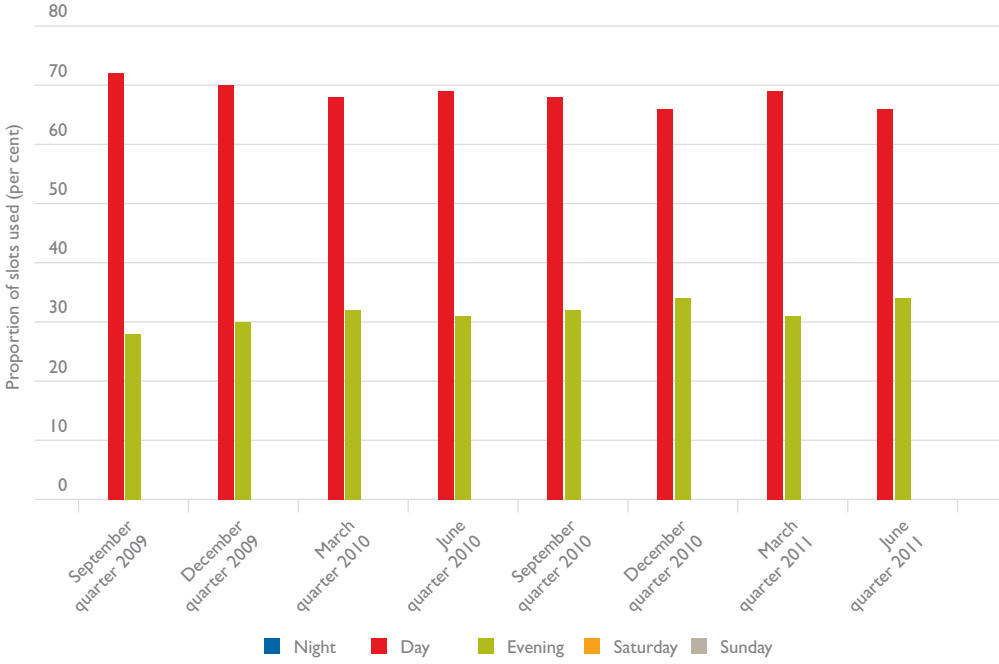
Figure 1.9 Adelaide: landside of container terminal size of task indicators



Note: The counts of containers by road, TEUs by road and trucks processed include operations under the vehicle booking system and bulk runs.

Sources: Patrick and DP World.

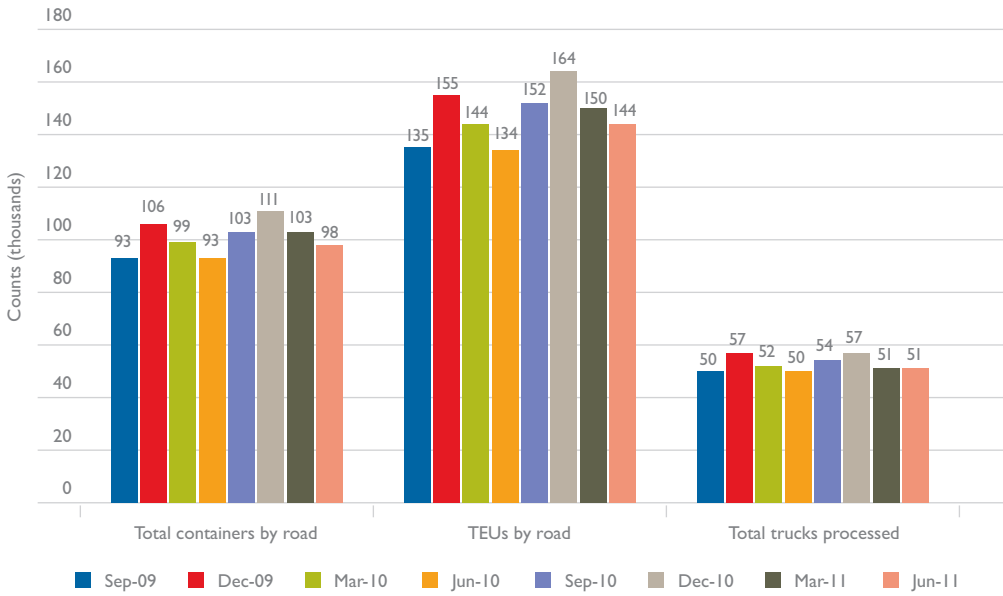
Figure 1.10 Adelaide: adjusted vehicle booking system usage



Note: The definitions of the time windows are as follows: Night (2400–0600 Monday to Friday), Day (0600–1800 Monday to Friday) and Evening (1800–2400 Monday to Friday).

Sources: Patrick and DP World.

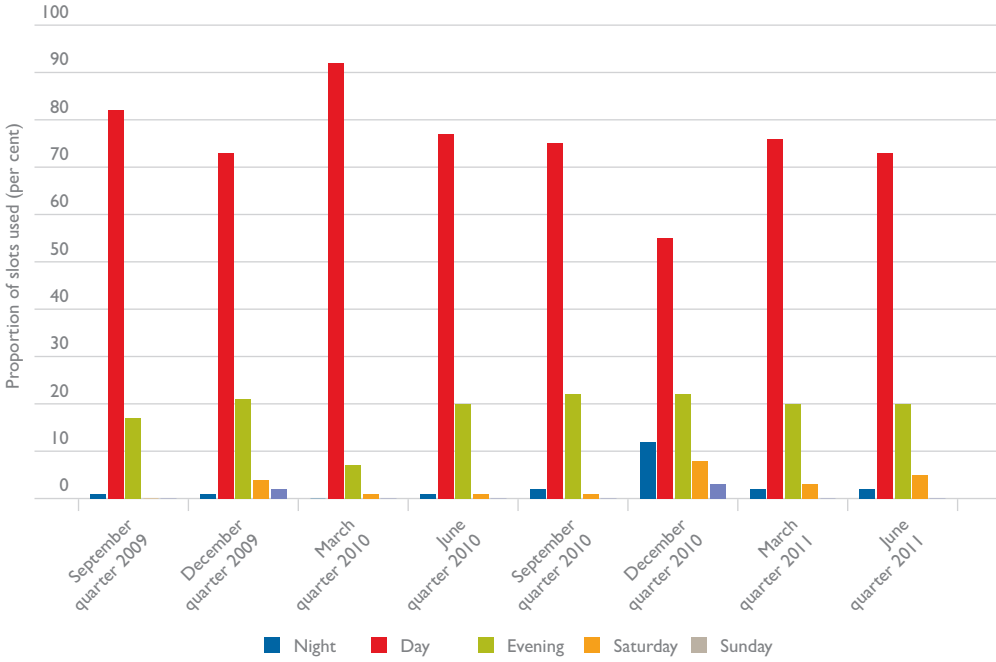
Figure 1.11 Fremantle: landside of container terminal size of task indicators



Note: The counts of containers by road, TEUs by road and trucks processed include operations under the vehicle booking system and bulk runs.

Sources: Patrick and DP World.

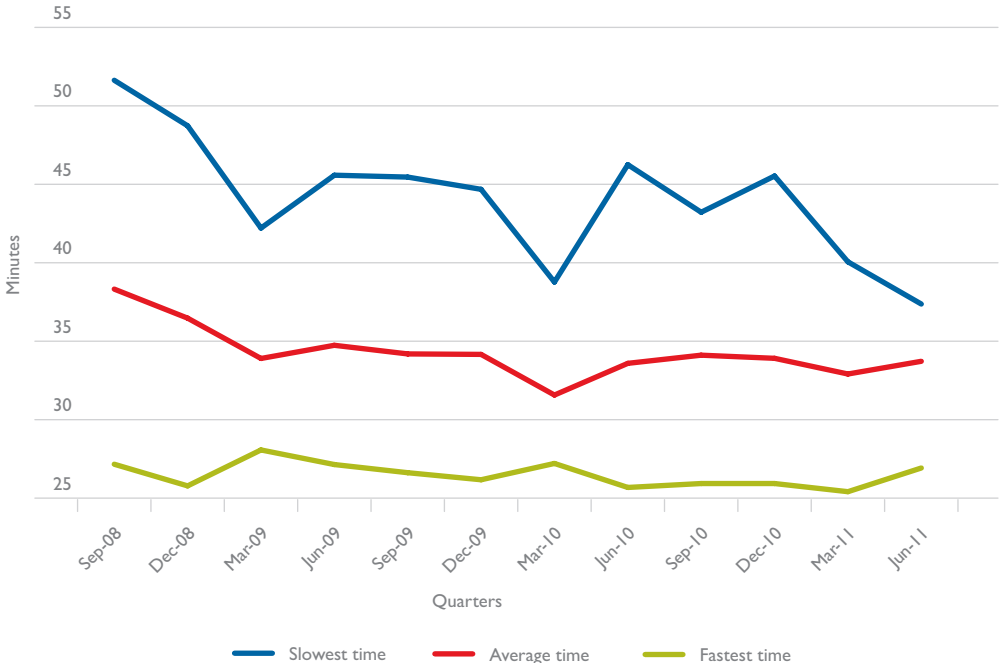
Figure 1.12 Fremantle: adjusted vehicle booking system usage



Note: The definitions of the time windows are as follows: Night (2400–0600 Monday to Friday), Day (0600–1800 Monday to Friday) and Evening (1800–2400 Monday to Friday).

Sources: Patrick and DP World.

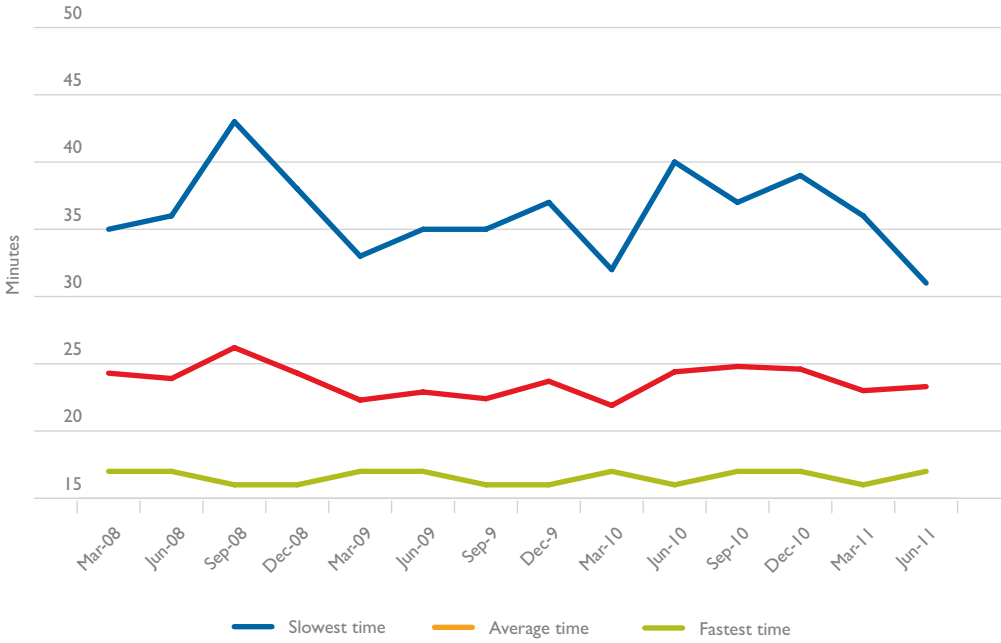
Figure 1.13 Productivity in terms of truck turnaround – five ports: fastest, average and slowest rates achieved



Note: The upper and lower limit correspond to different port terminals in the various quarters.

Sources: Patrick and DP World.

Figure 1.14 Productivity in terms of container turnaround – five ports: fastest, average and slowest rates achieved



Note: The fastest and slowest rates correspond to different port terminals in the various quarters.
Sources: Patrick and DP World.

CHAPTER 2
Stevedoring productivity

Overview

Stevedoring productivity in this chapter refers to the productivity of moving containers from the ship to the wharf by the stevedoring companies at the five major city ports in Australia. These measures of productivity are the crane rate, the vessel working rate and the ship rate. The crane rate is the number of containers a dockside crane operator lifts on or off a container ship in an hour. The vessel working rate is a measure of the productivity of the stevedores on board a container ship in loading and unloading containers. The ship rate is the rate at which a ship is unloaded.

Stevedoring productivity indicators are presented in Table 2.1 Table 2.2 and Figures 2.1 to Figure 2.8. The notes below provide explanation of the concepts being measured, the scope of the measurement and highlights any qualifications that should be borne in mind by users of the data. The variables are discussed in the order they appear in Table 2.1.

The three measures look at different aspects of this productivity, although all are measured in containers per hour:

The *crane rate* is the number of containers a dockside crane lifts on or off a container ship in an hour (this is a measure of the productivity of capital – how many containers a crane moves in an hour).

The *vessel working rate* is the number of containers the stevedores on board a container ship move in loading and unloading a ship divided by the amount of labour time (this is a measure of the productivity of labour – how many containers a person moves in an hour).

The *ship rate* is the rate at which a ship is unloaded (this is estimated as the product of the crane rate and the number of cranes working a vessel – how many containers are moved on or off a ship in an hour).

All measures exclude periods when work stops (for instance because of bad weather) from the hours counted. The measures can be expressed as either containers per hour or a standardised measure of Twenty-foot Equivalent Units (TEUs) an hour.

Explanatory notes

Five ports

Data under this heading relate to simple sums of, or other form of aggregation of data for the five capital city port terminals: Brisbane, Sydney, Melbourne, Adelaide and Fremantle.

Container terminal

The movement of containers from the container vessel takes place on to a wharf or pier known as a container terminal. Unlike a traditional wharf, a container terminal needs a large area adjoining the wharf for storing unloaded containers. The containers are placed in stacks of two, three or more and are kept there until they are moved away from the terminal by truck or train. While in the terminal the containers are the responsibility of a stevedoring company.

Stevedoring

The term stevedore can refer to a company which manages the operation of loading or unloading a ship. In Australia the people who work on the waterfront are referred to as waterside workers or stevedores. A stevedoring company typically owns equipment used in the loading or discharge operation and hires labour for that purpose. A stevedoring company also may contract with a terminal owner to manage all terminal operations. Many large container ship operators have established in-house stevedoring operations to handle cargo at their own terminals and to provide stevedoring services to other container carriers. In Australia, the two major stevedoring companies are Toll/Patrick and PO Ports/Dubai Ports World.

Ships handled

Only fully cellular ships used as such are included in calculations. Fully cellular ships are defined as purpose built container ships equipped with 40-foot cell guides below deck as a minimum. Such vessels are excluded if used for mixed cargoes of containers and general cargo.

Total containers handled

This is the total number of containers lifted on/off fully cellular ships in a given period. They should not be confused with TEUs. "Twenty foot equivalent units" is universally recognised as a measure of containers which aggregates both twenty foot and forty foot containers into twenty foot units for statistical purposes. Counts include transhipped containers and thus total container count on the wharf-side tends to be more than those on the landside of the container terminal.

TEUs Handled

The total 40-foot containers lifted on/off fully cellular ships multiplied by 2, plus the total 20-foot containers lifted on/off fully cellular ships. Counts include transhipped containers and thus total container count on the wharf-side tends to be more than those on the landside of the container terminal. Table 2.2 presents the stevedoring productivity indicators in terms of TEUs per hour. These are not directly comparable with the data in Table 2.1 because indicators based on TEUs per hour are affected by changes in the mix of 20-foot and 40-foot containers from one period to the next.

40 foot containers (per cent)

This is the number of 40 foot containers as a percentage of total containers handled. The higher this indicator is, the larger the degree to which productivity measured as TEUs per hour, overstates the actual productivity. With TEUs per hour used as the measure one container lift becomes two lifts. This is why the table which tabulates containers in TEUs should not be used for measuring productivity.

Crane rate (containers per hour)

This indicator measures the productivity of capital at a port terminal. This is the total containers handled divided by the elapsed crane time (defined below).

Elapsed Crane Time

This is defined as the total allocated crane hours, less operational and non-operational delays. This is the total allocated crane hours, assuming that the vessel is ready for working, less the following operational and non-operational delays:

- No labour allocated
- Closed-port holiday
- Port-wide industrial stoppage
- Total crane time spent handling break-bulk cargo and containers that require manual intervention, e.g. use of wires, chains, non-rigid spreaders or other handling gear
- Award or enterprise agreement breaks as applicable
- Adverse weather
- Delays caused by the ship or its agent
- All breakdowns, including spreader changes
- Other equipment breakdowns which stop crane operations
- Booming up for passing ships
- Handling hatch covers
- Cage work and lashing/unlashing where crane operations are affected
- Crane long-travelling between hatches and crossing accommodation

- Labour withdrawn without operator's agreement including enterprise agreement related industrial stoppages
- Over-dimensional containers requiring additional (rigid) spreader
- Spreader changes
- Waiting for export cargo
- Defective ship's gear (e.g. jammed twist-locks, broken cell guides, ballast pumps unable to maintain list/trim, etc.).

Crane time not worked (percent)

This is the time when a crane could not be used for any reason (operational or non-operational) as a percentage of the total time allocated to a crane.

Vessel working rate (containers per hour)

This indicator measures labour productivity at a port terminal and is computed as the total containers handled divided by the elapsed labour time (in hours), defined below. Sometimes the vessel working rate is referred to as the 'elapsed labour rate'.

Elapsed Labour Time

This is the elapsed time between labour first boarding the ship and labour last leaving the ship, less the following non-operational delays:

- No labour allocated to ship
- Closed-port holiday
- Port-wide industrial stoppage
- Break bulk and containers that require manual interventions, e.g. use of wires, chains, non-rigid spreaders or other handling gear.

For a given worker, the elapsed labour time is estimated as the difference between the time when workers first board the ship and the time when they last leave the ship, less the time when the workers have not worked for whatever reason.

Ship rate (containers per hour)

This measures the combined stevedoring productivity of capital and labour. It gives the stevedoring productivity per ship while the ship is being worked. It is computed as the product of the net crane rate and the crane intensity, defined below.

Crane Intensity

Crane intensity is the total number allocated crane hours, divided by the elapsed labour time.

Throughput pbm (tonnes per berth area expressed in square metres)

This is the quantity of container and non-container cargo which passes through the port container terminals and is measured in tonnes per berth's area in square metres. It is a measure of the density of the storage system and reflects the ability of the terminal container storage area to transfer containers from ship to shore and vice versa.

Table 2.1 Container terminal performance indicators: productivity in containers per hour

Port / Indicator	Jun-08	Sep-08	Dec-08	Mar-09	Jun-09	Sep-09	Dec-09	Mar-10	Jun-10	Sep-10	Dec-10	Mar-11	Jun-11
Five ports													
Ships handled	1 156	1 156	1073	927	925	932	940	878	880	971	1003	959	963
Total containers	977 870	1 043 867	1 036 375	833 663	853 558	933 578	1 037 498	933 580	958 584	1048 214	1061 560	961 423	998 301
Crane rate	27.5	27.5	27.5	28.9	29.8	29.9	29.5	29.0	28.7	29.1	29.4	29.9	28.2
Vessel working rate	39.1	38.6	40.7	38.9	39.4	41.7	42.2	42.2	40.6	41.7	41.8	42.6	39.4
Crane time not worked (per cent)	19.8	20.8	18.1	19.9	18.9	20.2	19.8	18.9	19.5	19.9	20.4	20.1	20.5
40-foot containers (per cent)	42.7	44.7	44.8	43.7	42.0	46.2	47.9	46.0	45.3	46.6	46.7	46.5	47.0
Ship rate	48.7	48.8	49.6	48.6	48.5	52.2	52.6	52.0	50.4	52.1	52.5	53.3	49.6
Throughput pbm	137	146	145	117	120	131	145	131	134	147	149	135	140
Brisbane													
Ships handled	255	243	231	199	191	188	202	182	181	214	208	197	202
Total containers	162 475	172 604	171 674	138 155	137 896	152 392	168 978	141 210	155 133	169 162	172 728	146 382	164 176
Crane rate	23.1	25.2	23.8	26.0	26.9	27.2	27.6	27.3	28.8	30.9	31.8	32.0	30.9
Vessel working rate	28.5	32.5	31.4	30.8	30.8	33.3	34.7	35.6	38.7	38.5	39.8	39.4	38.9
Crane time not worked (per cent)	21.3	20.0	17.6	18.9	21.2	22.5	22.5	21.8	18.8	19.6	19.1	20.9	20.6
40-foot containers (per cent)	43.1	44.5	44.6	43.1	43.4	47.1	49.5	47.3	44.6	46.1	40.4	47.4	47.3
Stevedoring variability (per cent)	46.1	39.5	46.3	44.8	50.2	33.9	37.1	36.1	36.5	42.0	37.0	35.7	39.8
Ship rate	36.3	40.6	38.1	38.0	39.1	42.9	44.7	45.5	47.7	47.9	49.2	49.8	49.1
Throughput pbm	101	107	107	86	86	95	105	88	97	105	107	91	102
Sydney													
Ships handled	343	351	321	274	275	276	279	257	255	286	280	275	263
Total containers	308 660	342 522	346 663	277 606	283 416	315 905	361 971	314 600	327 800	362 560	345 408	329 003	333 463
Crane rate	27.2	26.7	27.0	29.1	29.9	29.9	28.2	27.4	26.2	27.1	27.0	27.3	26.6
Vessel working rate	39.7	35.7	38.3	37.4	37.7	39.3	38.8	38.2	34.1	38.5	39.4	37.2	35.7

Table 2.1 Container terminal performance indicators: productivity in containers per hour (continued)

Port / Indicator	Jun-08	Sep-08	Dec-08	Mar-09	Jun-09	Sep-09	Dec-09	Mar-10	Jun-10	Sep-10	Dec-10	Mar-11	Jun-11
Crane time not worked (per cent)	22.8	26.1	22.0	22.8	21.2	21.8	20.5	20.2	22.9	20.5	20.8	22.6	22.7
40-foot containers (per cent)	45.4	46.4	46.6	45.7	44.0	47.3	49.7	47.2	47.3	47.8	48.0	47.8	48.4
Stevedoring variability (per cent)	47.6	50.4	56.7	46.1	47.2	46.0	49.3	38.5	43.9	49.5	28.7	57.8	56.6
Ship rate	51.4	48.4	49.1	48.5	47.9	50.3	48.9	47.9	44.2	48.5	49.8	48.1	46.2
Throughput pbm	159	176	179	143	146	163	186	162	169	187	178	169	172
Melbourne													
Ships handled	346	353	316	268	266	274	275	253	253	285	300	277	286
Total containers	340 140	363 079	355 915	280 218	293 258	321 229	348 091	329 944	332 501	359 440	378 290	332 413	347 209
Crane rate	29.4	29.6	30.1	30.3	31.4	31.9	32.0	32.1	31.9	31.3	31.2	32.0	28.8
Vessel working rate	45.7	47.0	50.8	46.8	49.2	52.4	52.8	52.1	51.4	50.5	47.2	52.1	46.7
Crane time not worked (per cent)	17.4	16.8	15.1	17.0	15.2	17.1	16.9	16.4	16.8	18.5	19.0	16.5	17.6
40-foot containers (per cent)	43.6	45.8	45.1	44.7	40.7	46.3	47.8	45.6	45.3	46.8	49.1	46.7	46.9
Stevedoring variability (per cent)	40.5	60.9	44.3	52.5	41.3	39.0	42.7	45.1	47.2	49.2	50.1	52.3	53.1
Ship rate	55.3	56.5	59.8	56.4	58.0	63.2	63.5	62.3	61.7	61.9	58.2	62.4	56.7
Throughput pbm	186.3	198.8	194.9	153.5	160.6	175.9	190.6	180.7	182.1	196.8	207.2	182.0	190.1
Adelaide													
Ships handled	77	68	67	56	60	59	59	58	59	59	71	72	75
Total containers	59 584	56 250	54 905	43 294	49 912	51 500	53 632	50 824	50 352	53 405	55 304	55 779	54 429
Crane rate	29.6	29.3	26.5	27.8	26.9	25.2	26.4	25.7	25.4	27.6	27.5	28.0	27.7
Vessel working rate	40.4	40.0	32.3	35.1	31.8	33.3	35.2	38.4	34.1	37.8	35.8	37.3	38.8
Crane time not worked (per cent)	9.3	9.6	9.4	11.1	7.6	14.2	15.8	11.1	10.7	12.4	14.7	15.0	14.4
40-foot containers (per cent)	31.6	32.6	32.8	33.7	35.0	37.4	36.0	36.2	37.3	37.1	39.2	35.9	38.4

Table 2.1 Container terminal performance indicators: productivity in containers per hour (continued)

Port / Indicator	Jun-08	Sep-08	Dec-08	Mar-09	Jun-09	Sep-09	Dec-09	Mar-10	Jun-10	Sep-10	Dec-10	Mar-11	Jun-11
Stevedoring variability (per cent)	na	na	na	na	na	na	na	na	na	na	na	na	na
Ship rate	44.5	44.2	35.7	39.5	34.4	38.8	41.8	43.2	38.2	43.2	42.0	43.8	45.3
Throughput pbm	127	120	117	92	106	110	114	108	107	114	118	119	116
Fremantle													
Ships handled	135	141	138	130	133	135	125	128	132	127	144	138	137
Total containers	107 011	109 412	107 218	94 390	89 076	92 552	104 826	97 002	92 798	103 647	109 830	97 846	99 024
Crane rate	27.8	26.2	26.7	29.1	29.9	29.8	30.3	27.6	27.5	26.5	27.9	29.7	27.3
Vessel working rate	31.3	29.2	33.6	33.7	29.7	31.3	34.4	32.9	31.9	29.6	36.8	35.8	27.5
Crane time not worked (per cent)	24.1	26.7	22.1	26.0	28.6	28.3	27.9	25.6	26.5	29.1	28.7	28.9	29.7
40-foot containers (per cent)	37.7	42.2	44.0	40.1	41.9	45.8	45.7	46.7	44.2	47.3	47.9	46.1	46.3
Stevedoring variability (per cent)	46.8	66.7	53.6	55.2	46.7	38.7	43.4	47.0	41.7	42.0	36.1	42.0	47.9
Ship rate	41.2	39.8	43.1	45.5	41.6	43.6	47.8	44.2	43.4	41.8	51.6	50.3	39.1
Throughput pbm	82.9	84.7	83.0	73.1	69.0	71.7	81.2	75.1	71.9	80.3	85.0	75.8	76.7

na not available
r revised
pbm per berth metre

Notes
1. The definitions used in compiling the stevedoring productivity data are detailed in explanatory notes at the end of the journal.
2. The data in this table are expressed in container moves per hour and therefore are not directly comparable with the teus per hour data in Table 2.2.
3. Crane time not worked is the difference between the ship and the vessel working rates as a percentage of the vessel working rate.
4. Time series data on indicators in this table is available as an excel spreadsheet at www.bitre.gov.au

Sources: Patrick, DP World.

Table 2.2 Container terminal performance indicators – productivity in teus per hour

Port/Indicator	Jun-08	Sep-08	Dec-08	Mar-09	Jun-09	Sep-09	Dec-09	Mar-10	Jun-10	Sep-10	Dec-10	Mar-11	Jun-11
Five Ports													
Ships handled	1 156	1 156	1 073	0 927	0 925	932	940	878	880	971	1003	959	963
Total teus	1 395 650	1 510 291	1 500 175	1 197 845	1 212 340	1 364 981	1 534 762	1 363 332	1 393 150	1 536 512	1 556 991	1 408 291	1 467 073
Crane rate	39.2	39.9	39.8	41.4	42.7	43.7	43.8	42.3	41.6	42.7	43.2	43.8	41.4
Vessel working rate	55.9	56.0	59.0	56.0	55.9	61.0	62.5	61.6	59.1	61.2	62.0	56.9	58.0
Ship rate	69.8	70.8	72.1	69.6	69.6	76.4	78.2	76.0	73.4	76.4	77.3	78.1	73.0
Brisbane													
Ships handled	255	243	231	199	191	188	202	182	181	214	208	197	202
Total teus	232 442	249 372	248 183	197 645	197 793	224 152	252 673	208 060	224 323	247 098	242 492	215 812	241 798
Crane rate	32.9	36.4	34.5	37.2	38.4	39.8	41.0	40.2	41.6	45.2	44.9	47.2	45.4
Vessel working rate	40.7	46.9	45.5	44.0	44.1	48.9	51.8	52.6	55.9	56.2	59.1	58.0	57.3
Ship rate	51.8	58.7	55.1	54.5	55.8	62.9	66.8	67.3	69.0	70.0	69.8	73.4	72.3
Sydney													
Ships handled	343	351	321	274	275	276	279	257	255	286	280	275	263
Total teus	448 857	501 480	508 196	404 554	408 159	465 307	541 938	463 230	482 719	535 848	511 070	486 205	494 873
Crane rate	39.5	39.1	39.5	42.2	43.4	43.8	42.5	40.3	38.5	40.0	39.9	40.3	39.4
Vessel working rate	57.8	52.4	56.2	54.6	54.3	58.0	58.1	56.3	50.2	56.9	58.2	55.0	53.1
Ship rate	74.9	70.9	72.0	70.2	69.4	73.7	73.7	70.6	65.0	71.6	73.5	71.0	68.6
Melbourne													
Ships handled	346	353	316	268	266	274	275	253	253	285	300	277	286
Total teus	488 594	529 223	516 431	405 493	412 653	469 802	514 533	480 498	483 141	527 714	564 005	487 574	510 151
Crane rate	42.2	43.2	43.7	43.4	45.2	46.8	47.4	46.7	46.3	46.0	46.6	46.9	42.3
Vessel working rate	65.6	68.5	73.7	67.6	69.3	76.5	78.0	75.9	74.9	74.2	70.3	60.6	68.8
Ship rate	79.5	82.3	86.8	80.6	83.5	92.6	94.1	90.7	89.9	91.1	86.8	91.6	83.5

Table 2.2 Container terminal performance indicators – productivity in teus per hour (continued)

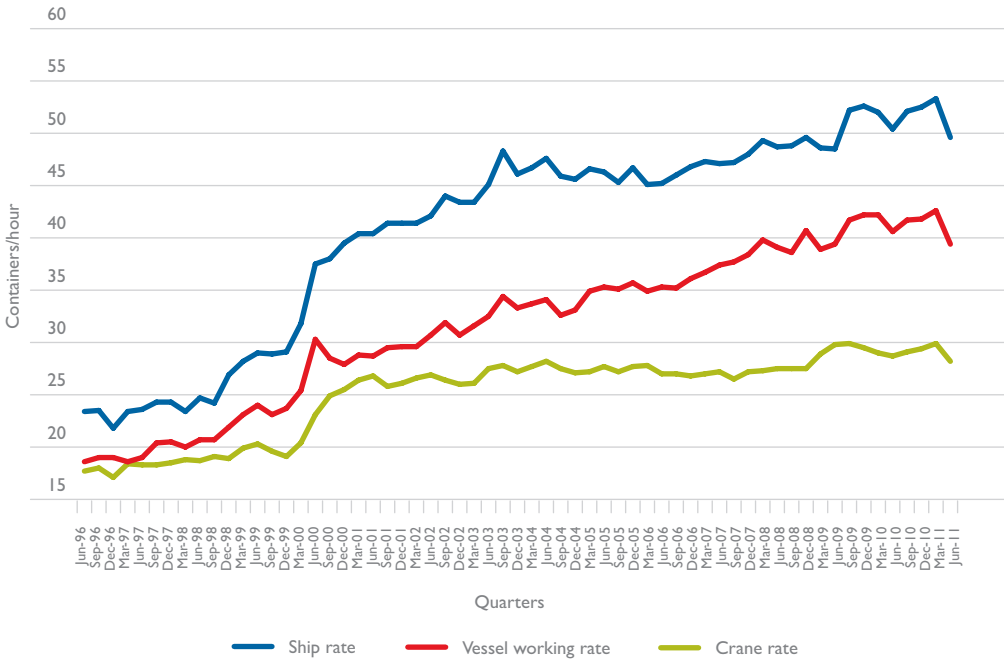
Port/Indicator	Jun-08	Sep-08	Dec-08	Mar-09	Jun-09	Sep-09	Dec-09	Mar-10	Jun-10	Sep-10	Dec-10	Mar-11	Jun-11
Adelaide													
Ships handled	77	68	67	56	60	59	59	58	59	59	71	72	75
Total teus	78 420	74 603	72 937	57 903	67 378	70 747	72 937	69 230	69 135	73 225	76 968	75 779	75 348
Crane rate	38.9	38.9	35.1	37.2	36.3	34.7	35.9	35.0	34.9	37.8	38.3	38.0	38.3
Vessel working rate	52.7	53.0	42.9	46.9	42.9	45.7	47.9	52.3	46.9	51.9	49.8	50.6	53.7
Ship rate	58.6	58.6	47.4	52.8	46.4	53.3	56.9	58.8	52.5	59.2	58.4	59.6	62.7
Fremantle													
Ships handled	135	141	138	130	133	135	125	128	132	127	144	138	137
Total teus	147 337	155 613	154 428	132 250	126 357	134 973	152 681	142 314	133 832	152 627	162 456	142 921	144 903
Crane rate	38.3	37.3	38.5	41.0	42.4	43.5	44.1	40.2	39.7	39.1	41.3	43.3	39.9
Vessel working rate	43.1	41.5	48.4	47.2	42.1	45.7	50.3	48.2	46.0	43.6	54.5	52.3	40.3
Ship rate	56.8	56.6	62.1	64.0	59.0	63.9	69.8	64.4	62.7	61.6	76.4	73.5	57.2

na not available

Notes: 1. Data from CSX World Terminals at Brisbane are incorporated from the December quarter 1999 onwards.

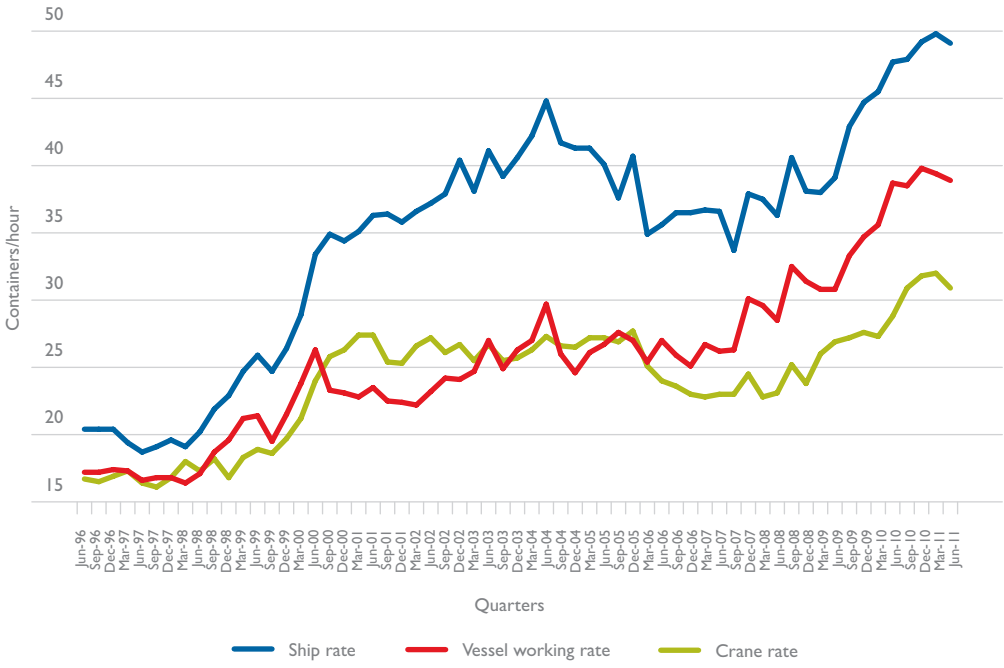
Sources: Patrick, DP World.

Figure 2.1 Five ports: productivity in containers per hour



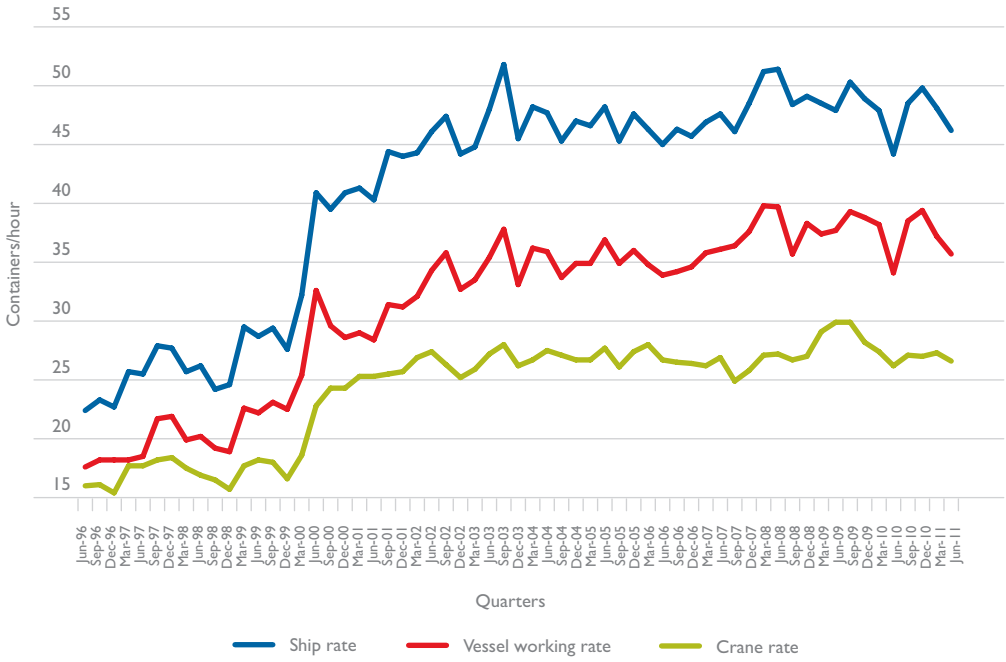
Note: These figures are based on data in Table 2.1. See explanatory notes for definition of terms.
Sources: Patrick and DP World.

Figure 2.2 Brisbane: productivity in containers per hour



Note: These figures are based on data in Table 2.1. See explanatory notes for definition of terms.
Sources: Patrick and DP World.

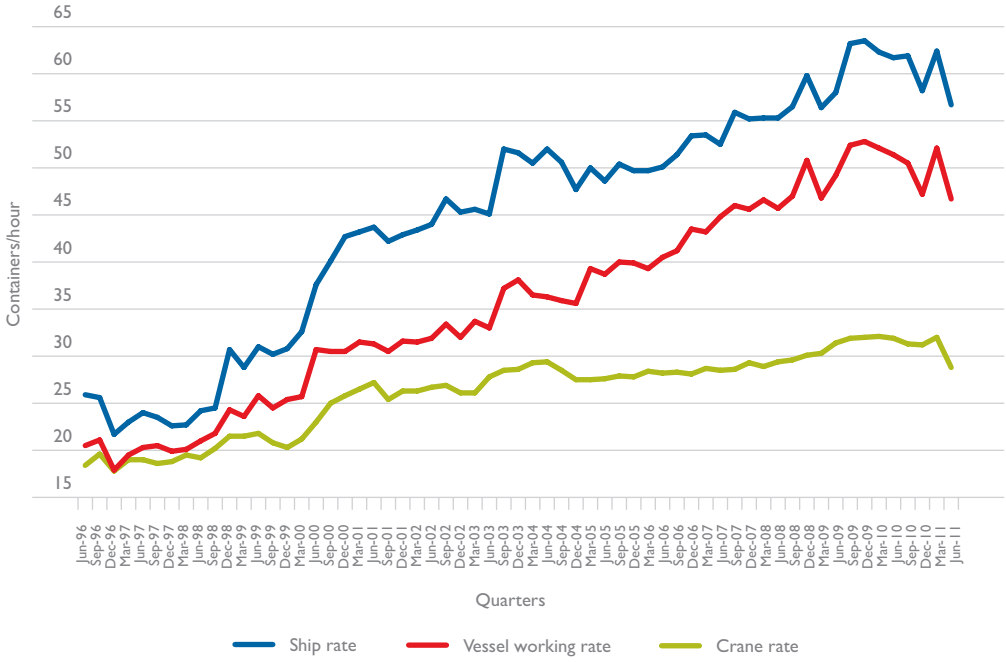
Figure 2.3 Sydney: productivity in containers per hour



Note: These figures are based on data in Table 2.1. See explanatory notes for definition of terms.

Sources: Patrick and DP World.

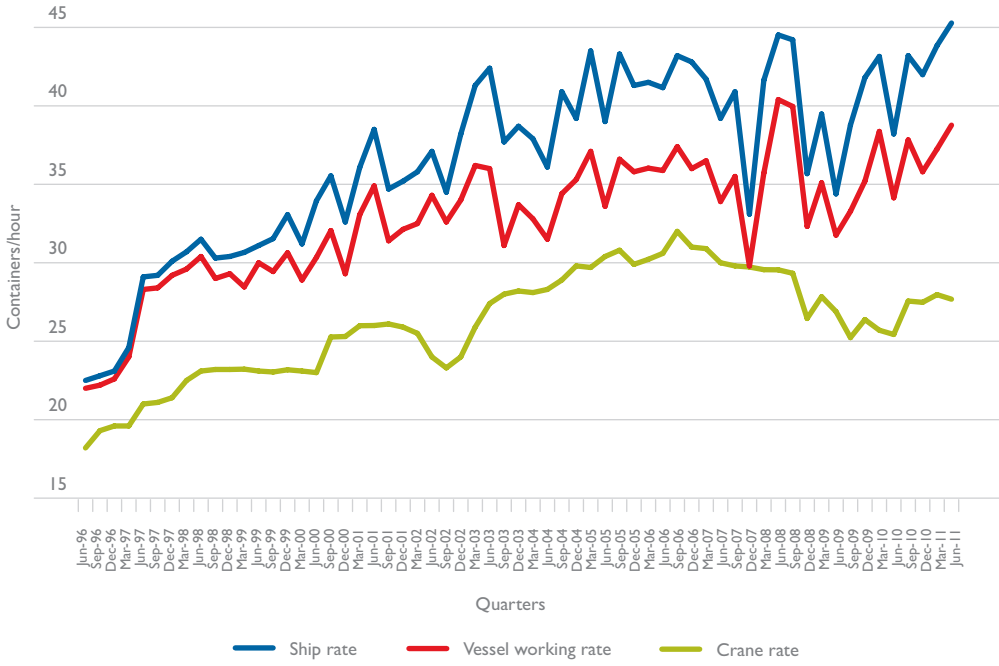
Figure 2.4 Melbourne: productivity in containers per hour



Note: These figures are based on data in Table 2.1. See explanatory notes for definition of terms.

Sources: Patrick and DP World.

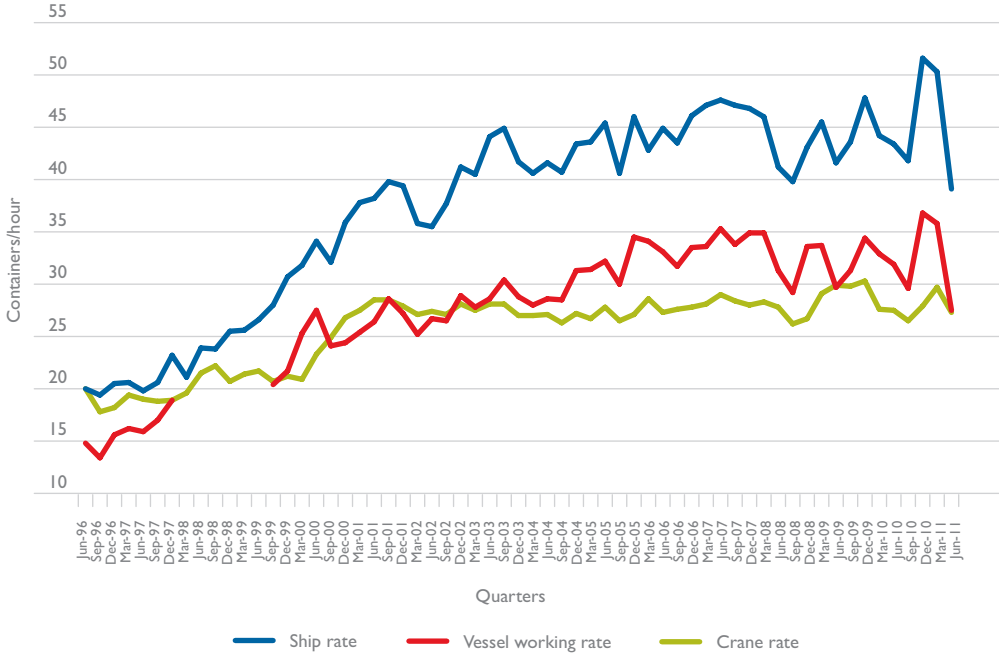
Figure 2.5 Adelaide: productivity in containers per hour



Note: These figures are based on data in Table 2.1. See explanatory notes for definition of terms.

Sources: Patrick and DP World.

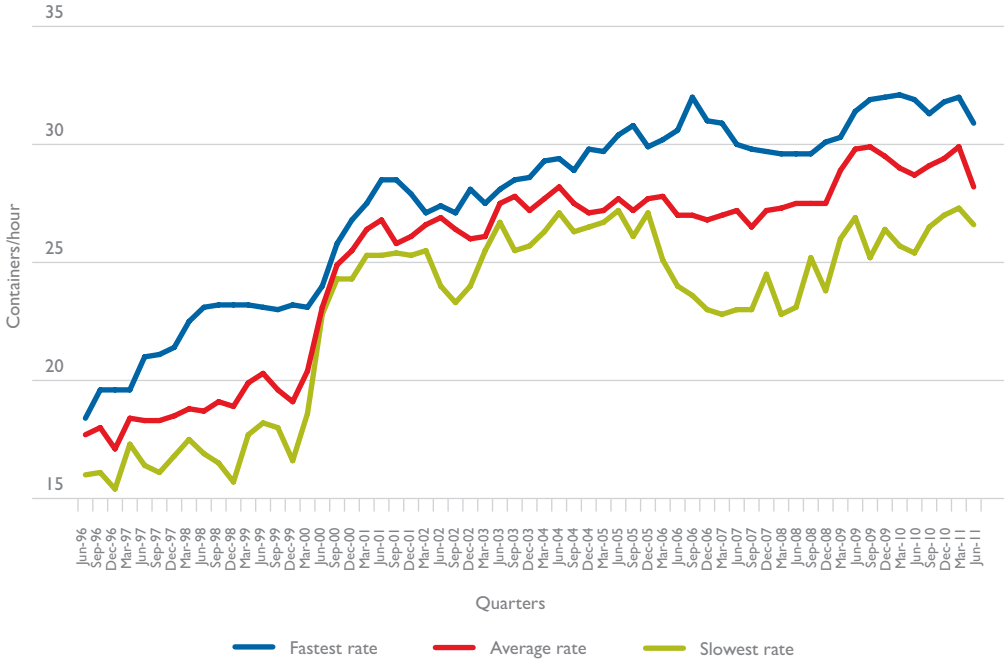
Figure 2.6 Fremantle: productivity in containers per hour



Note: These figures are based on data in Table 2.1. See explanatory notes for definition of terms.

Sources: Patrick and DP World.

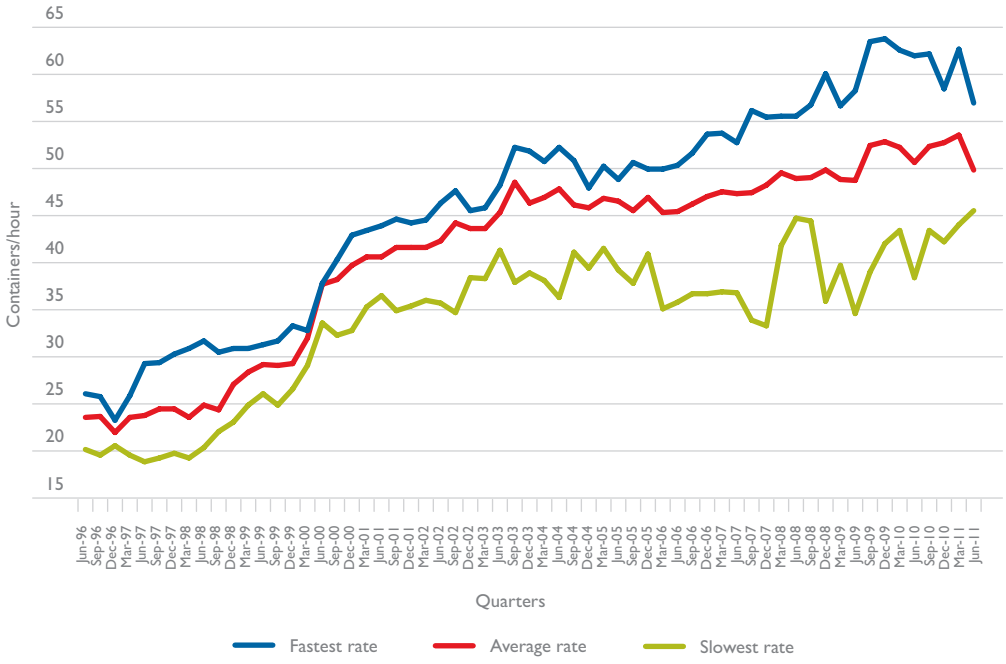
Figure 2.7 Productivity – five ports fastest, average and slowest crane rates achieved



Note: The fastest and slowest rates correspond to different port terminals in the various quarters.

Sources: Patrick and DP World.

Figure 2.8 Productivity – five ports fastest, average and slowest ship rates achieved



Note: The fastest and slowest rates correspond to different port terminals in the various quarters.

Sources: Patrick and DP World.

CHAPTER 3
Port interface cost index

Overview

The port interface cost index provides a measure of shore-based shipping costs (charges) for containers moved through Australian mainland major city ports. These five ports account for approximately 90 per cent of Australia's container traffic. Data are presented in Tables 3.1 to 3.6. The port interface cost index is based on an indicative approach; that is, the index is not an average of all costs, but is based on those costs typically charged by service providers in most instances.

Explanatory notes

Vessel size

This is the total internal capacity of a vessel. It is often referred to as Gross Tonnage.

Parameters

The Port Interface Cost Index (PICI) has as its starting point the estimation of parameters for two typical sizes of container ships:

- 9 991 GT vessel represents all vessels of sizes ranging from 5 000 to 20 000;
- 37 394 GT vessel represents all vessels of sizes ranging from 35 000 to 40 000
- 53 324 GT vessel represents all vessels of sizes ranging from 50 000 to 55 000.

These parameters enable the PICI charges to be estimated on a per TEU basis. The parameters are summarised in Table 3.1 and they are:

- Average TEU exchanged for each vessel size;
- Average number of port calls; and
- Elapsed berth time (hours).

It is then possible to estimate ship based and cargo based charges per TEU for these typical vessels. These are presented in Tables 3.2 and 3.4. Ship based charges are the charges vessel owners pay for a port visit by the vessel. Cargo based charges are the charges levied on the actual cargo of containers.

The port interface costs per TEU consist of the total costs which affect the import and export of a container. They are presented in Table 3.5 for the 35 000 – 40 000 GT ship category. The total costs are the sum of the ship-based charges, the cargo-based charges, the stevedoring costs, customs brokers' fees and transport charges. The stevedoring costs are taken from the ACCC annual report on the stevedoring industry. Together these costs enable the calculation of the national port interface index measured in current and constant (2001) prices in dollars per TEU. This is the final result and provides an estimate of how much it costs to import or export one TEU.

What PICI measures

The port interface cost index is a measure of shore-based shipping costs or charges for containers moved through mainland capital city ports. These are called 'shore-based' because they are that part of the charges paid by importers and exporters of containers which are directly related to the activity which occurs in the port and on the wharf. They do not include the total price for importing or exporting goods carried in containers paid by customers to customs brokers and freight forwarders.

The index is a measure of the movements in costs to users of waterfront and related services and, therefore, whether the cost is increasing or decreasing. The waterfront is defined as the interface between seaports and land transport, hence the term port interface cost index.

Stevedoring and port and related charges are estimated for a standard representative ship transferring an average number of containers. Also land transport and custom's agent's charges are estimated for a representative transport distance for land transport and a representative consignment for customs agents' charges.

The Port Interface Cost Index provides estimates in the changes in five major cost elements by port for exports and imports. The five cost components covered are: (a) Ship based charges (b) Cargo-based charges (c) Stevedoring costs (d) Customs brokers' fees (e) road transport costs.

Data sources

BITRE estimates ship-based charges and cargo based charges for the representative vessels from price data obtained from port authorities and other maritime operators and transport companies and customs brokers.

TEUs

This is an industry standard measure of shipping containers. TEUs are twenty foot equivalent units.

TEUs loaded

Twenty foot equivalent container units loaded with goods.

TEUs empty

Twenty foot equivalent empty containers.

TEUs loaded inwards

These are imported twenty foot equivalent containers.

TEUs loaded outwards

These are exported twenty foot equivalent containers.

Number of port calls

This the average numbers of visits of vessels in a particular GT range.

Elapsed berth time (hours)

This is the average time between arrival at, and departure from, their berth of all vessels in a particular GT range.

Ship-based charges

These charges are levied on container ships once they come into harbour. These include the following items:

- Conservancy charges which are navigation service charges levied by the government of the state in which the port is situated.
- Tonnage charges that are based on the Gross Tonnage of the vessel—port service charges levied by the port authority.
- Pilotage charge to cover services for piloting the ship.
- Towage charges levied by the tug boat operator.
- Mooring & Unmooring – charge levied either by the port authority or the stevedoring company,
- Berth hires charges sometimes charged by the stevedores.

Cargo-based charges

These include the following items:

- wharfage charges that are levied on each container by the port authorities,
- harbour dues that are levied on each container by the port authorities, such as channel infrastructure fees,
- berth charges that are sometimes charged by port authorities.

Port interface Costs

These costs are the sum of the ship based charges and the cargo based charges with the addition of a stevedoring charge and customs brokers and transport charges. They include ship-based charges and cargo-based charges as shown under the heading port and related charges. They also include:

Stevedoring charges

Stevedoring and port and related charges are estimated for a standard representative ship transferring an average number of containers. Stevedoring charges are the charges levied by stevedoring companies for handling containers. They are estimated for Australia each year by the ACCC which monitors their price.

Customs brokers' fees

These are the rates charged by customs brokers for the administrative costs associated with organising the import and export of containers for a representative consignment.

Road transport charges

Transport charges are estimates of what transport companies charge for transporting a container to or from the wharf from/to the metropolitan area of the capital city in which the port is situated. These charges are estimated for a representative transport distance.

Individual port index

Port interface costs are calculated for each of the five ports for each six month period. They are shown as the import total or the export total in the Port Interface Cost tables and are the total cost of importing or exporting a container (TEU).

National Index

The National Port Interface Cost Index is the Australian average for each six month period of importing or exporting a container in an average ship.

Table 3.1 Parameters used in the port interface cost indices

	Brisbane		Sydney		Melbourne		Adelaide		Fremantle	
	Jul-Dec 2010	Jan-Jun 2011	Jul-Dec 2010	Jan-Jun 2011	Jul-Dec 2010	Jan-Jun 2011	Jul-Dec 2010	Jan-Jun 2011	Jul-Dec 2010	Jan-Jun 2011
Vessel size GT 9 991										
Average Teus exchanged [a]										
All	na	361	na	269	na	350	na	115	na	1 871
Loaded	na	274	na	212	na	278	na	111	na	1 530
Empty	na	87	na	57	na	73	na	2	na	341
Loaded inwards	na	164	na	72	na	95	na	2	na	809
Loaded outwards	na	110	na	141	na	183	na	111	na	721
Ship call parameters [a]										
Number of port calls	na	5	na	6	na	6	na	2	na	14
Elapsed berth time (hrs)	na	25	na	27	na	22	na	7	na	41
Vessel size GT 37 394										
Average Teus exchanged [b]										
All	1 287	1 220	2 028	1 931	1 996	1 931	1 195	1 070	1 898	874
Loaded	951	978	1 358	1 350	1 581	1 587	952	883	1 467	638
Empty	336	242	670	582	415	344	243	187	432	236
Loaded inwards	614	598	1 039	990	953	884	514	429	902	422
Loaded outwards	337	381	319	359	628	703	438	455	564	216
Ship call parameters [b]										
Number of port calls	1	3	3	3	3	3	2	2	2	3
Elapsed berth time (hrs)	26	25	44	45	31	32	26	25	31	26
Vessel size GT 53 324										
Average Teus exchanged [c]										
All	na	2 007	na	2 201	na	2 500	na	1 425	na	1 280
Loaded	na	1 329	na	1 525	na	2 099	na	1 219	na	1 005
Empty	na	677	na	676	na	401	na	207	na	275
Loaded inwards	na	598	na	1 144	na	1 222	na	578	na	651

T 3.1 Parameters used in the port interface cost indices (continued)

	Brisbane		Sydney		Melbourne		Adelaide		Fremantle	
	Jul-Dec 2010	Jan-Jun 2011	Jul-Dec 2010	Jan-Jun 2011	Jul-Dec 2010	Jan-Jun 2011	Jul-Dec 2010	Jan-Jun 2011	Jul-Dec 2010	Jan-Jun 2011
Loaded outwards	na	571	na	381	na	876	na	640	na	354
Ship call parameters [c]										
Number of port calls	na	3	na	4	na	4	na	5	na	6
Elapsed berth time (hrs)	na	30	na	42	na	34	na	30	na	27

na not available
a. Mean value for ships between 5 000 and 20 000 GT.
b. Mean value for ships between 35 000 and 40 000 GT.
c. Mean value for ships between 50 000 and 55 000 GT.

Sources: BITRE estimates based on ship call data supplied by relevant port authorities/corporations and other port service providers.

Table 3.2 Port and related charges for ships in the 5 000–20 000 GT range

	Brisbane		Sydney		Melbourne		Adelaide		Fremantle	
	Jul-Dec 2010	Jan-Jun 2011	Jul-Dec 2010	Jan-Jun 2011	Jul-Dec 2010	Jan-Jun 2011	Jul-Dec 2010	Jan-Jun 2011	Jul-Dec 2010	Jan-Jun 2011
Ship-based charges ($/TEU)										
Conservancy	na	5.12	-	-	-	-	na	2.38	-	-
Tonnage	-	-	na	17.25	na	9.91	na	5.35	na	1.06
Pilotage	na	11.14	na	11.58	na	19.58	na	5.80	na	1.64
Towage [a]	na	15.85	na	43.03	na	25.96	na	12.14	na	2.08
Mooring, unmooring [b]	na	6.44	na	9.31	na	2.28	-	-	na	0.58
Berth hire [c]	-	-	-	-	-	-	-	-	-	-
Total [c]	na	38.56	na	81.16	na	57.73	na	25.67	na	5.36
Cargo-based charges ($/TEU)										
Wharfage										
Imports	na	30.32	na	108.05	na	42.24	na	75.13	na	62.98
Exports	na	30.32	na	66.26	na	42.24	na	75.13	na	62.98
Harbour dues	na	50.43	-	-	-	-	-	-	-	-
Berth charge	-	-	-	-	-	-	-	-	na	18.87
Channel infrastructure fees					na	39.65				
Total port and related charges ($/TEU) [d]										
Loaded imports	na	119.30	na	189.21	na	136.38	na	106.96	na	87.21
Loaded exports	na	119.30	na	147.42	na	136.38	na	106.96	na	87.21
Charges per ship visit ($/visit)										
Total ship-based charges	na	13 914	na	21 870	na	21 870	na	23 091	na	10 035
Empty TEUs [e]	na	1 571	na	684	na	767	0	1 940	na	3 236

- not applicable
r. revised
a. After enquiries at all ports the number of tugs required for towage in Adelaide and Fremantle used in PICI calculations was revised in Waterline 43.
b. Due to lack of data from operators mooring and unmooring charges for Brisbane are BITRE estimates.
c. Charged by stevedores and itemised separately from basic stevedoring charge.
d. Components may not sum to totals due to rounding.
e. Sum of wharfage, harbour dues and berth charge per empty teu, multiplied by average exchange of empty teus.

Note1: Port and related charges are based on the parameters described in table 3.1

Sources: BITRE estimates based on ship call data supplied by relevant port authorities/corporations, and price schedules of relevant port authorities/corporations, towage operators and pilotage service providers.

Note2: This is a new category represented by container ship of 9 991 GT.

Table 3.3 Port and related charges for ships in the 35 000–40 000 GT range

	Brisbane		Sydney		Melbourne		Adelaide		Fremantle	
	Jul-Dec 2010	Jan-Jun 2011	Jul-Dec 2010	Jan-Jun 2011	Jul-Dec 2010	Jan-Jun 2011	Jul-Dec 2010	Jan-Jun 2011	Jul-Dec 2010	Jan-Jun 2011
Ship-based charges ($/TEU)										
Conservancy	5.29	5.67	-	-	-	-	3.74	4.17	-	-
Tonnage	-	-	8.58	9.01	6.25	6.46	7.82	8.62	3.90	8.47
Pilotage	9.58	10.66	2.84	3.95	5.72	5.91	4.36	4.87	1.62	3.52
Towage [a]	11.05	12.41	5.96	6.30	6.09	6.33	14.44	16.12	8.78	19.07
Mooring, unmooring [b]	1.77	1.91	2.02	2.12	0.45	0.47	-	-	0.57	1.25
Berth hire [c]	-	-	-	-	-	-	-	-	-	-
Total [c]	27.69	30.64	19.40	21.38	18.51	19.17	30.36	33.79	14.88	32.30
Cargo-based charges ($/TEU)										
Wharfage										
Imports	30.32	30.32	108.05	108.05	42.24	42.24	75.13	75.13	62.98	62.98
Exports	30.32	30.32	66.26	66.26	42.24	42.24	75.13	75.13	62.98	62.98
Harbour dues	48.97	48.97	-	-	-	-	-	-	-	-
Berth charge	-	-	-	-	-	-	-	-	18.87	18.87
Channel infrastructure fees	-	-	-	-	38.65	39.65	-	-	-	-
Total port and related charges ($/TEU) [d]										
Loaded imports	108.43	111.39	127.45	129.43	97.16	97.82	111.65	115.08	96.73	114.15
Loaded exports	108.43	111.39	85.66	87.64	97.16	97.82	111.65	115.08	96.73	114.15
Charges per ship visit ($/visit)										
Total ship-based charges	35 628	37 379	39 336	41 284	36 956	37 023	36 289	36 172	28 243	28 243
Empty TEUs [e]	6 050	4 354	7 981	6 934	4 386	3 631	1500	1153	4 101	2 241

- not applicable
a. After enquiries at all ports the number of tugs required for towage in Adelaide and Fremantle used in PICI calculations was revised in Waterline 43.
b. Due to lack of data from operators mooring and unmooring charges for Brisbane are BITRE estimates.
c. Charged by stevedores and itemised separately from basic stevedoring charge.
d. Components may not sum to totals due to rounding.
e. Sum of wharfage, harbour dues and berth charge per empty teu, multiplied by average exchange of empty teus.
Note: Port and related charges are based on the parameters described in table 3.
Sources: BITRE estimates based on ship call data supplied by relevant port authorities/corporations, and price schedules of relevant port authorities/corporations, towage operators and pilotage service providers.

Table 3.4 Port and related charges for ships in the 50 000–55 000 GT range

	Brisbane		Sydney		Melbourne		Adelaide		Fremantle	
	Jul-Dec 2010	Jan-Jun 2011	Jul-Dec 2010	Jan-Jun 2011	Jul-Dec 2010	Jan-Jun 2011	Jul-Dec 2010	Jan-Jun 2011	Jul-Dec 2010	Jan-Jun 2011
Ship-based charges ($/TEU)										
Conservancy	na	4.92	-	-	-	-	na	3.14	-	-
Tonnage	-	-	na	11.27	na	4.99	na	6.47	na	8.25
Pilotage	na	7.60	na	3.73	na	4.96	na	3.66	na	2.40
Towage [a]	na	11.18	na	5.49	na	8.09	na	17.69	na	14.81
Mooring, unmooring [b]	na	1.13	na	2.19	na	0.38	na	-	na	0.85
Berth hire [c]	-	-	-	-	-	-	-	-	-	-
Total [c]	na	24.83	na	22.67	na	18.42	na	30.96	na	26.31
Cargo-based charges ($/TEU)										
Wharfage										
Imports	na	30.32	na	108.05	na	42.24	na	75.13	na	62.98
Exports	na	30.32	na	66.26	na	42.24	na	75.13	na	62.98
Harbour dues	na	48.97	-	-	-	38.65	-	-	-	-
Berth charge	-	-	-	-	-	-	-	-	na	18.87
Channel infrastructure fees	-	-	-	-	na	38.65	-	-	-	-
Total port and related charges ($/TEU) [d]										
Loaded imports	na	105.58	na	108.05	na	97.07	na	112.25	na	108.16
Loaded exports	na	105.58	na	66.26	na	97.07	na	112.25	na	108.16
Charges per ship visit ($/visit)										
Total ship-based charges	na	49 826	na	49 910	na	46 043	na	44 125	na	33 685
Empty TEUs [e]	na	12 202	na	8 062	na	4 236	na	1 273	na	2 613

- not applicable
a. After enquiries at all ports the number of tugs required for towage in Adelaide and Fremantle used in PICI calculations was revised in Waterline 43.
b. Due to lack of data from operators mooring and unmooring charges for Brisbane are BITRE estimates.
c. Charged by stevedores and itemised separately from basic stevedoring charge.
d. Components may not sum to totals due to rounding.
e. Sum of wharfage, harbour dues and berth charge per empty teu, multiplied by average exchange of empty teus.
Note: Port and related charges are based on the parameters described in table 3.
Sources: BITRE estimates based on ship call data supplied by relevant port authorities/corporations, and price schedules of relevant port authorities/corporations, towage operators and pilotage service providers.

Table 3.5 Port interface costs for ships in the 35 000–40 000 GT range

	Brisbane		Sydney		Melbourne		Adelaide		Fremantle	
	Jul-Dec 2010	Jan-Jun 2011	Jul-Dec 2010	Jan-Jun 2011	Jul-Dec 2010	Jan-Jun 2011	Jul-Dec 2010	Jan-Jun 2011	Jul-Dec 2010	Jan-Jun 2011
$/TEU										
Import										
Ship-based charges	28	29	19	20	19	20	30	30	15	15
Cargo-based charges	81	82	108	109	79	80	75	75	82	82
Stevedoring [p]	171	171	171	171	171	171	171	171	171	171
Customs brokers' fees	199	151	136	139	154	152	171	153	157	157
Road transport charges	373	395	455	478	436	434	297	293	377	394
Import total [a]	851	828	890	867	867	857	744	723	801	818
Export										
Ship-based charges	28	29	19	20	19	20	30	30	15	15
Cargo-based charges	81	82	66	67	79	80	75	75	82	82
Stevedoring [p]	171	171	171	171	171	171	171	171	171	171
Customs brokers' fees	219	159	135	137	136	136	122	103	90	90
Road transport charges	373	395	455	478	436	434	297	293	377	394
Export total [a]	871	836	847	837	845	840	695	673	734	751

p. updated annually after the release of the ACCC stevedoring monitoring report.

a. components may not sum to totals due to rounding.

Notes
1. Based on parameters described in table 3.2.
2. Waterline data on customs brokers' fees and road transport charges are collected for the purpose of monitoring trends in charges over time. They should not be used for inter-port comparisons, as sample characteristics are based on findings contained in *Port interface cost index* (BTCE 1993, *Report 84*) and further updates done in 2001 and may vary between ports.
3. The stevedoring charge used in Waterline is monitored by the ACCC and is the weighted average for Brisbane, Sydney, Melbourne, Adelaide, Fremantle and Burnie. Stevedoring charges vary between ports but detailed data for individual ports are not publicly available.

Sources: BITRE estimates based on: ship call data supplied by relevant port authorities/corporations; price schedules of relevant port authorities/corporations, towage operators and pilotage service providers; surveys of customs brokers and road transport operators; stevedoring charge data supplied by the ACCC 2010; ABS 2010.

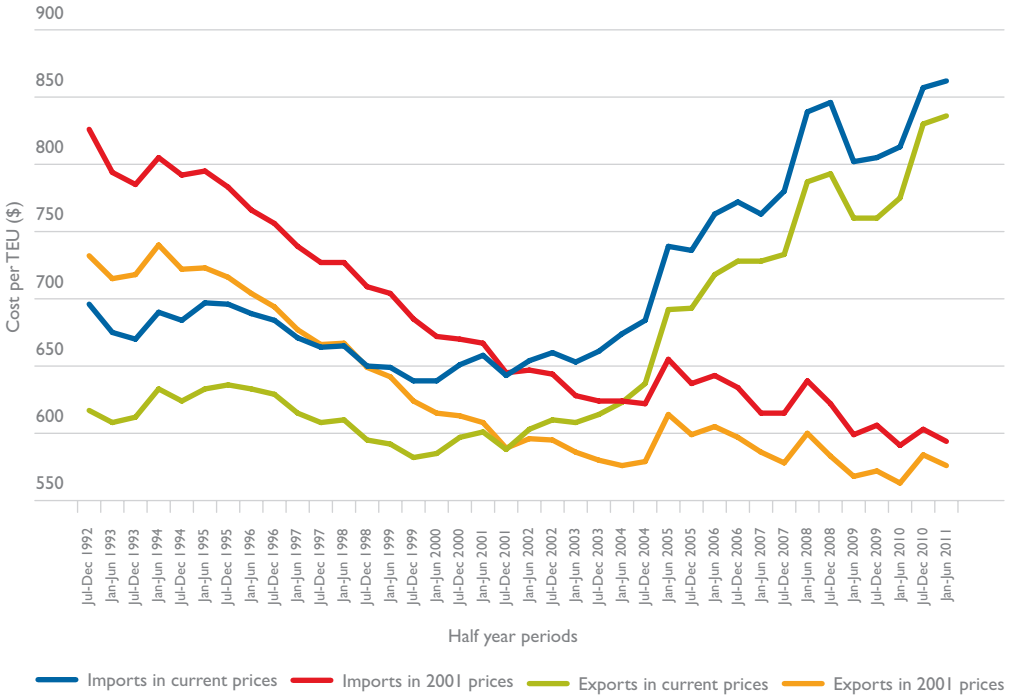
Table 3.6 The national port interface cost index for ships in the 35 000–40 000 GT range

	Jul-Dec 2004	Jan-Jun 2005	Jul-Dec 2005	Jan-Jun 2006	Jul-Dec 2006	Jan-Jun 2007	Jul-Dec 2007	Jan-Jun 2008	Jul-Dec 2008	Jan-Jun 2009	Jul-Dec 2009	Jan-Jun 2010	Jul-Dec 2010	Jan-Jun 2011
Imports in current prices	684	739	736	763	772	763	780	839	846	802	805	813	857	862
Imports in 2001 prices	621	655	636	643	634	615	615	640	622	599	605	602	623	594
Exports in current prices	637	692	693	718	728	728	733	787	793	760	760	775	830	836
Exports in 2001 prices	578	614	599	605	597	586	578	600	584	568	572	574	603	576

Note: Exports and imports in constant 2001 dollars are calculated by using deflator based on trend series of non-farm GDP chain volume and current prices of the seasonally adjusted series.

Sources: BITRE estimates based on: ship call data supplied by port authorities/corporations; price schedules of port authorities/corporations, towage operators and pilotage service providers; surveys of customs brokers and road transport operators; stevedoring charges data supplied by the ACCC 2010; and ABS 2010.

Figure 3.1 The national port interface cost indices for ships in the 35 000–40 000 GT range



Sources: BITRE estimates based on: ship call data supplied by port authorities/corporations; price schedules of port authorities/corporations,

CHAPTER 4
Ship visits

Overview

This chapter illustrates trends in container ship size over time for ships which visit the five ports covered by *Waterline*.

Table 4.1 provides the five port total number of ship visits and the average number of TEUs exchanged per ship visit for container vessels with sizes ranging from 5 000 to 60 000 GT and over. Table 4.2 lists the distribution of ship visits by vessel gross tonnage on a five port basis.

Explanatory notes

Ship calls

Ship visits measures the number of times a ship calls at a port or ports, for example, a ship that sails to Australia 3 times and makes a total of 15 port calls in a year counts as 1 ship, 3 voyages and 15 port calls.

Data sources

The estimates reported are based on ship call data supplied by port authorities for Brisbane, Sydney, Melbourne, Adelaide and Fremantle.

Table 4.1 Five port average number of TEUs exchanged and total ship visits per 6 month period for selected GT ranges, weighted by number of ships

Gross tonnage	Jan-June 2003	Jul-Dec 2003	Jan-June 2004	Jul-Dec 2004	Jan-June 2005	Jul-Dec 2005	Jan-June 2006	Jul-Dec 2006	Jan-June 2007	Jul-Dec 2007	Jan-June 2008	Jul-Dec 2008	Jan-June 2009	Jul-Dec 2009	Jan-June 2010	Jul-Dec 2010	Jan-June 2011
5 000 – 10 000																	
Average TEUs exchanged	161	193	333	204	283	368	267	564	391	402	319	554	352	445	309	272	271
Total ship visits	75	72	93	80	71	67	93	108	144	131	159	158	120	123	137	134	143
10 000 – 15 000																	
Average TEUs exchanged	405	485	688	628	554	506	464	653	711	864	511	554	414	420	283	344	294
Total ship visits	53	54	40	84	89	106	136	108	116	125	103	63	46	42	31	48	58
15 000 – 20 000																	
Average TEUs exchanged	839	826	971	885	693	800	685	889	873	1 116	845	918	978	994	1 028	643	370
Total ship visits	181	191	153	266	316	439	406	430	224	209	189	210	81	84	52	11	29
20 000 – 25 000																	
Average TEUs exchanged	902	990	1 014	935	818	858	685	923	878	942	857	904	918	1 117	977	930	872
Total ship visits	182	214	199	306	321	294	374	256	163	148	207	220	134	138	87	53	39
25 000 – 30 000																	
Average TEUs exchanged	1 027	1 031	959	1 071	956	1 021	882	1 099	991	2 528	1 049	1 163	1 210	1 217	1 138	1 178	1 056
Total ship visits	286	323	344	185	332	377	395	475	558	618	545	458	362	356	381	474	449
30 000 – 35 000																	
Average TEUs exchanged	1 262	1 374	1 478	896	1 215	1 433	1 151	1 324	1 185	1 296	806	1 041	1 063	1 059	1 081	1 155	1 130
Total ship visits	175	257	247	191	223	141	198	156	177	235	243	205	139	131	112	107	151
35 000 – 40 000																	
Average TEUs exchanged	1 408	1 445	1 474	1 385	1 394	1 454	1 137	1 377	1 605	1 867	1 643	1 760	1 872	1 869	1 731	1 784	1 586
Total ship visits	214	189	225	228	227	225	178	223	313	357	333	379	320	334	375	407	424
40 000 – 45 000																	
Average TEUs exchanged	1 450	1 558	1 601	1 098	1 511	1 653	1 177	1 428	1 630	1 819	1 773	1 776	1 773	1 798	1 865	1 951	1 776
Total ship visits	162	186	181	143	196	165	223	249	212	173	136	139	177	184	199	281	264

Table 4.1 Five port average number of TEUs exchanged and total ship visits per 6 month period for selected GT ranges, weighted by number of ships (continued)

Gross tonnage	Jan-June 2003	Jul-Dec 2003	Jan-June 2004	Jul-Dec 2004	Jan-June 2005	Jul-Dec 2005	Jan-June 2006	Jul-Dec 2006	Jan-June 2007	Jul-Dec 2007	Jan-June 2008	Jul-Dec 2008	Jan-June 2009	Jul-Dec 2009	Jan-June 2010	Jul-Dec 2010	Jan-June 2011
45 000 – 50 000																	
Average TEUs exchanged	1 201	1 270	1 379	853	1 279	1 433	914	1 027	1 236	1 651	1 536	1 675	1 847	1 883	1 851	1 797	1 410
Total ship visits	72	77	75	32	65	77	88	81	154	153	145	123	129	112	98	54	28
50 000 – 55 000																	
Average TEUs exchanged	995	1 044	1 366	795	1 735	1 247	1 321	1 362	1 232	1 807	1 606	1 761	2 273	2 367	2 226	2 121	2 075
Total ship visits	61	69	22	71	89	60	55	55	110	101	166	225	269	270	332	201	344
55 000 and above																	
Average TEUs exchanged	1 252	0	0	681	1 308	88	0	695	659	1 457	0	290	796	579	2 538	0	484
Total ship visits	3	0	0	6	10	4	0	19	1	11	0	1	3	3	4	0	1
Total ship visits	1 464	1 632	1 579	1 592	1 939	1 955	2 146	2 160	2 172	2 261	2 226	2 181	1 780	1 777	1 808	1 770	1 930

Source: BITRE estimates based on UCC type ship call data supplied by relevant port authorities and corporations.

Table 4.2 Container ship visits by port

Number of ship visits	Brisbane	Sydney	Melbourne	Adelaide	Fremantle	Total
			July 2010 – June 2011			
5000 –10 000	127	87	63	0	0	277
10 000 –15 000	49	22	35	0	0	106
15 000 – 20 000	0	0	1	8	31	40
20 000 – 25 000	31	31	30	0	0	92
25 000 – 30 000	132	314	350	72	55	923
30 000 – 35 000	35	73	79	28	43	258
35 000 – 40 000	206	222	236	70	97	831
40 000 – 45 000	130	138	164	54	59	545
45 000 – 50 000	25	25	28	2	2	82
50 000 – 55 000	123	109	196	15	102	545
above 55 000	1	0	0	0	0	1
Total	859	1 021	1 182	249	389	3 700

Source: BITRE estimates based on ship call data supplied by relevant port authorities and corporations.

CHAPTER 5
Non-financial performance indicators

Overview

The non-financial data presented in this chapter supplements the data presented for container productivity in Chapter 2. This data covers the total bulk and non-bulk cargo which goes through the five mainland major city ports covered in *Waterline*. Non-bulk cargo consists of general cargo and containerised cargo. The total of containers is for the whole port rather than for the container terminals.

The January – June and July – December non-financial indicators for the five mainland capital city ports are presented in Table 5.1. A longer time series of this data is available in an Excel spreadsheet at www.bitre.gov.au

Explanatory notes

Cargo throughput (tonnes)

This is the quantity of container and non-container cargo which passes through the port and is measured in tonnes.

Non-containerised general cargo (tonnes)

This is cargo which is not carried in containers.

Containerised cargo (TEUs exchanged)

This is the cargo which is carried in containers normalised as twenty foot equivalent containers.

Average total employment

This is the total employment of the port authorities. It does not include the waterside workers employed by stevedoring and other companies providing port services.

Port turnaround times (hours)

This is the time in hours a container ship is in a port. It is measured as a median of all the container ships in port over a six month period. It is also measured as the 95th percentile for those ships. The 95th percentile says that 95 per cent of the time, the turnaround time is below this duration. Conversely, 5 per cent of the time, turnaround time is above that duration.

Table 5.1 Non-financial performance indicators, selected Australian ports

	Jan-Jun 2007	Jul-Dec 2007	Jan-Jun 2008	Jul-Dec 2008	Jan-Jun 2009	Jul-Dec 2009	Jan-Jun 2010	Jul-Dec 2010	Jan-Jun 2011
Five ports [e]									
Total cargo throughput ('000 tonnes)	59 953	62 591	63 756	64 049	61 063	61 831	64 979	69 817	70 504
Non-containerised general cargo ('000 tonnes) [a]	2 768	2 701	2 826	2 855	1 842	2 153	2 321	11 754	11 978
Containerised cargo (teus exchanged)									
Full import	1 166 116	1 389 211	1 305 203	1 449 281	1 121 703	1 345 190	1 252 358	1 437 021	1 334 669
Empty import	139 096	136 768	142 714	140 312	155 333	129 206	124 477	127 401	128 880
Full export	778 137	817 213	849 152	876 847	857 981	880 174	884 712	929 540	913 054
Empty export	540 582	627 401	563 815	666 821	411 197	588 658	563 320	687 216	579 673
Total	2 623 931	2 970 593	2 858 884	3 133 261	2 546 214	2 943 228	2 824 867	3 181 179	2 956 276
Average total employment [b]	1 114	1 141	1 154	1 222	1 254	1 251	1 260	1 267	1 211
Port turnaround time (hrs) [c]									
Median result	-	-	-	-	-	-	-	-	-
95th percentile	-	-	-	-	-	-	-	-	-
Brisbane									
Total cargo throughput ('000 tonnes)	14 130	15 006	14 716	15 808	16 086	15 697	15 911	17 099	16 132
Non-containerised general cargo ('000 tonnes) [a]	546	516	542	670	316	458	551	582	498
Containerised cargo (teus exchanged)									
Full import	177 073	216 280	196 074	218 787	158 988	133 943	124 430	144 304	139 035
Empty import	38 023	32 133	33 613	37 363	37 174	30 456	27 458	32 063	30 186
Full export	120 261	125 275	130 028	139 042	131 578	133 943	124 430	144 304	139 035
Empty export	100 106	114 465	92 892	104 798	68 437	100 812	96 928	109 197	90 255
Total	435 463	488 153	452 607	499 990	396 177	399 154	373 246	429 868	398 511
Average total employment [b]	293	312	312	342	353	350	337	323	268
Port turnaround time (hrs) [c]									
Median result	33	35	33	26	32	33	32	30	32
95th percentile	54	54	51	45	70	76	61	62	69
Sydney									
Total cargo throughput ('000 tonnes)	13 772	14 886	14 558	14 715	13 099	14 169	13 992	14 976	14 752
Non-containerised general cargo ('000 tonnes) [a]	347	270	262	142	1	0	0	1	2
Containerised cargo (teus exchanged)									
Full import	380 056	459 364	428 179	489 703	386 403	496 239	454 790	521 027	479 408
Empty import	9 762	9 796	9 224	10 840	15 580	12 962	12 232	9 861	10 247
Full export	176 919	188 416	196 678	222 367	220 061	223 290	219 277	231 724	227 070

Table 5.1 Non-financial performance indicators, selected Australian ports (continued)

	Jan-Jun 2007	Jul-Dec 2007	Jan-Jun 2008	Jul-Dec 2008	Jan-Jun 2009	Jul-Dec 2009	Jan-Jun 2010	Jul-Dec 2010	Jan-Jun 2011
Empty export	218 275	248 943	237 825	262 222	176 744	261 042	247 688	289 416	251 398
Total	785 012	906 519	871 906	985 132	798 788	993 533	933 987	1 052 028	968 123
Average total employment [b]	244	240	223	244	260	267	298	309	318
Port turnaround time (hrs) [c]									
Median result	29.6	29.8	27.9	29.6	29.0	34.6	37.9	39.8	36.9
95th percentile	53	57	47	56	54	63	72	65	65
Melbourne									
Total cargo throughput ('000 tonnes)	14 628	15 159	15 665	15 542	13 560	14 995	15 299	16 096	16 233
Non-containerised general cargo ('000 tonnes) [a]	1 175	1 184	1 251	1 273	1 028	1 055	1 130	1 167	1 151
Containerised cargo (teus exchanged)									
Full import	463 052	542 218	508 357	557 940	422 482	532 350	502 392	566 876	523 361
Empty import	54 843	47 900	50 920	48 483	59 685	47 694	50 621	54 369	58 205
Full export	343 064	354 504	372 536	359 377	353 155	375 205	391 422	402 698	403 631
Empty export	177 075	205 955	174 254	231 319	124 911	170 507	166 444	216 133	167 700
Total	1 038 034	1 150 577	1 106 067	1 197 119	960 233	1 125 756	1 110 879	1 240 077	1 152 897
Average total employment [b]	201	209	223	228	224	217	210	205	197
Port turnaround time (hrs) [c]									
Median result	31	32	30	31	30	30	32	32	30
95th percentile	63	65	56	62	56	62	70	67	69
Adelaide									
Total cargo throughput ('000 tonnes)	5 072	5 014	5 283	4 952	4 767	4 713	5 887	8 763	10 340
Non-containerised general cargo ('000 tonnes) [a]	180	196	187	190	73	105	128	134	115
Containerised cargo (teus exchanged)									
Full import	31 441	38 144	40 656	40 260	40 656	47 581	42 201	53 095	51 821
Empty import	23 583	28 340	29 018	27 862	26 461	24 052	23 564	22 143	21 907
Full export	50 233	57 587	59 075	59 382	59 075	59 748	58 801	60 929	64 351
Empty export	7 656	12 710	14 591	16 724	6 125	10 379	8 175	13 888	9 567
Total	112 913	136 781	143 340	144 228	132 317	141 760	132 741	150 055	147 646
Average total employment [b]	99	103	107	107	109	112	111	110	108
Port turnaround time (hrs) [c]									
Median result	21	20	21	25	24	0	26	25	25
95th percentile	35	34	35	39	48	0	42	40	40

Table 5.1 Non-financial performance indicators, selected Australian ports (continued)

	Jan-Jun 2007	Jul-Dec 2007	Jan-Jun 2008	Jul-Dec 2008	Jan-Jun 2009	Jul-Dec 2009	Jan-Jun 2010	Jul-Dec 2010	Jan-Jun 2011
Fremantle									
Total cargo throughput ('000 tonnes)	12 352	12 525	13 534	13 032	13 550	12 258	13 890	12 883	13 047
Non-containerised general cargo ('000 tonnes) [a]	520	535	585	580	423	535	512	9 871	10 214
Containerised cargo (teus exchanged)									
Full import	114 494	133 205	131 937	142 591	113 174	135 077	128 545	151 719	141 044
Empty import	12 885	18 599	19 939	15 764	16 433	14 042	10 602	8 965	8 335
Full export	87 660	91 431	90 835	96 679	94 112	87 988	90 782	89 885	78 967
Empty export	37 470	45 328	44 253	51 758	34 980	45 918	44 085	58 582	60 753
Total	252 509	288 563	284 964	306 792	258 699	283 025	274 014	309 151	289 099
Average total employment [b]	277	277	289	302	309	305	305	320	319
Port turnaround time (hrs) [c]									
Median result	27	26	29	31	28	26	29	21	24
95th percentile	55	51	62	67	57	46	60	47	51

- not applicable
a. Excludes bulk cargoes and refers to break bulk commodities including machinery, iron and steel products, timber, paper and timber products and other general products.
b. Break bulk trade dropped signifficantly at Sydney Ports as the result of cessation of trade when the Darling Harbour berths closed at the end of September 2007.
c. Comparisons between ports are not appropriate because each port authority/corporation has a different structure.
d. Port turnaround times refer only to ships calling at container terminals. Comparisons between ports are not appropriate because each port has a different set of parameters to measure the turnaround time. Normally, only inter-temporal comparison at individual ports is of use.
e. Components may not sum to totals due to rounding.

Source: Ports Australia

CHAPTER 6
Stevedoring and ship arrival reliability

Overview

This chapter presents two quarterly indicators of waterfront reliability: stevedoring cargo receival and ship arrival advice.

Explanatory notes

Stevedoring-cargo receival

Table 6.1 present the information on cargo receival at major container terminals. The indicator for each port is prepared by combining each stevedore's cargo availability figures with the proportion of container lifts handled at the stevedore's terminals at the port to produce the weighted mean presented in Table 6.1. Stevedoring reliability data was not available for Adelaide.

Ship arrival

Table 6.1 also include data for two indicators of ship arrival advice.

The first indicator is the percentage of ship arrivals within one hour of the most recently advised arrival time available to the port authority/corporation at 24 hours prior to actual arrival. Data was not available for Melbourne.

The second indicator is the percentage of ship arrivals within one hour of the last scheduled arrival time advised inside the 24 hours prior to actual arrival. Data was not available for Melbourne. Abbreviations

Table 6.1 Stevedoring and ship arrival reliability indicators

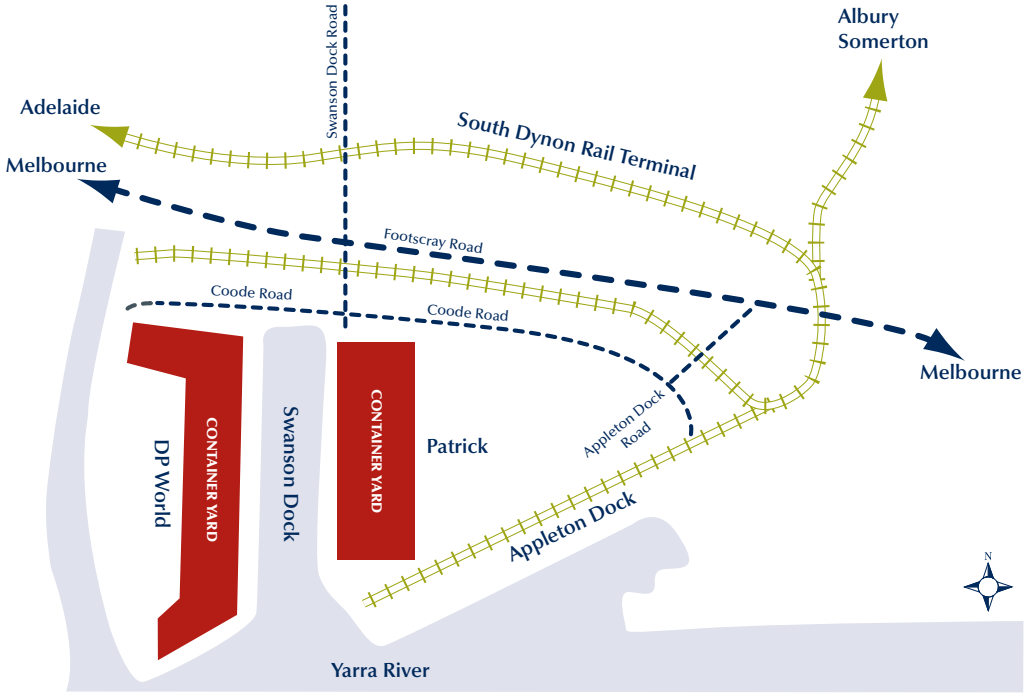
Indicator	Brisbane		Sydney		Melbourne		Adelaide		Fremantle	
	Jan-Mar 2011	Apr-June 2011	Jan-Mar 2011	Apr-June 2011	Jan-Mar 2011	Apr-June 2011	Jan-Mar 2011	Apr-June 2011	Jan-Mar 2011	Apr-June 2011
Stevedoring										
Cargo receival	89.2	87.4	67.2	65.8	96.9	98.3	na	na	91.7	92.5
Ship arrival										
Advice at 24 hrs	97.7	96.4	38.0	35.0	na	na	97.0	100.0	na	na
Advice inside 24 hrs	98.0	99.0	90.0	93.0	na	na	98.0	98.0	na	na

na not available

Sources: Ports Australia, Patrick, DP World Terminals

APPENDIX A
Diagrams of five major Australian container port terminals

FA1 Patrick and DP World terminals—Swanson dock, Port Melbourne, Victoria

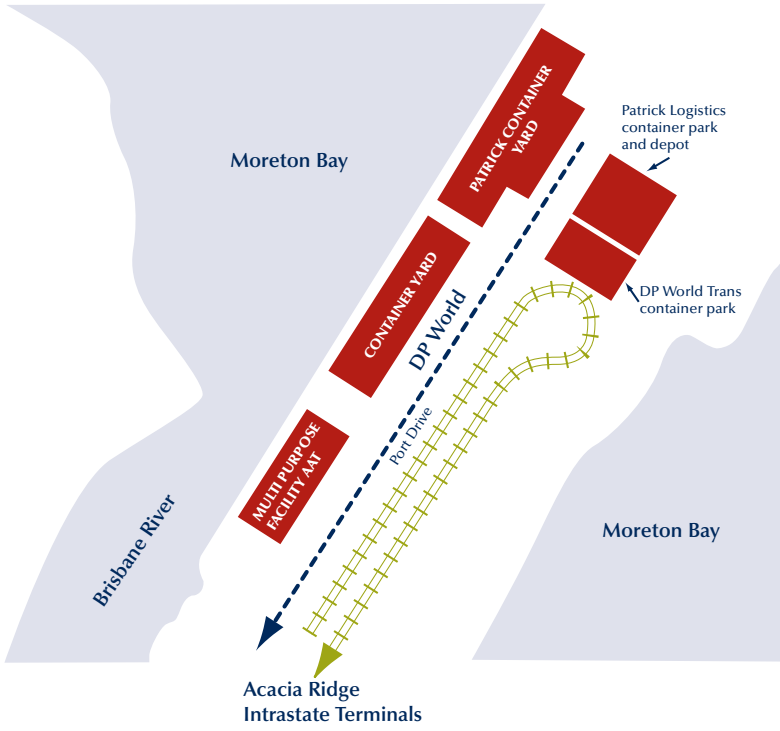


Patrick and DP World container terminals, Swanson Dock, Port Melbourne, Victoria

Note: For DP World and Patrick trains from the Wanston Dock to access the rail network they have to cross Footscray Road. This access is being improved with a grade separation funded by an Auslink National Project. The trains pass throught the South Dynon rail terminal which is only a few hundred metres north of Footscray Road. The diagram is correct as as March 2007.

Source: DOTARS (2006), DOTARS (2007a), DP World (2007b), Google Maps Australia (2007), Patrick (2007c), Port of Melbourne (2006), SKM (2003).

FA2 Patrick and DP World terminals—Fisherman Islands, Port of Brisbane, Queensland

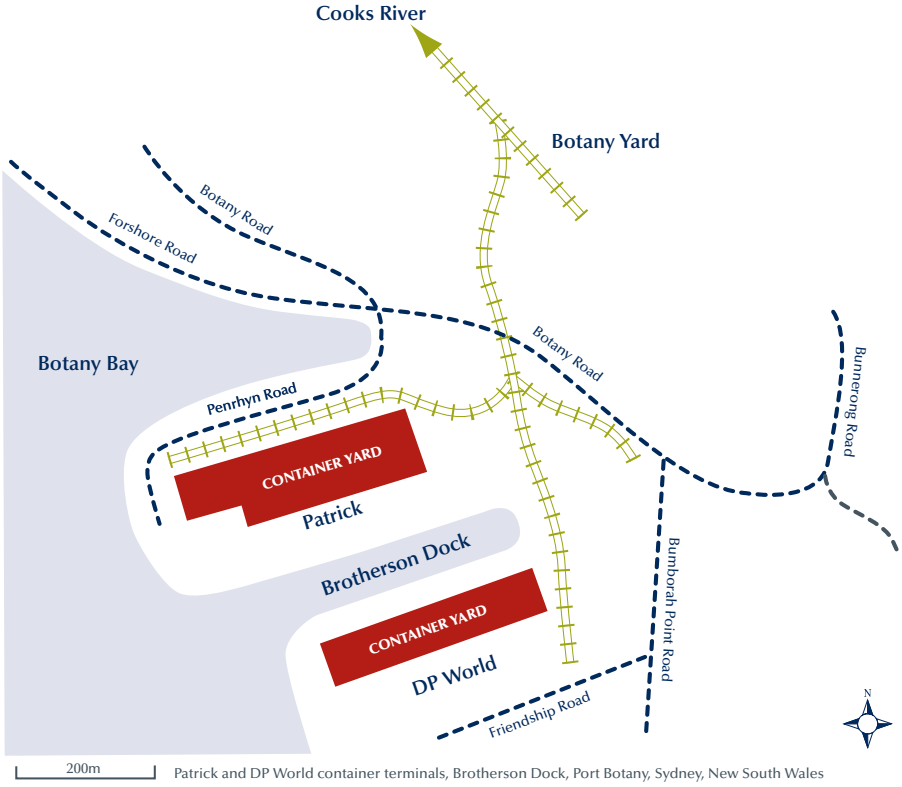


AAT, Patrick and DP World container terminals, Fisherman Islands, Port of Brisbane, Queensland

Note: This is a purpose built container terminal and includes a near dock rail terminal shared by the two stevedores for export and import containers and Australian Amalgamated Terminals (AAT) which provides a multi purpose facility with container handling capacity which can be used for motor vehicles as well as other stevedoring activities. Berths 1 to 3 are leased by AAT, berths 4 to 6 are leased by DP World and berths 7 to 9 are leased by Patrick for their Autostrad container terminal. The rail terminal has a direct turning loop which avoids shunting of trains. The Fisherman Islands terminal is connected to the Acacia Ridge terminal and to regional terminals. The Acacia Ridge multi-modal container terminal is connected to the intrastate narrow gauge rail network as well as the interstate standard gauge network. The diagram is correct as at March 2007.

Source: DP World (2007b), Google Maps Australia (2007), DOTARS (2006), Patrick (2007b), Port of Brisbane (2007).

FA3 Patrick and DP World terminals—Brogtherson dock, Port Botany, Sydney, New South Wales

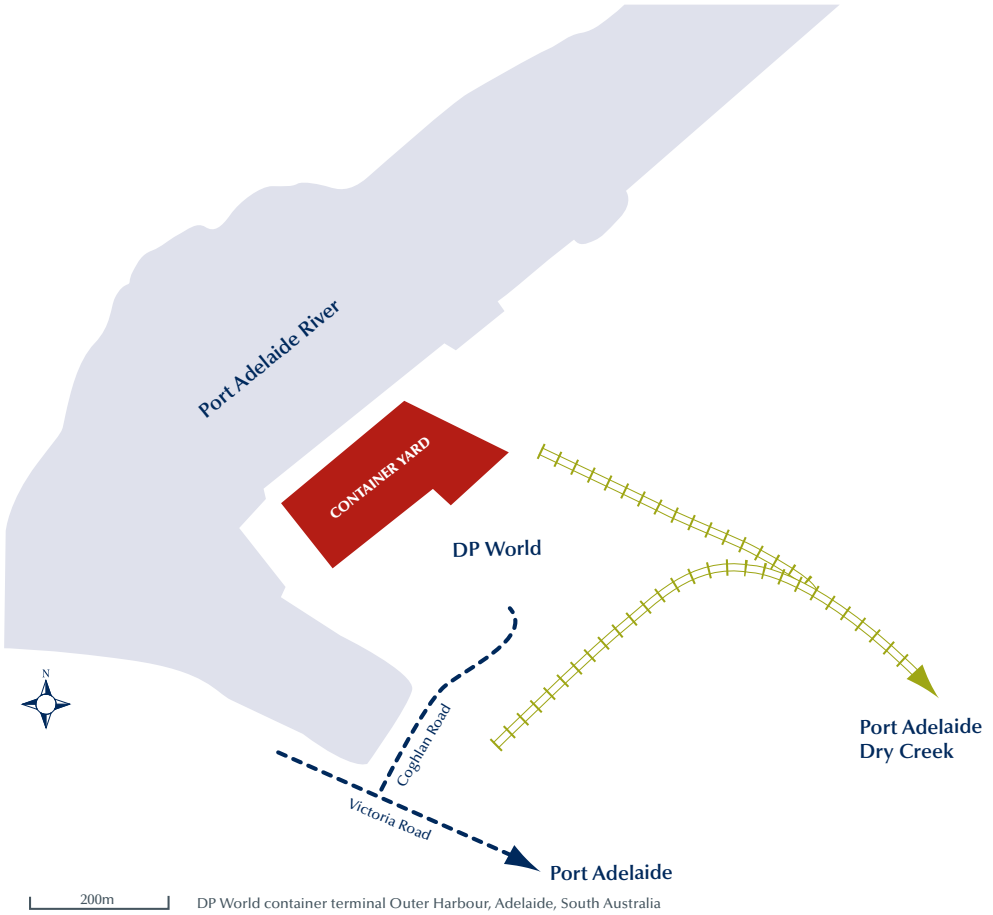


Patrick and DP World container terminals, Brotherson Dock, Port Botany, Sydney, New South Wales

Note: Port Botany has on-dock rail terminals. Access for both DP World and Patrick is directly adjacent to the container yards making it easier to load containers directly on to trains. Trains with containers for both the stevedores are split up at the Botany Rail Yard which is adjacent to the container terminal at Brotherson dock. DP World Transport has an intermodal terminal adjacent to the Port Botany container terminals which is used primarily for empty containers. Further down (about 8 kilometres) along the Botany Freight Rail Line, the Cooks River terminal is also used for empty containers. To the west of the metropolitan area are intermodal terminals at Yennora, Leightonfield, Minto and Camellia. Development of the Port Botany rail link is planned as part of an Auslink National Project. The diagram is correct as at March 2007.

Source: DOTARS (2007b), DP World (2007b), Freight Industry Advisory Board (2005), Google Maps Australia (2007), DOTARS (2006), Patrick (2007c).

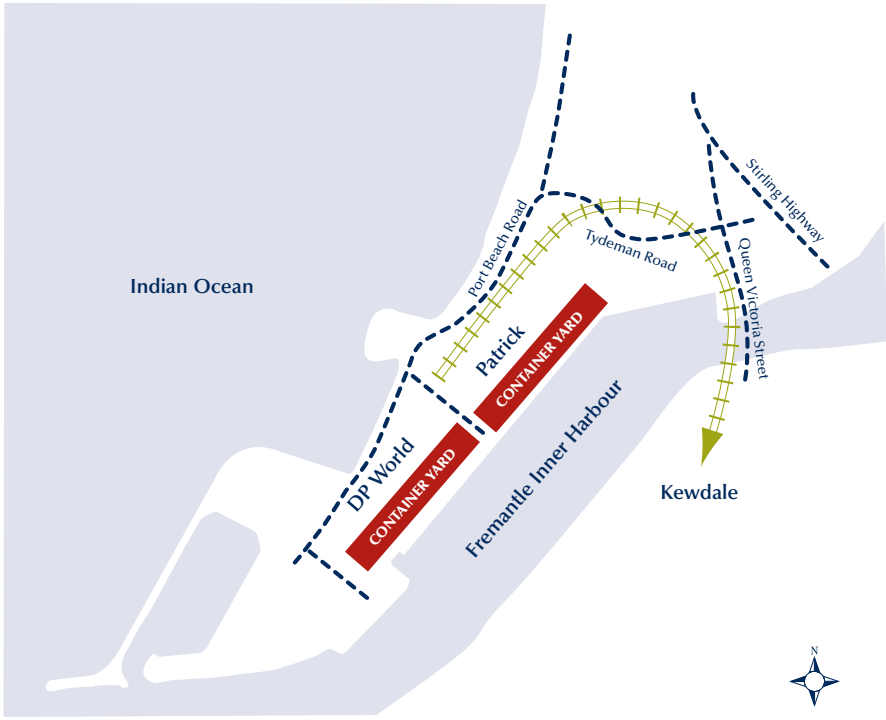
FA4 DP World terminal—Outer Harbour, Adelaide



Note: This is the only container terminal at Adelaide. It is operated by DP World stevedores, is located at Pelican Point, Outer Harbour, approximately 10 kilometres from Port Adelaide. It has an on-dock rail terminal adjacent to a container depot which in turn is connected via Port Adelaide to the Dry Creek intermodal terminal by a dual guage (broad and standard guage) line. The link is to be improved as an Auslink National Project by a new rail bridge across the Port River and Port Adelaide as Stage 3 of the Port River Expressway Upgrade (DOTARS 2007c). The diagram is correct as at March 2007.

Source: DOTARS (2007c), DP World (2007b), Google Maps Australia (2007), DOTARS (2006).

FA5 Patrick and DP World container terminals—North Quay, Fremantle



Patrick and DP World container terminals, North Quay, Fremantle, Western Australia

Note: The container terminal has a rail terminal adjacent to the Patrick container yard. The DP World terminal is located further along the dock. The rail terminal on North Quay has recently been upgraded as an Auslink National Project. The new link is dual guage providing access for narrow guage trains to the terminal. Containers travelling by rail have as origin/destination the Perth metropolitan area, regional Western Australia or are land bridged to Adelaide. However interstate containers (land bridge) are not dispatched directly from the Inner Harbour rail terminal but from Kewdale, which is Perth's only intermodal terminal. The diagram is correct as at March 2007.

Source: Department of Planning and Infrastructure (2004), DOTARS (2006), DP World (2007b), Fremantle Ports (2007), Google Maps Australia (2007), DOTARS (2007d), Patrick (2007c).

Abbreviations

ABS	Australian Bureau of Statistics
ACCC	Australian Competition and Consumer Commission
Avge	Average
BTCE	Bureau of Transport and Communications Economics
BTRE	Bureau of Transport and Regional Economics
BITRE	Bureau of Infrastructure, Transport and Regional Economics
CVP	Continuing Voyage Permit
DOTARS	Department of Transport and Regional Services
DP World	Dubai Ports World
Five port	The five mainland capital city ports (Brisbane, Sydney, Melbourne, Adelaide, Fremantle)
GT	Gross tons, formerly abbreviated as GRT
Hrs	Hours
Infrastructure	Department of Infrastructure and Transport
na	Not available
Mins	minutes
Pbm	Per berth metre
PICI	Port Interface Cost Index
R	revised
SVP	Single Voyage Permit
TEUS	Twenty-foot equivalent units
TTT	Truck turnaround time
UCC	Unitized Cellular Container vessel
VBS	Vehicle Booking System

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