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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 2010.

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
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- customs brokers
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- pilot, tug and mooring operators
- stevedoring companies: Patrick and DP World; and
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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. For further information on this publication please contact: at email: waterline@infrastructure.gov.au; Telephone: (02) 6274 7168; Fax: (02) 6274 7727.

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In-brief

Land-side performance indicators

After a decline in March and June quarters of 2009, handling of TEUs in all major Australian ports recovered in the remainder of 2009 and 2010. Productivity of truck turnaround in five ports improved from 34.2 minutes in March 2009 to 32.2 in March 2010 and from 35.6 to 35.2 minutes in June quarters of 2009 and 2010 respectively. Shift work in trucking containers, as measured by the adjusted booking system, indicated an increase of evening and weekend work from 23.8 per cent in June quarter 2009 to 28.9 per cent in June quarter of 2010. In the same period, a decline in day shift share from 64.6 to 58.4 per cent was noted. This improvement in utilisation of shift work was strongest in Brisbane and Sydney whilst in Melbourne and Fremantle day shift work slightly increased.

Wharf-side productivity

The number of containers handled in five Australian ports increased in June quarter 2010 by 12.3 per cent, as compared with June quarter 2009. This increase in container handling was particularly strong in Sydney (15.7 per cent), Melbourne (13.4 per cent) and Brisbane (12.5 per cent). At the same time, a small decline was noted in container handling in Adelaide.

Container terminal performance rates in five ports, as measured by crane rates, worsened from 29.8 TEUs in March quarter of 2009 to 28.7 in June quarter of 2010. However, ship rates improved in the same period from 48.5 to 50.4 TEUs respectively.

Port-interface cost index

Between January and June 2010, the National port interface cost indices for

15 000-20 000 GT increased in nominal terms to 817 from 813 for imports and to 781 from 771 between July and December 2009, whilst the real price indices declined to 596 from 603 for imports and for exports declined to 570 from 572, respectively.

For container ships in the 35 000-40 000 GT category the National port interface cost indices increased in nominal terms to 813 from 806 for imports and to 777 from 764 between July and December 2009. The real price indices declined to 593 from 598 for imports and declined for exports to 566 from 567, respectively.

Elapsed berth time for smaller ship category (monitored GT 17 215) declined in Fremantle from 38 to 35 hours but increased in all other ports, except for Brisbane, where it was stable at 19 hours. For the larger ship category (GT

37 394) the elapsed berth time increased in Sydney (from 42 to 48 hours), Melbourne (from 30 to 33 hours) and Brisbane (from 28 to 29 hours) but declined in Adelaide (from 29 to 24 hours) and Fremantle (from 29 to 26 hours).

Container ship visits

During the period of fiscal year 2009/10, the dominating ship size visiting Melbourne and Sydney was 25 000-30 000 GT, with 260 and 248 visits respectively, whereas for Fremantle the dominating size was 50 000-55 000 GT with 145 visits. The average TEUs per visit has been also increasing in largest ship categories visiting Australian ports but declined in the remaining ship categories.

Port performance – non-financial indicators

Imports of containerised cargo in five ports, as measured by TEUs exchanged, increased from 1.12 in January-June 2009 to 1.25 million TEUs in January-June 2010. The total container exchanges increased in the same period from 2.55 to 2.82 million TEUs due to increased imports of empty and exports of full containers.

Wharf and ship reliability

Except for Melbourne, cargo receipt at major container terminals worsened slightly between January and June 2010, as compared with previous year. Ship arrival indicators indicate deterioration over January – June 2010, except for Brisbane. Both indicators demonstrate a pronounced seasonal pattern.

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CHAPTER I

Landside of the port terminal

Overview

Chapter I 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 I.1 and Figures I.1 to Figures I.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 I.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 seven day week.

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 I.I](#) 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 I.I 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 I.I 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	Jun-08	Sep-08	Dec-08	Mar-09	Jun-09	Sep-09	Dec-09	Mar-10	Jun-10
Five ports									
Road									
Total trucks	479 677	507 328	500 910	412 415	409 456	440 753	499 009	457 146	464 317
Total containers	864 190	893 091	880 899	703 729	712 322	794 784	878 923	814 180	823 382
Total TEUS	1 165 539	1 253 145	1 239 292	961 507	984 402	1 117 423	1 253 505	1 144 636	1 153 947
Truck turnaround time – mins.	38.0	40.6	38.1	34.2	35.6	34.7	34.9	32.2	35.2
Containers per truck	1.7	1.6	1.7	1.7	1.7	1.8	1.8	1.8	1.8
Avg. container turnaround time – mins.	24.0	26.0	24.6	22.0	22.6	22.1	23.1	21.3	23.4
TEUS per truck	2.4	2.4	2.4	2.4	2.4	2.5	2.4	2.4	2.4
Rail									
Total containers (excl. Adel. and Frem.)	83 408	86 954	92 120	82 523	85 566	97 279	97 926	83 539	86 894
Number of VBS timeslots available									
Overall total	668 917	667 465	659 686	617 056	575 755	623 485	644 167	616 067	644 087
Monday- Friday									
Day (0600-1800)	366 142	369 195	353 132	337 673	347 817	372 604	365 315	351 597	360 739
Evening (1800-2400)	145 837	143 686	140 626	140 179	125 965	133 834	135 007	133 163	142 925
Night (2400 - 0600)	99 395	102 986	101 428	90 224	67 155	75 701	77 795	72 690	78 749
Sub total	611 374	615 867	595 186	568 076	540 937	582 139	578 117	557 450	582 413
Saturday									
Day (0600-1800)	31 199	27 914	32 417	27 417	19 457	19 498	29 929	25 629	26 888
Evening (1800-2400)	4 084	4 166	4 555	4 142	1 839	1 822	4 610	4 539	5 398
Night (2400 - 0600)	7 398	6 968	7 586	2 737	3 285	3 986	6 357	6 934	7 238
Sub total	42 681	39 048	44 558	34 296	24 581	25 306	40 896	37 102	39 524
Sunday									
Day (0600-1800)	1 527	1 630	4 197	3 393	2 575	4 638	11 950	10 004	10 614
Evening (1800-2400)	4 993	2 243	6 423	2 646	2 406	5 488	6 346	5 851	5 988
Night (2400 - 0600)	8 342	8 677	9 322	8 645	5 256	5 914	6 858	5 660	5 548
Sub total	14 862	12 550	19 942	14 684	10 237	16 040	25 154	21 515	22 150
Number of VBS timeslots used									
Overall total	567 555	566 593	558 788	527 776	506 960	559 740	588 221	554 371	579 833
Monday- Friday									
Day (0600-1800)	338 318	337 855	325 265	315 215	327 292	352 221	348 291	334 119	338 163
Evening (1800-2400)	114 351	112 213	111 958	110 502	96 526	109 347	120 255	116 194	123 927
Night (2400 - 0600)	81 504	85 446	83 317	75 030	58 566	68 685	72 096	66 739	73 852
Sub total	534 173	535 514	520 540	500 746	482 384	530 253	540 642	517 052	535 942
Saturday									
Day (0600-1800)	19 154	15 445	19 452	14 435	13 056	12 933	22 689	17 593	21 360
Evening (1800-2400)	944	1 206	1 380	1 210	1 247	1 317	2 258	1 467	2 578
Night (2400 - 0600)	5 877	5 336	5 825	1 733	2 768	3 711	4 422	4 179	4 130
Sub total	25 975	21 987	26 657	17 378	17 071	17 961	29 369	23 239	28 068
Sunday									
Day (0600-1800)	771	820	2 095	1 053	1 396	2 486	7 921	5 339	6 632
Evening (1800-2400)	973	1 629	3 101	1 992	2 079	3 944	4 433	3 949	4 377
Night (2400 - 0600)	5 662	6 644	6 395	6 606	4 030	5 096	5 856	4 792	4 814
Sub total	7 406	9 093	11 591	9 651	7 505	11 526	18 210	14 080	15 823
Brisbane									
Road									
Total trucks	72 946	79 345	75 460	61 434	63 109	66 754	74 285	62 273	62 914
Total containers	142 301	148 818	148 488	110 461	121 257	132 151	143 580	126 845	131 037
TEUS	204 282	219 576	213 936	154 765	171 089	190 140	211 979	184 328	188 537
Truck turnaround time - mins. ^a	47.3	48.5	47.8	39.9	40.7	39.1	38.2	33.8	37.6
Containers per truck	1.8	1.7	1.8	1.8	1.9	2.0	1.9	2.0	2.1
Avg. container turnaround time - mins.	25.4	28.1	26.2	22.0	21.8	20.9	21.9	19.7	21.5
TEUS per truck	2.6	2.5	2.5	2.5	2.6	2.6	2.5	2.4	2.4
Rail									
Total containers ^b	13 929	15 722	14 747	10 040	10 988	12 510	13 277	6 603	13 303
Number of VBS timeslots available									
Overall total	108 882	108 786	101 717	104 692	74 528	75 718	77 642	84 371	95 820
Monday- Friday									
Day (0600-1800)	47 750	46 811	44 161	48 262	52 252	53 588	55 317	57 733	62 148
Evening (1800-2400)	22 731	23 023	21 564	22 386	16 416	15 826	16 246	20 268	24 763
Night (2400 - 0600)	27 119	28 813	25 296	25 502	2 098	2 182	2 484	2 590	3 915
Sub total	97 600	98 647	91 021	96 150	70 766	71 596	74 047	80 591	90 826
Saturday									
Day (0600-1800)	6 046	5 155	5 507	5 180	3 262	3 063	3 100	3 233	4 191
Evening (1800-2400)	171	19	0	0	0	0	0	38	286
Night (2400 - 0600)	2 088	2 024	2 143	421	0	0	0	0	0
Sub total	8 305	7 198	7 650	5 601	3 262	3 063	3 100	3 271	4 477
Sunday									
Day (0600-1800)	0	0	0	0	0	134	0	0	4
Evening (1800-2400)	0	0	0	0	0	541	459	509	511
Night (2400 - 0600)	2 977	2 941	3 046	2 941	499	541	459	509	511
Sub total	2 977	2 941	3 046	2 941	500	1 059	495	509	517
Number of VBS timeslots used									
Overall total	86 255	85 893	78 676	83 562	65 083	67 591	73 709	78 553	91 681
Monday- Friday									
Day (0600-1800)	41 940	41 754	39 166	43 491	47 974	50 512	53 777	55 771	60 005
Evening (1800-2400)	17 729	16 862	16 100	17 323	13 326	13 605	15 415	18 408	23 555
Night (2400 - 0600)	19 153	21 117	17 224	17 899	1 923	1 998	2 447	2 372	3 779
Sub total	78 822	79 734	72 491	78 713	63 222	66 115	71 639	76 551	87 339
Saturday									
Day (0600-1800)	3 944	2 837	2 918	2 953	1 497	850	1 622	1 519	3 582
Evening (1800-2400)	112	0	0	0	0	0	0	38	281
Night (2400 - 0600)	1 928	1 572	1 552	146	0	0	0	0	0
Sub total	5 984	4 409	4 470	3 099	1 497	850	1 622	1 557	3 863
Sunday									
Day (0600-1800)	0	0	0	0	0	103	36	0	2
Evening (1800-2400)	0	0	0	0	0	35	0	0	4
Night (2400 - 0600)	1 449	1 750	1 716	1 750	364	488	412	445	473
Sub total	1 449	1 750	1 716	1 750	364	626	448	445	479

Table 1.1 Container terminal landside performance indicators

Port/Indicator	Jun-08	Sep-08	Dec-08	Mar-09	Jun-09	Sep-09	Dec-09	Mar-10	Jun-10
Sydney									
Road									
Total trucks	133 225	140 901	136 158	113 625	111 935	123 163	144 586	127 177	129 819
Total containers	227 445	244 910	242 330	190 120	186 230	218 899	257 143	226 630	234 419
TEUS	335 680	362 200	363 603	284 720	278 400	332 314	394 624	340 033	352 014
Truck turnaround time – mins.	44.1	51.6	48.7	42.2	45.6	45.5	44.7	38.8	46.2
Containers per truck	1.5	1.5	1.5	1.7	1.7	1.8	1.8	1.8	1.8
Avg. container turnaround time - mins.	35.5	42.6	37.9	32.8	35.4	35.0	36.6	32.4	40.3
TEUS per truck	2.2	2.2	2.3	2.2	2.3	2.4	2.3	2.3	2.3
Rail									
Total containers	57 067	56 247	58 862	55 757	57 017	63 498	62 900	56 772	53 938
Number of VBS timeslots available									
Overall total	183 633	178 481	187 112	165 547	141 455	164 745	181 402	166 464	178 200
Monday- Friday									
Day (0600-1800)	90 034	92 286	88 735	79 473	74 182	83 894	80 086	73 345	76 337
Evening (1800-2400)	35 822	33 424	34 639	34 131	28 094	34 100	36 182	31 969	34 874
Night (2400 - 0600)	30 407	31 410	33 959	28 664	27 417	30 075	31 027	28 593	30 399
Sub total	156 263	157 120	157 333	142 268	129 693	148 069	147 295	133 907	141 610
Saturday									
Day (0600-1800)	13 071	11 100	11 852	12 132	5 656	5 760	10 299	9 277	11 102
Evening (1800-2400)	2 968	2 553	2 377	2 551	120	8	2 642	3 102	3 392
Night (2400 - 0600)	2 555	2 087	2 794	2 316	1 296	1 658	4 566	4 372	5 540
Sub total	18 594	15 740	17 023	16 999	7 072	7 426	17 507	16 751	20 034
Sunday									
Day (0600-1800)	1 527	1 302	4 122	1 578	733	2 566	9 286	8 335	8 840
Evening (1800-2400)	4 297	976	4 901	1 391	1 136	3 877	4 378	4 453	4 680
Night (2400 - 0600)	2 952	3 343	3 733	3 311	2 821	2 807	2 936	3 018	3 036
Sub total	8 776	5 621	12 756	6 280	4 690	9 250	16 600	15 806	16 556
Number of VBS timeslots used									
Overall total	139 823	146 186	146 922	139 950	123 281	154 169	163 483	144 661	157 595
Monday- Friday									
Day (0600-1800)	80 590	82 176	79 326	74 969	70 781	81 772	77 442	69 502	71 372
Evening (1800-2400)	24 525	26 586	25 977	27 410	21 223	30 802	34 499	30 445	32 426
Night (2400 - 0600)	23 984	26 638	28 074	25 588	21 999	27 479	29 201	25 867	29 000
Sub total	129 100	135 400	133 376	127 967	114 003	140 052	141 141	125 815	132 797
Saturday									
Day (0600-1800)	5 616	5 178	5 228	5 304	4 340	5 347	7 872	6 256	9 091
Evening (1800-2400)	220	137	33	137	3	5	305	253	1 052
Night (2400 - 0600)	1 414	1 098	1 987	1 587	1 228	1 615	2 714	1 821	2 775
Sub total	7 250	6 413	7 248	7 028	5 571	6 967	10 891	8 330	12 918
Sunday									
Day (0600-1800)	724	634	1 630	879	696	1 868	6 170	4 924	5 998
Evening (1800-2400)	485	596	1 796	971	992	2 630	2 746	2 836	3 253
Night (2400 - 0600)	2 264	3 143	2 872	3 105	2 019	2 652	2 535	2 756	2 629
Sub total	3 473	4 373	6 298	4 955	3 707	7 150	11 451	10 516	11 880
Melbourne									
Road									
Total trucks	192 996	208 763	209 862	165 562	167 209	181 341	203 071	195 108	201 035
Total containers	335 025	356 461	349 015	286 682	286 158	320 448	340 029	330 962	333 414
TEUS	477 662	515 555	502 706	404 365	406 723	460 103	492 353	476 200	479 041
Truck turnaround time – mins.	28.5	27.2	25.8	28.1	27.1	26.6	26.2	27.2	25.7
Containers per truck	1.7	1.7	1.7	1.7	1.7	1.8	1.7	1.7	1.7
Avg. container turnaround time -mins.	17.2	16.4	16.0	17.4	17.0	16.0	16.4	17.0	16.3
TEUS per truck	2.5	2.5	2.4	2.4	2.4	2.5	2.4	2.4	2.4
Rail									
Total containers ^b	12 412	14 985	18 511	16 726	17 561	21 271	21 749	20 164	19 653
Number of VBS timeslots available									
Overall total	250 670	251 124	245 488	222 378	239 268	257 447	259 023	243 045	245 377
Monday- Friday									
Day (0600-1800)	140 400	139 851	133 117	123 712	137 528	147 206	139 652	132 102	135 286
Evening (1800-2400)	50 225	49 052	47 844	45 795	45 145	48 147	49 635	48 128	47 758
Night (2400 - 0600)	41 793	42 763	42 003	36 053	37 640	42 030	43 281	41 171	43 331
Sub total	232 418	231 666	222 964	205 560	220 313	237 383	232 568	221 401	226 375
Saturday									
Day (0600-1800)	11 443	11 019	13 566	9 768	10 271	10 191	14 673	12 483	10 608
Evening (1800-2400)	945	1 594	2 174	1 589	1 719	1 814	1 968	1 399	1 720
Night (2400 - 0600)	2 755	2 857	2 649	0	1 989	2 328	1 791	2 562	1 698
Sub total	15 143	15 470	18 389	11 357	13 979	14 333	18 432	16 444	14 026
Sunday									
Day (0600-1800)	0	328	75	1 813	1 770	1 688	2 592	1 669	1 770
Evening (1800-2400)	696	1 267	1 522	1 255	1 270	1 477	1 968	1 398	1 270
Night (2400 - 0600)	2 413	2 393	2 538	2 393	1 936	2 566	3 463	2 133	1 936
Sub total	3 109	3 988	4 135	5 461	4 976	5 731	8 023	5 200	4 976
Number of VBS timeslots used									
Overall total	231 844	225 456	224 096	197 459	220 632	235 683	239 286	223 685	226 025
Monday- Friday									
Day (0600-1800)	131 860	130 144	125 083	115 308	130 838	138 390	132 104	125 420	128 080
Evening (1800-2400)	46 782	44 155	44 322	40 900	42 679	45 489	46 950	44 560	44 788
Night (2400 - 0600)	38 367	37 691	37 853	31 538	34 644	38 609	39 898	38 171	40 005
Sub total	217 010	211 990	207 259	187 746	208 162	222 489	218 953	208 152	212 874
Saturday									
Day (0600-1800)	9 251	6 947	10 099	5 870	6 952	6 551	12 077	9 295	7 817
Evening (1800-2400)	612	1 069	1 345	1 071	1 244	1 312	1 953	1 176	1 245
Night (2400 - 0600)	2 535	2 666	2 286	0	1 540	2 096	1 708	2 358	1 355
Sub total	12 398	10 682	13 730	6 941	9 736	9 959	15 738	12 829	10 417
Sunday									
Day (0600-1800)									
Evening (1800-2400)	488	1 033	1 305	1 021	1 087	1 279	1 687	1 113	1 087
Night (2400 - 0600)	1 949	1 751	1 802	1 751	1 647	1 956	2 909	1 591	1 647
Sub total	2 437	2 784	3 107	2 772	2 734	3 235	4 596	2 704	2 734

Table 1.1 Container terminal landside performance indicators

Port/Indicator	Jun-08	Sep-08	Dec-08	Mar-09	Jun-09	Sep-09	Dec-09	Mar-10	Jun-10
Adelaide									
Road									
Total trucks	24 823	21 094	19 239	21 094	18 289	19 754	19 924	20 230	20 409
Total containers	51 922	33 118	30 924	33 118	28 327	30 697	32 029	30 692	31 061
TEUS	73 403	44 236	41 741	44 236	38 528	42 709	44 621	41 719	42 222
Truck turnaround time – mins.	35.4	29.2	37.8	29.2	28.6	32.8	34.2	28.3	28.6
Containers per truck	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.5	1.5
Avg. container turnaround time - mins.	22.5	18.6	23.5	18.6	18.4	21.1	21.3	18.6	18.8
TEUS per truck	2.1	2.1	2.2	2.1	2.1	2.2	2.2	2.1	2.1
Rail									
Total containers	na	na	na	na	na	na	na	na	na
Number of VBS timeslots available									
Overall total	39 706	40 661	38 033	40 661	37 492	40 738	39 156	37 869	38 008
Monday- Friday									
Day (0700-1400)	23 248	24 239	22 891	24 239	22 297	23 869	23 491	22 324	22 355
Evening (1400-2200)	16 458	16 422	15 142	16 422	15 195	16 869	15 665	15 545	15 653
Night (2200 - 0700)	0	0	0	0	0	0	0	0	0
Sub total	39 706	40 661	38 033	40 661	37 492	40 738	39 156	37 869	38 008
Number of VBS timeslots used									
Overall total	33 889	31 601	30 786	31 601	25 081	27 541	28 797	27 400	27 490
Monday- Friday									
Day (0700-1400)	22 632	22 101	21 106	22 101	18 297	19 847	20 017	18 931	19 371
Evening (1400-2200)	11 257	9 500	9 680	9 500	6 785	7 694	8 780	8 469	8 119
Night (2200 - 0700)	0	0	0	0	0	0	0	0	0
Sub total	33 889	31 601	30 786	31 601	25 081	27 541	28 797	27 400	27 490
Fremantle									
Road									
Total trucks	55 687	57 225	60 191	50 700	48 914	49 741	57 143	52 358	50 140
Total containers	107 497	109 784	110 142	83 348	90 350	92 589	106 142	99 051	93 451
TEUS	147 915	155 815	159 047	117 657	128 190	134 866	154 550	144 075	134 355
Truck turnaround time – mins.	32.0	34.1	29.6	28.7	30.5	28.3	30.7	29.2	31.9
Containers per truck	1.7	1.6	1.6	1.6	1.8	1.9	1.9	1.9	1.9
Avg. container turnaround time - mins.	18.7	20.7	18.3	17.5	18.4	17.2	19.1	18.2	19.7
TEUS per truck	2.4	2.4	2.3	2.3	2.3	2.4	2.3	2.3	2.3
Rail									
Total containers	na	na	na	na	na	na	na	na	na
Number of VBS timeslots available									
Overall total	86 026	88 413	87 336	83 778	83 012	84 837	86 944	84 318	86 682
Monday- Friday									
Day (0600-1800)	64 710	66 008	64 228	61 987	61 558	64 047	66 769	66 093	64 613
Evening (1800-2400)	20 601	21 765	21 437	21 445	21 115	18 892	17 279	17 253	19 877
Night (2400 - 0600)	76	0	170	5	0	1 414	1 003	336	1 104
Sub total	85 387	87 773	85 835	83 437	82 673	84 353	85 051	83 682	85 594
Saturday									
Day (0600-1800)	639	640	1 492	337	268	484	1 857	636	987
Evening (1800-2400)	0	0	4	2	0	0	0	0	0
Night (2400 - 0600)	0	0	0	0	0	0	0	0	0
Sub total	639	640	1 496	339	268	484	1 857	636	987
Sunday									
Day (0600-1800)	0	0	0	2	71	0	36	0	2
Evening (1800-2400)	0	0	0	0	0	0	0	0	34
Night (2400 - 0600)	0	0	5	0	0	0	0	0	65
Sub total	0	0	5	2	71	0	36	0	101
Number of VBS timeslots used									
Overall total	75 696	77 272	77 669	75 024	72 252	73 642	80 717	79 329	75 280
Monday- Friday									
Day (0600-1800)	61 296	61 679	60 584	59 345	59 402	61 700	64 952	64 495	59 336
Evening (1800-2400)	14 057	15 110	15 879	15 369	12 514	11 757	14 611	14 311	15 039
Night (2400 - 0600)	0	0	0	0	0	0	0	0	0
Sub total	75 353	76 789	76 462	74 714	71 915	73 457	79 563	78 806	74 375
Saturday									
Day (0600-1800)	343	483	1 207	308	267	185	1 118	523	870
Evening (1800-2400)	0	0	0	0	0	0	0	0	0
Night (2400 - 0600)	0	0	0	0	0	0	0	0	0
Sub total	343	483	1 207	308	267	185	1 118	523	870
Sunday									
Day (0600-1800)	0	0	0	2	70	0	36	0	2
Evening (1800-2400)	0	0	0	0	0	0	0	0	33
Night (2400 - 0600)	0	0	0	0	0	0	0	0	0
Sub total	0	0	0	2	70	0	36	0	35

na not available

VBS stands for vehicle booking system.

a. Truck turnaround time in Brisbane includes some truck waiting time outside the terminal gate.

b. This data is incomplete because stevedores do not collect all rail data.

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.

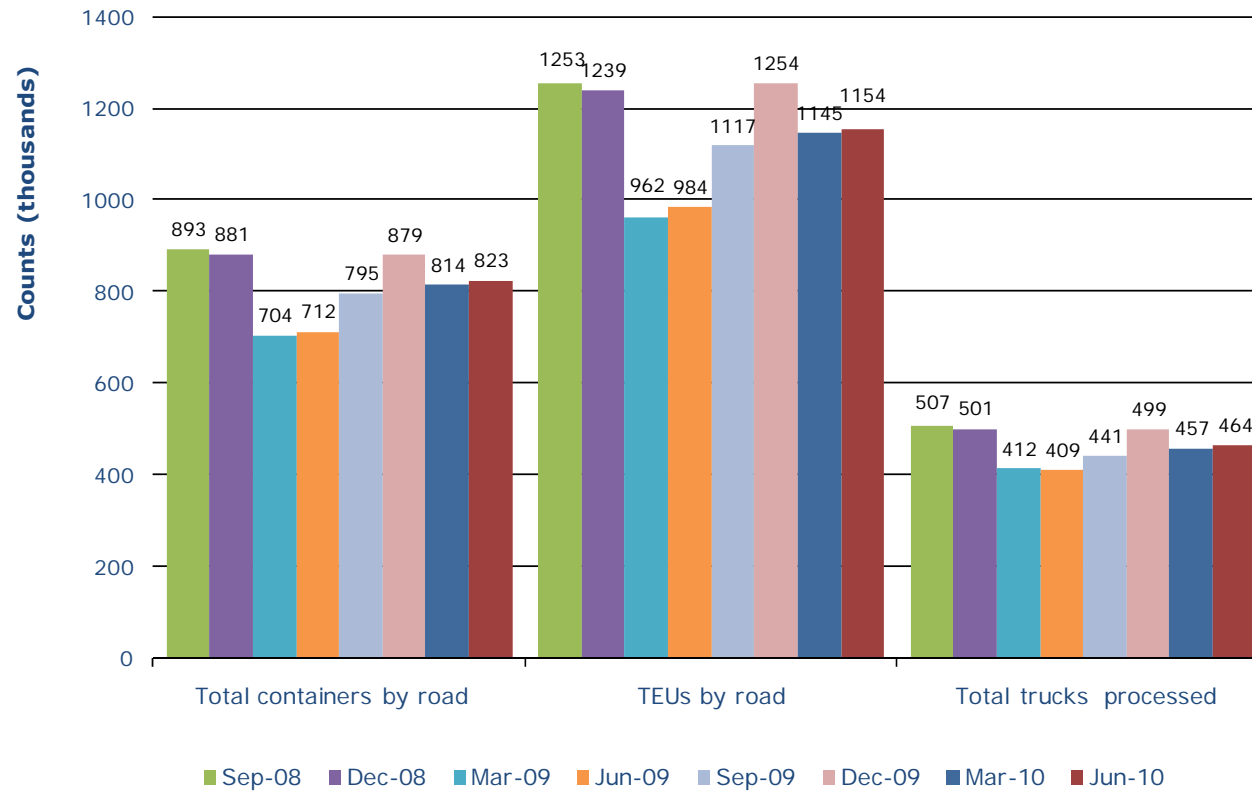
The rail sidings in Brisbane, Fremantle, Adelaide and DP World, Melbourne are near dock.

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.

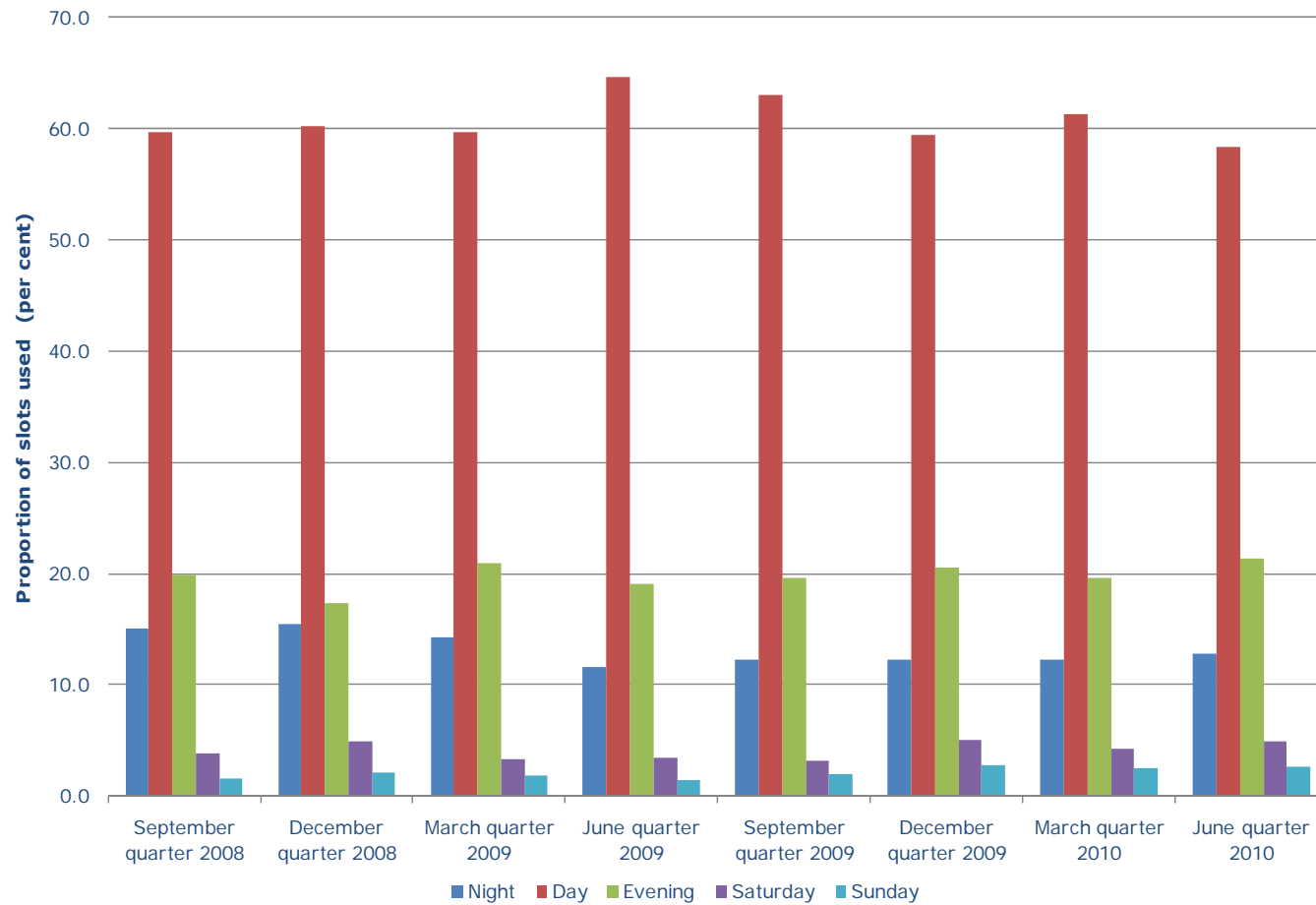
Sources: Patrick, DP World.

Figure 1.1 Five major ports 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.

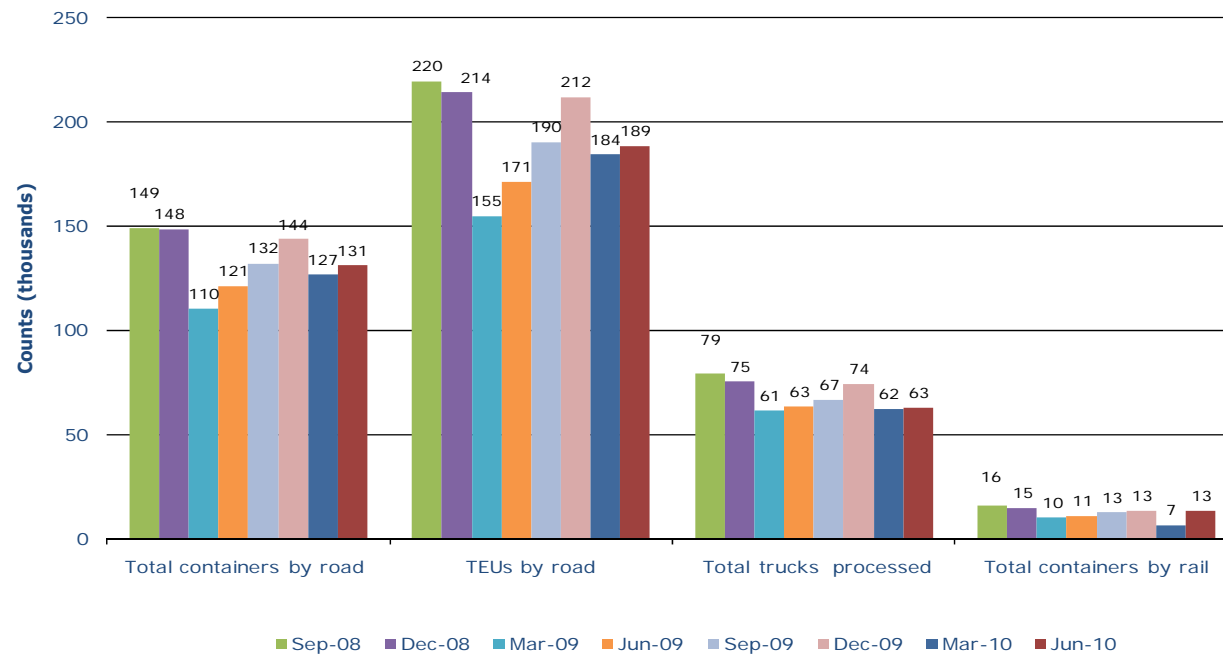
Sources: Patrick and DP World.

Figure 1.2 Five ports: adjusted vehicle booking system time usage



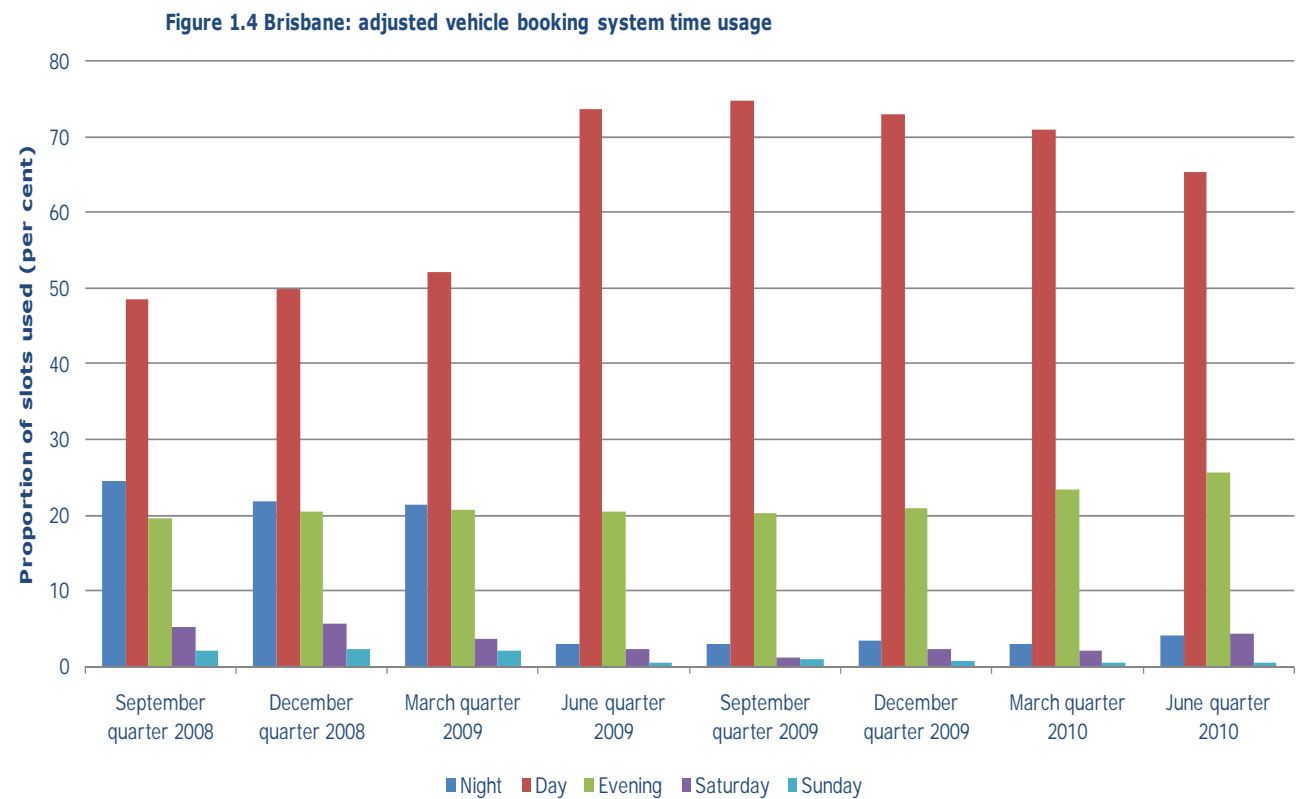
Note: The definitions of the time windows are as follows: Night (2400--0600 Monday to Friday),
Day (0600-1800 Monday to Friday) and Evening (1800-2400 Monday to Friday).

Sources: Patrick and DP World.

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

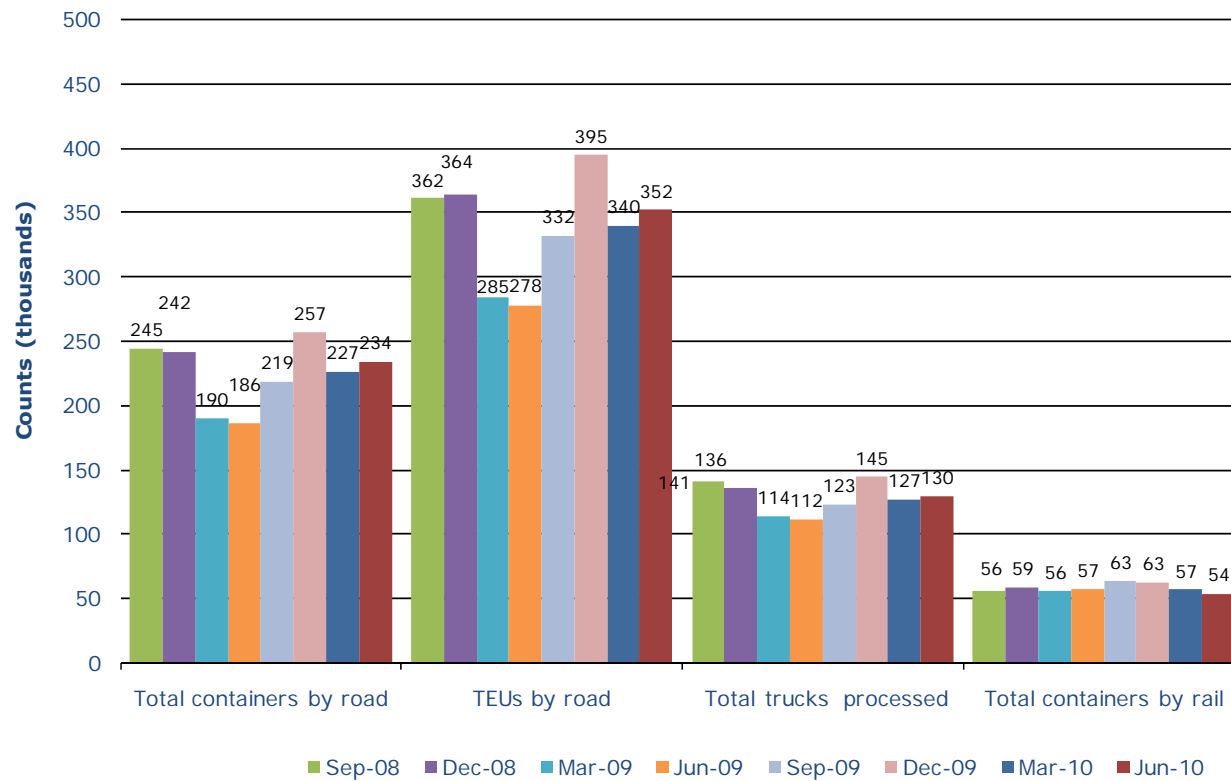
Note : The counts of containers by road, TEUs by road and trucks processed include operations under the vehicle booking system and bulk runs.

Sources: Patrick and DP World.



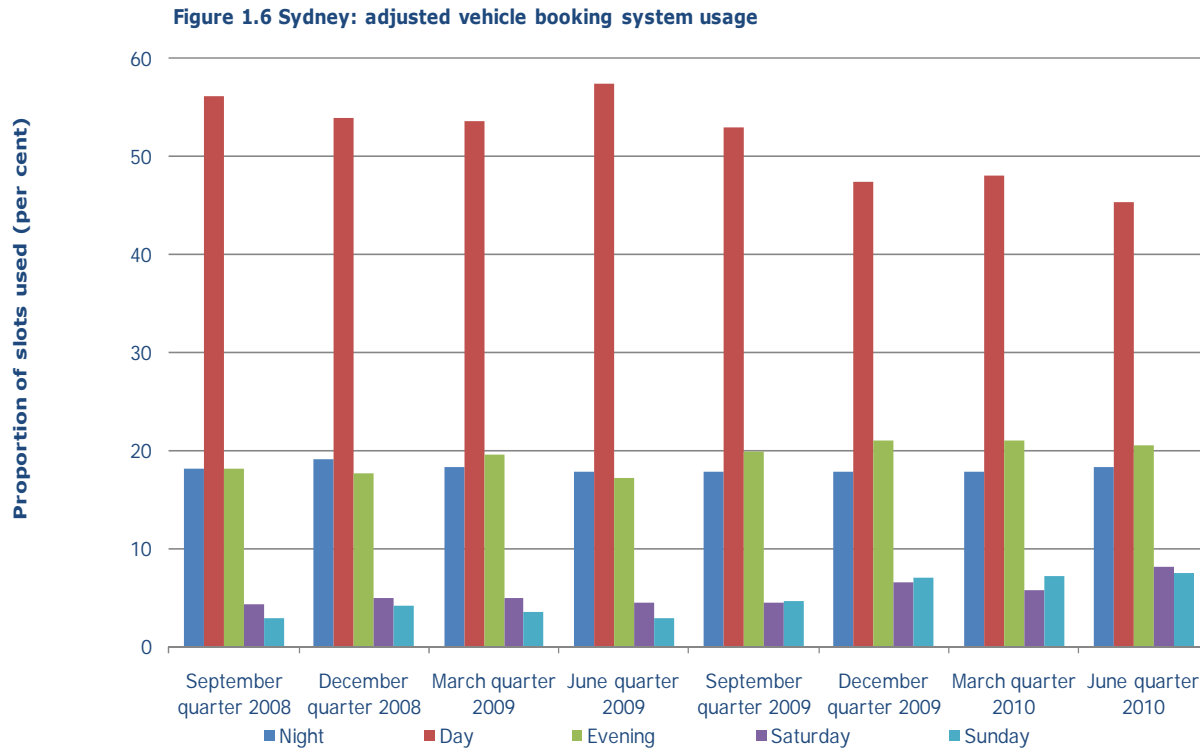
Note: The definitions of the time windows are as follows: Night (2400--0600 Monday to Friday), Day (0600--1800 Monday to Friday) and Evening (1800--2400 Monday to Friday).

Sources: Patrick and DP World.

Figure 1.5 Sydney Landside of container terminal size of task indicators

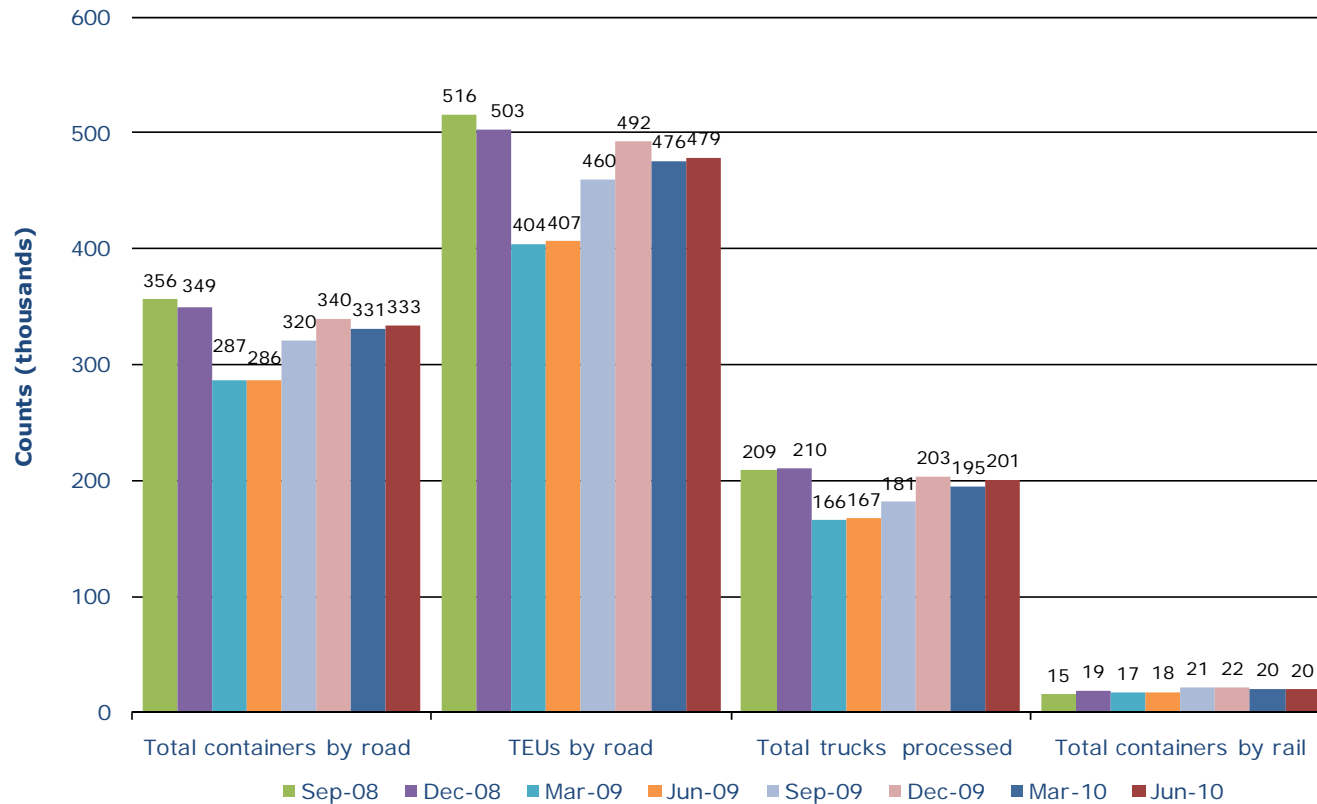
Note : The counts of containers by road, TEUs by road and trucks processed include operations under the vehicle booking system and bulk runs.

Sources: Patrick and DP World.



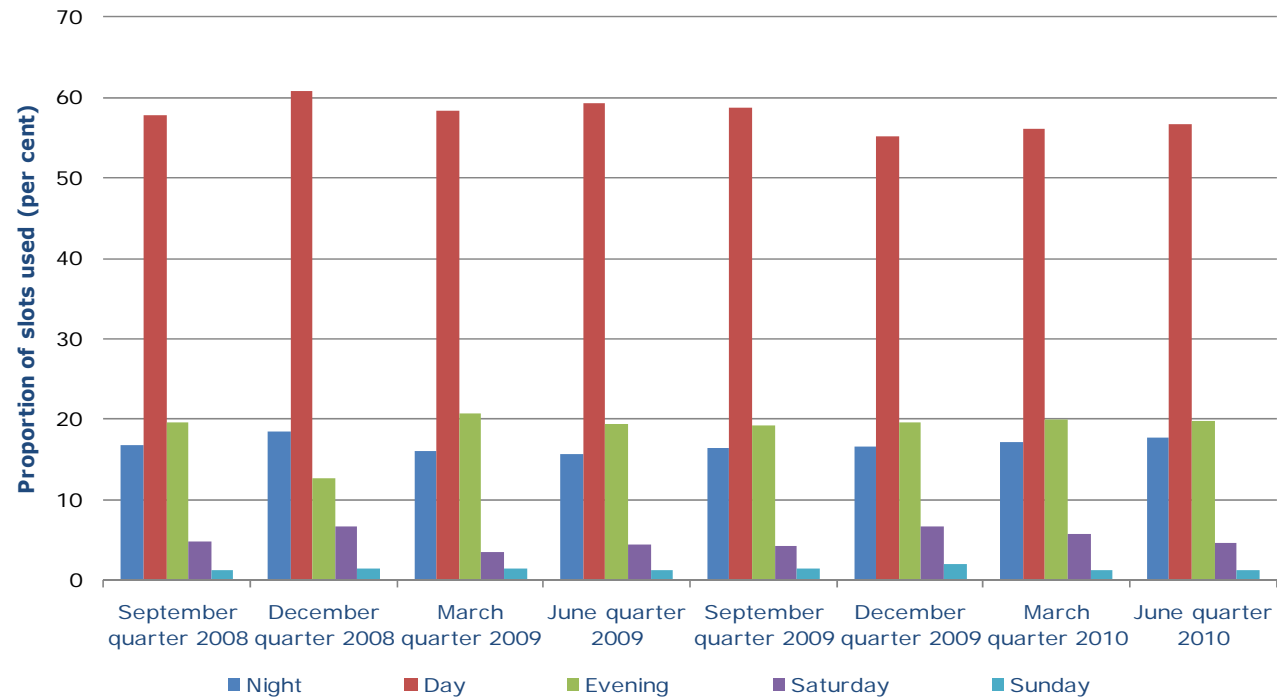
Note: The definitions of the time windows are as follows: Night (2400--0600 Monday to Friday),
Day (0600--1800 Monday to Friday) and Evening (1800--2400 Monday to Friday).

Sources: Patrick and DP World.

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

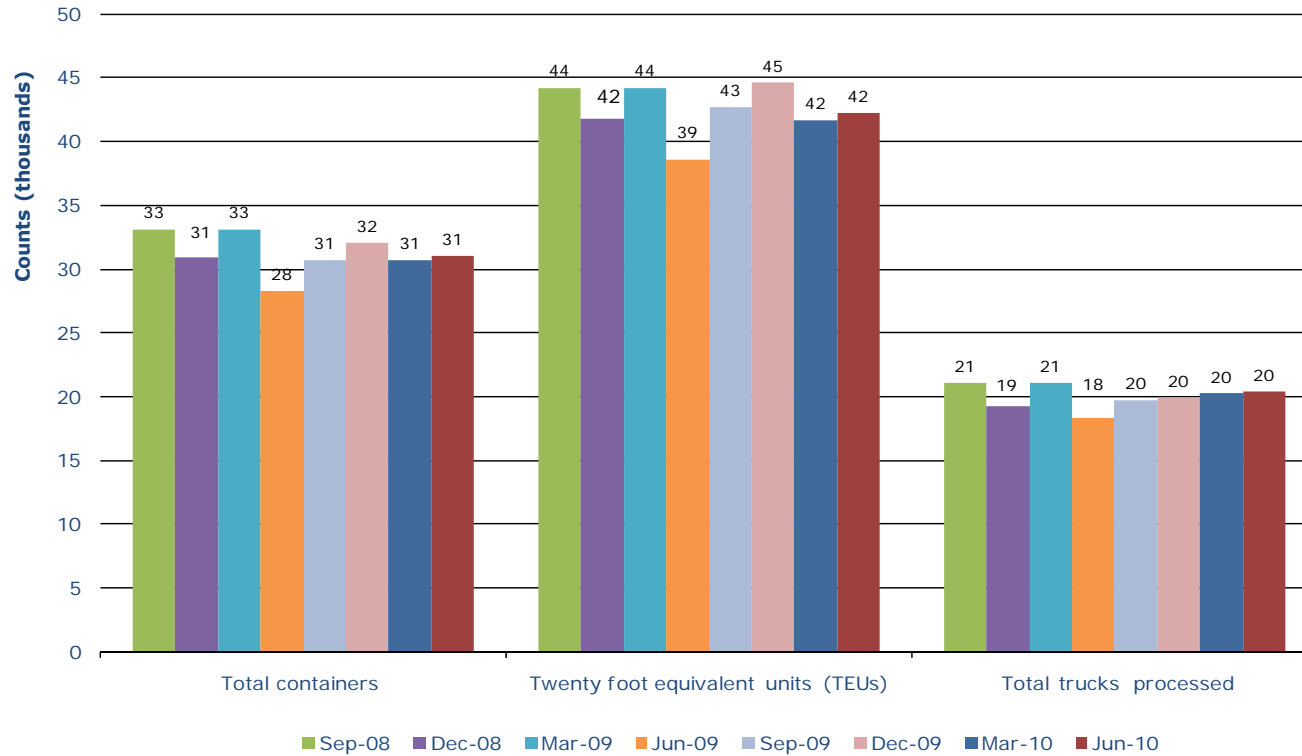
Note : The counts of containers by road, TEUs by road and trucks processed include operations under the vehicle booking system and bulk runs.

Sources: Patrick and DP World.

Figure 1.8 Melbourne: adjusted vehicle booking system usage

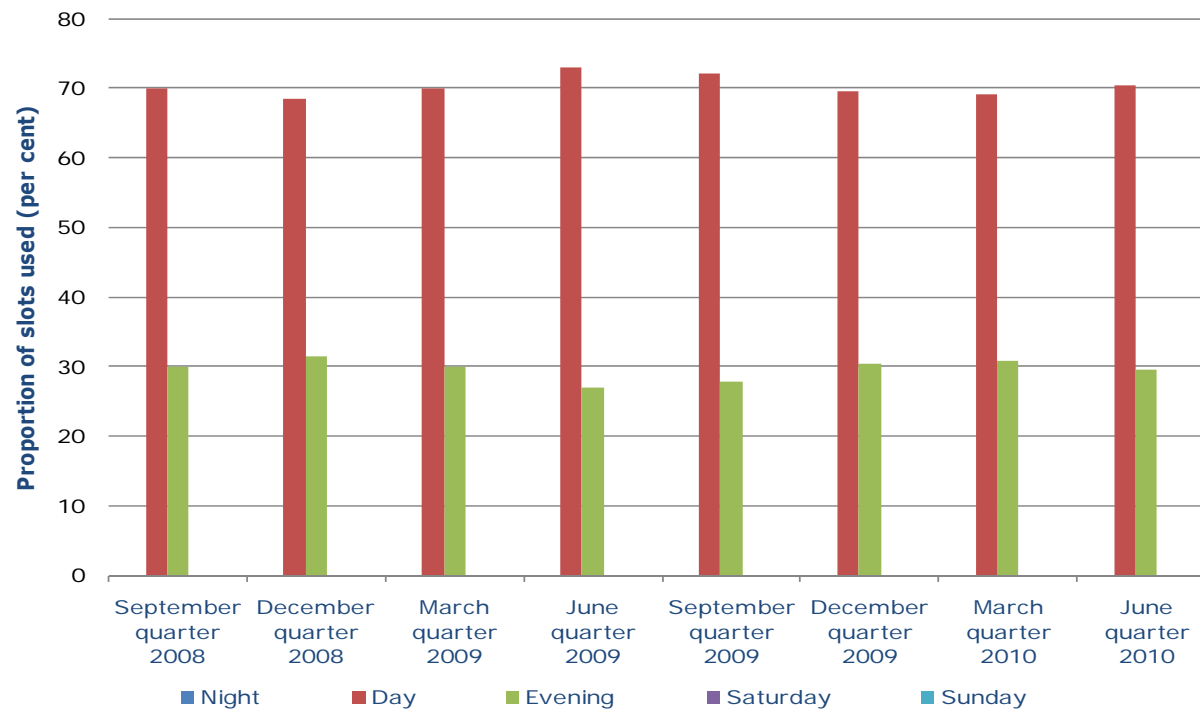
Note: The definitions of the time windows are as follows: Night (2400--0600 Monday to Friday),
Day (0600--1800 Monday to Friday) and Evening (1800--2400 Monday to Friday).

Sources: Patrick and DP World.

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

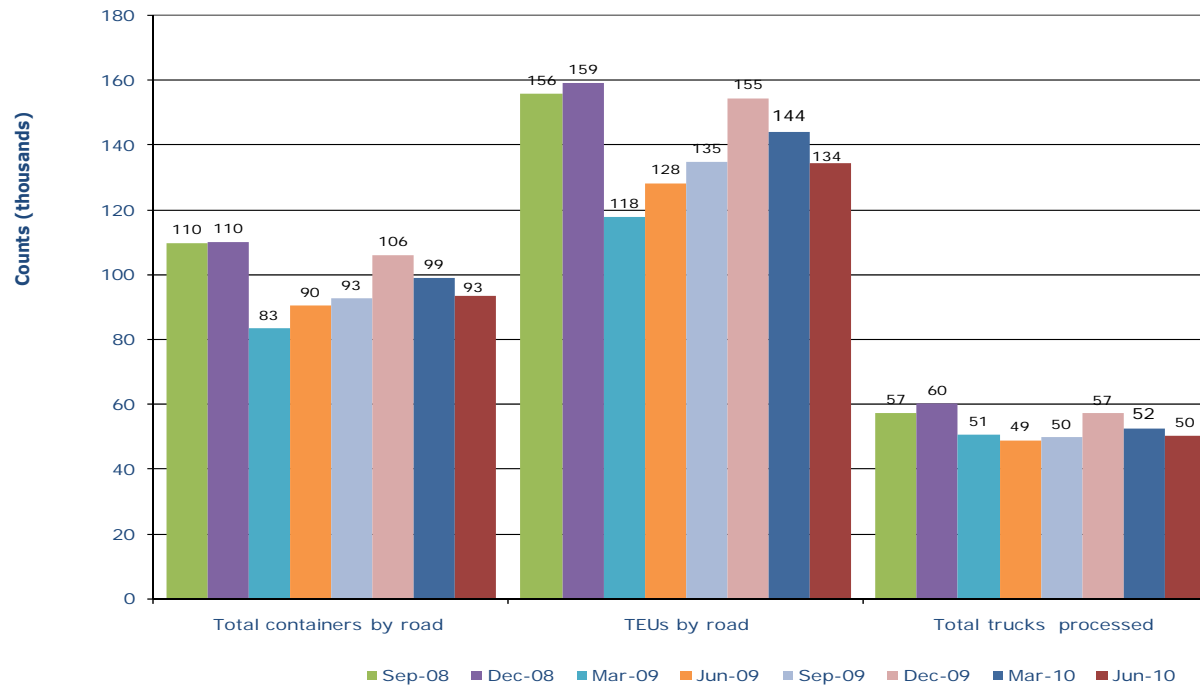
Note : The counts of containers by road, TEUs by road and trucks processed include operations under the vehicle booking system and bulk runs.

Sources: Patrick and DP World

Figure 1.10 Adelaide: adjusted vehicle booking system usage

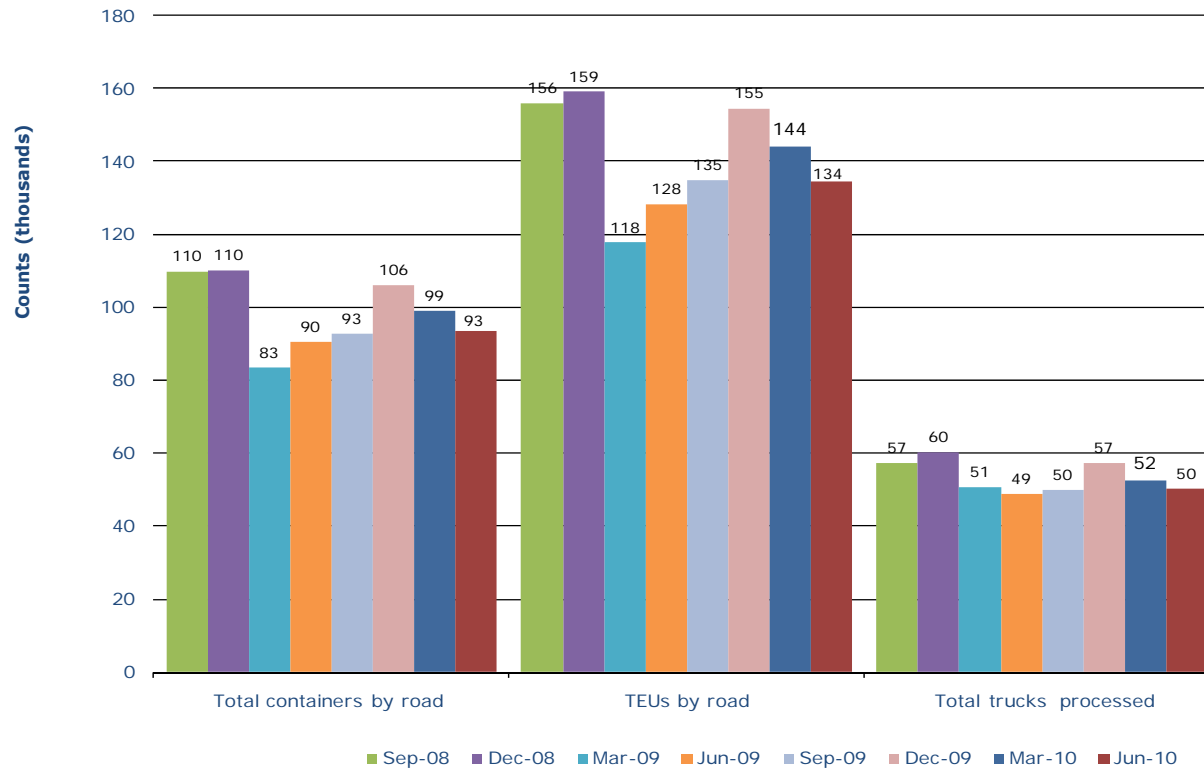
Note: The definitions of the time windows are as follows: Night (2400--0600 Monday to Friday),
Day (0600--1800 Monday to Friday) and Evening (1800--2400 Monday to Friday).

Sources: Patrick and DP World

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

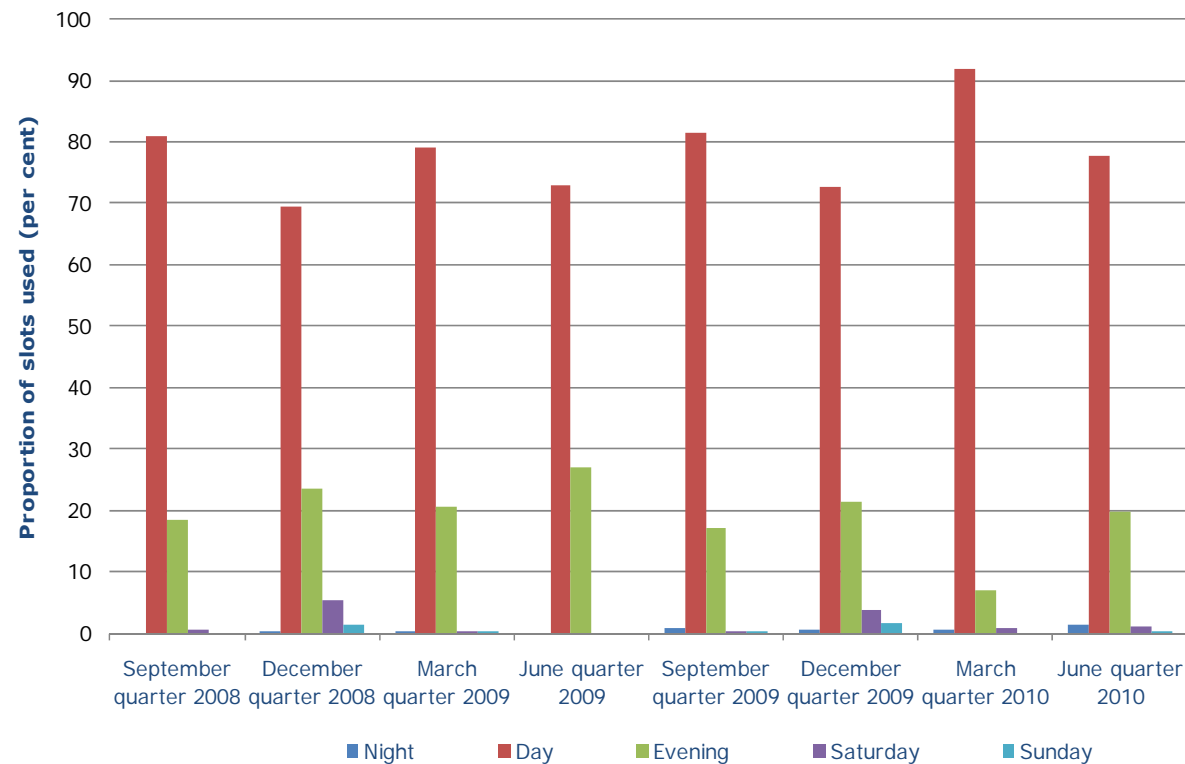
Note : The counts of containers by road, TEUs by road and trucks processed include operations under the vehicle booking system and bulk runs.

Sources: Patrick and DP World.

Figure 1.11 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.

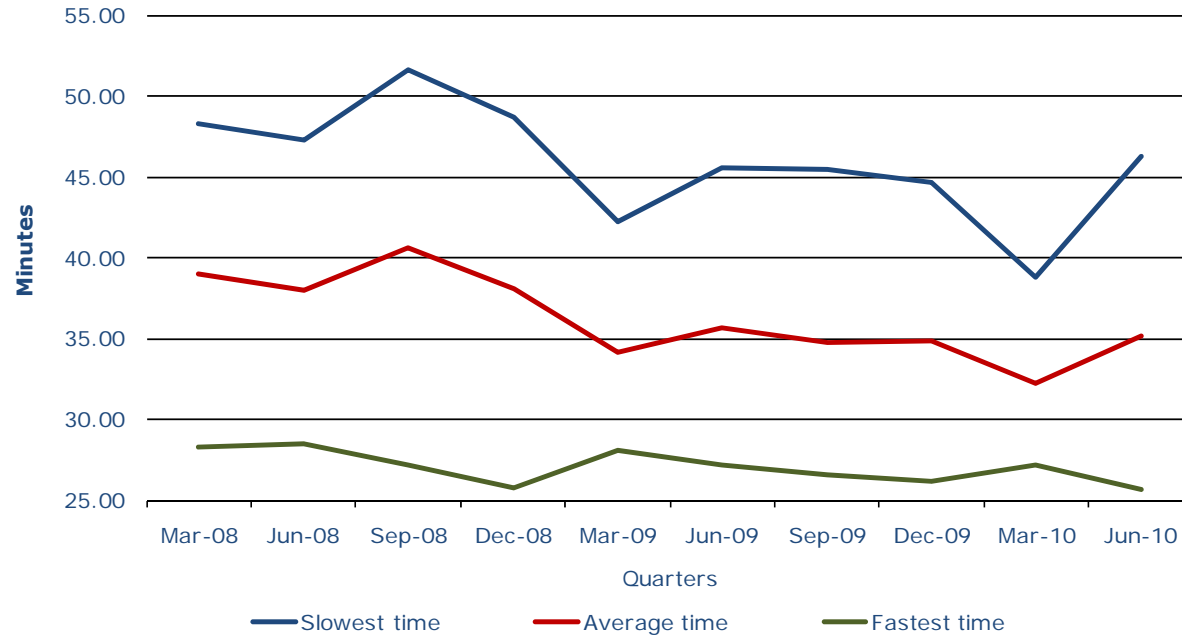
Sources: Patrick and DP World.

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).

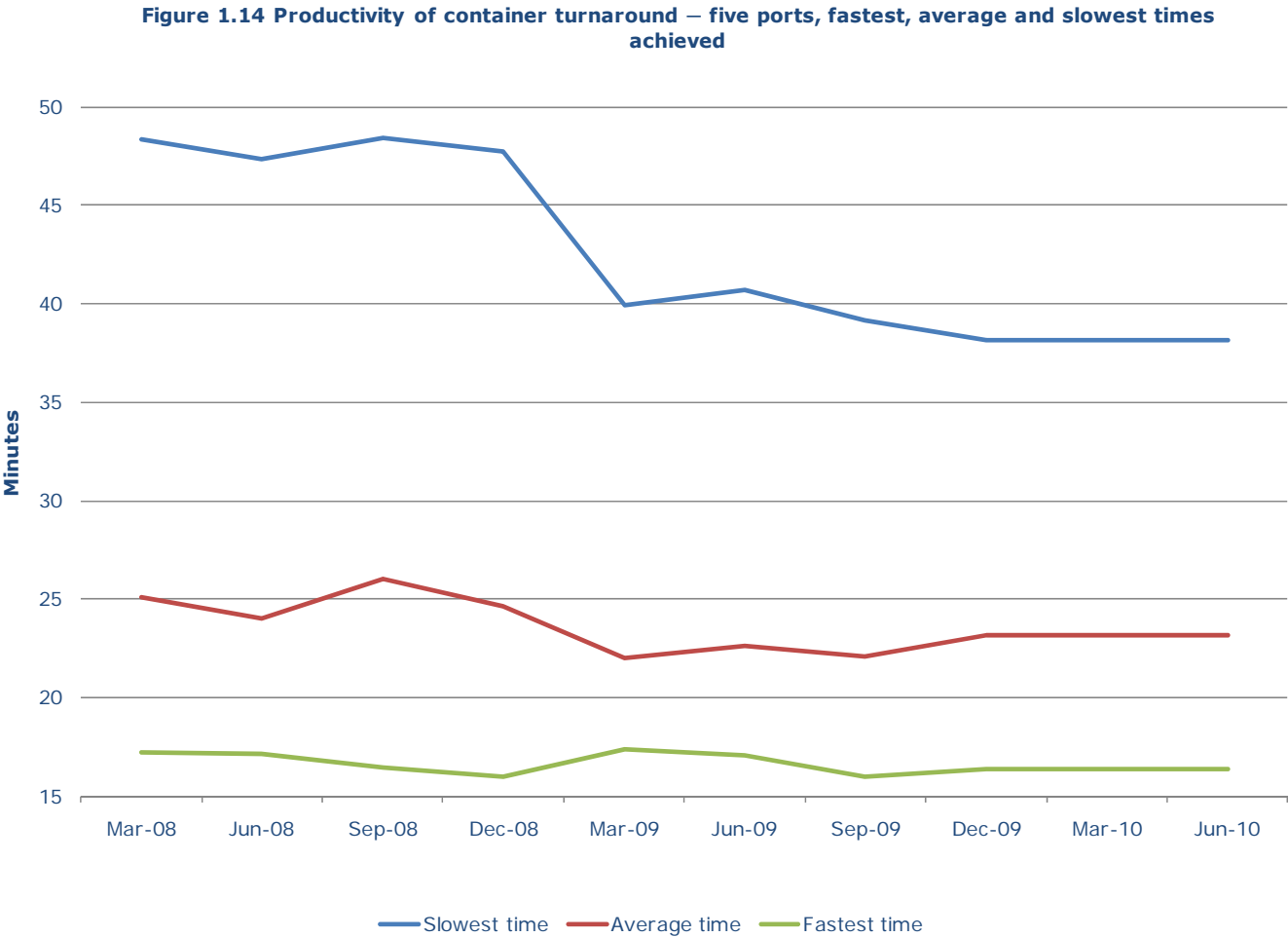
Sources: Patrick and DP World.

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



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

Sources: Patrick and DP World.



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.

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, eg. 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-07	Sep-07	Dec-07	Mar-08	Jun-08	Sep-08	Dec-08	Mar-09	Jun-09	Sep-09	Dec-09	Mar-10	Jun-10
Five ports													
Ships handled	1 110	1 154	1 138	1 107	1 156	1 156	1 073	927	925	932	940	878	880
Total containers	874 269	950 996	1 027 779	949 324	977 870	1 043 867	1 036 375	833 663	853 558	933 578	1 037 498	933 580	958 584
Crane rate	27.2	26.5	27.2	27.3	27.5	27.5	27.5	28.9	29.8	29.9	29.5	29.0	28.7
Vessel working rate	37.4	37.7	38.4	39.8	39.1	38.6	40.7	38.9	39.4	41.7	42.2	42.2	40.6
Crane time not worked (per cent)	21	20	20	19.3	19.8	20.8	18.1	19.9	18.9	20.2	19.8	18.9	19.5
40-foot containers (per cent)	41	43	44	42.9	42.7	44.7	44.8	43.7	42.0	46.2	47.9	46.0	45.3
Ship rate	47.1	47.2	48.0	49.3	48.7	48.8	49.6	48.6	48.5	52.2	52.6	52.0	50.4
Throughput pbm	123	133	144	133	137	146	145	117	120	131	145	131	134
Brisbane													
Ships handled	262	267	254	248	255	243	231	199	191	188	202	182	181
Total containers	146 916	164 803	177 766	153 170	162 475	172 604	171 674	138 155	137 896	152 392	168 978	141 210	155 133
Crane rate	23.0	23.0	24.5	22.8	23.1	25.2	23.8	26.0	26.9	27.2	27.6	27.3	28.8
Vessel working rate	26.2	26.3	30.1	29.6	28.5	32.5	31.4	30.8	30.8	33.3	34.7	35.6	38.7
Crane time not worked (per cent)	28	22	21	21.0	21.3	20.0	17.6	18.9	21.2	22.5	22.5	21.8	18.8
40-foot containers (per cent)	41	43	46	44.6	43.1	44.5	44.6	43.1	43.4	47.1	49.5	47.3	44.6
Stevedoring variability (per cent)	52	49	47	53.6	46.1	39.5	46.3	44.8	50.2	33.9	37.1	36.1	36.5
Ship rate	36.6	33.7	37.9	37.5	36.3	40.6	38.1	38.0	39.1	42.9	44.7	45.5	47.7
Throughput pbm	91	103	111	95	101	107	107	86	86	95	105	88	97
Sydney													
Ships handled	317	338	342	321	343	351	321	274	275	276	279	257	255
Total containers	271 655	299 142	327 858	302 223	308 660	342 522	346 663	277 606	283 416	315 905	361 971	314 600	327 800
Crane rate	26.9	24.9	25.8	27.1	27.2	26.7	27.0	29.1	29.9	29.9	28.2	27.4	26.2
Vessel working rate	36.1	36.4	37.6	39.8	39.7	35.7	38.3	37.4	37.7	39.3	38.8	38.2	34.1
Crane time not worked (per cent)	24	21	22	22.1	22.8	26.1	22.0	22.8	21.2	21.8	20.5	20.2	22.9
40-foot containers (per cent)	44	46	47	45.5	45.4	46.4	46.6	45.7	44.0	47.3	49.7	47.2	47.3
Stevedoring variability (per cent)	48	47	43	49.2	47.6	50.4	56.7	46.1	47.2	46.0	49.3	38.5	43.9
Ship rate	47.6	46.1	48.5	51.2	51.4	48.4	49.1	48.5	47.9	50.3	48.9	47.9	44.2
Throughput pbm	140	154	169	156	159	176	179	143	146	163	186	162	169
Melbourne													
Ships handled	326	333	331	326	346	353	316	268	266	274	275	253	253
Total containers	315 181	334 640	361 085	332 443	340 140	363 079	355 915	280 218	293 258	321 229	348 091	329 944	332 501
Crane rate	28.5	28.6	29.3	28.9	29.4	29.6	30.1	30.3	31.4	31.9	32.0	32.1	31.9
Vessel working rate	44.8	46.0	45.6	46.6	45.7	47.0	50.8	46.8	49.2	52.4	52.8	52.1	51.4
Crane time not worked (per cent)	15	18	17	15.7	17.4	16.8	15.1	17.0	15.2	17.1	16.9	16.4	16.8
40-foot containers (per cent)	41	44	43	43.4	43.6	45.8	45.1	44.7	40.7	46.3	47.8	45.6	45.3
Stevedoring variability (per cent)	56	51	51	54.9	40.5	60.9	44.3	52.5	41.3	39.0	42.7	45.1	47.2
Ship rate	52.5	55.9	55.2	55.3	55.3	56.5	59.8	56.4	58.0	63.2	63.5	62.3	61.7
Throughput pbm	173	183	198	182.1	186.3	198.8	194.9	153.5	160.6	175.9	190.6	180.7	182.1

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

Port / Indicator	Jun-07	Sep-07	Dec-07	Mar-08	Jun-08	Sep-08	Dec-08	Mar-09	Jun-09	Sep-09	Dec-09	Mar-10	Jun-10
Adelaide													
Ships handled	74	86	82	84	77	68	67	56	60	59	59	58	59
Total containers	46 382	52 693	53 486	54 357	59 584	56 250	54 905	43 294	49 912	51 500	53 632	50 824	50 352
Crane rate	30.0	29.8	29.7	29.6	29.6	29.3	26.5	27.8	26.9	25.2	26.4	25.7	25.4
Vessel working rate	33.9	35.5	29.8	35.7	40.4	40.0	32.3	35.1	31.8	33.3	35.2	38.4	34.1
Crane time not worked (per cent)	14	13	10	14.2	9.3	9.6	9.4	11.1	7.6	14.2	15.8	11.1	10.7
40-foot containers (per cent)	30	29	32	30.7	31.6	32.6	32.8	33.7	35.0	37.4	36.0	36.2	37.3
Stevedoring variability (per cent)	na	na	na	na	na	na	na	na	na	na	na	na	na
Ship rate	39.2	40.9	33.1	41.6	44.5	44.2	35.7	39.5	34.4	38.8	41.8	43.2	38.2
Throughput pbm	99	112	114	116	127	120	117	92	106	110	114	108	107
Fremantle													
Ships handled	131	130	129	128	135	141	138	130	133	135	125	128	132
Total containers	94 135	99 718	107 584	107 131	107 011	109 412	107 218	94 390	89 076	92 552	104 826	97 002	92 798
Crane rate	29.0	28.4	28.0	28.3	27.8	26.2	26.7	29.1	29.9	29.8	30.3	27.6	27.5
Vessel working rate	35.3	33.8	34.9	34.9	31.3	29.2	33.6	33.7	29.7	31.3	34.4	32.9	31.9
Crane time not worked (per cent)	26	28	25	24.1	24.1	26.7	22.1	26.0	28.6	28.3	27.9	25.6	26.5
40-foot containers (per cent)	37	39	41	38.0	37.7	42.2	44.0	40.1	41.9	45.8	45.7	46.7	44.2
Stevedoring variability (per cent)	44	55	63	56.3	46.8	66.7	53.6	55.2	46.7	38.7	43.4	47.0	41.7
Ship rate	47.6	47.1	46.8	46.0	41.2	39.8	43.1	45.5	41.6	43.6	47.8	44.2	43.4
Throughput pbm	73	77	83	83.0	82.9	84.7	83.0	73.1	69.0	71.7	81.2	75.1	71.9

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.

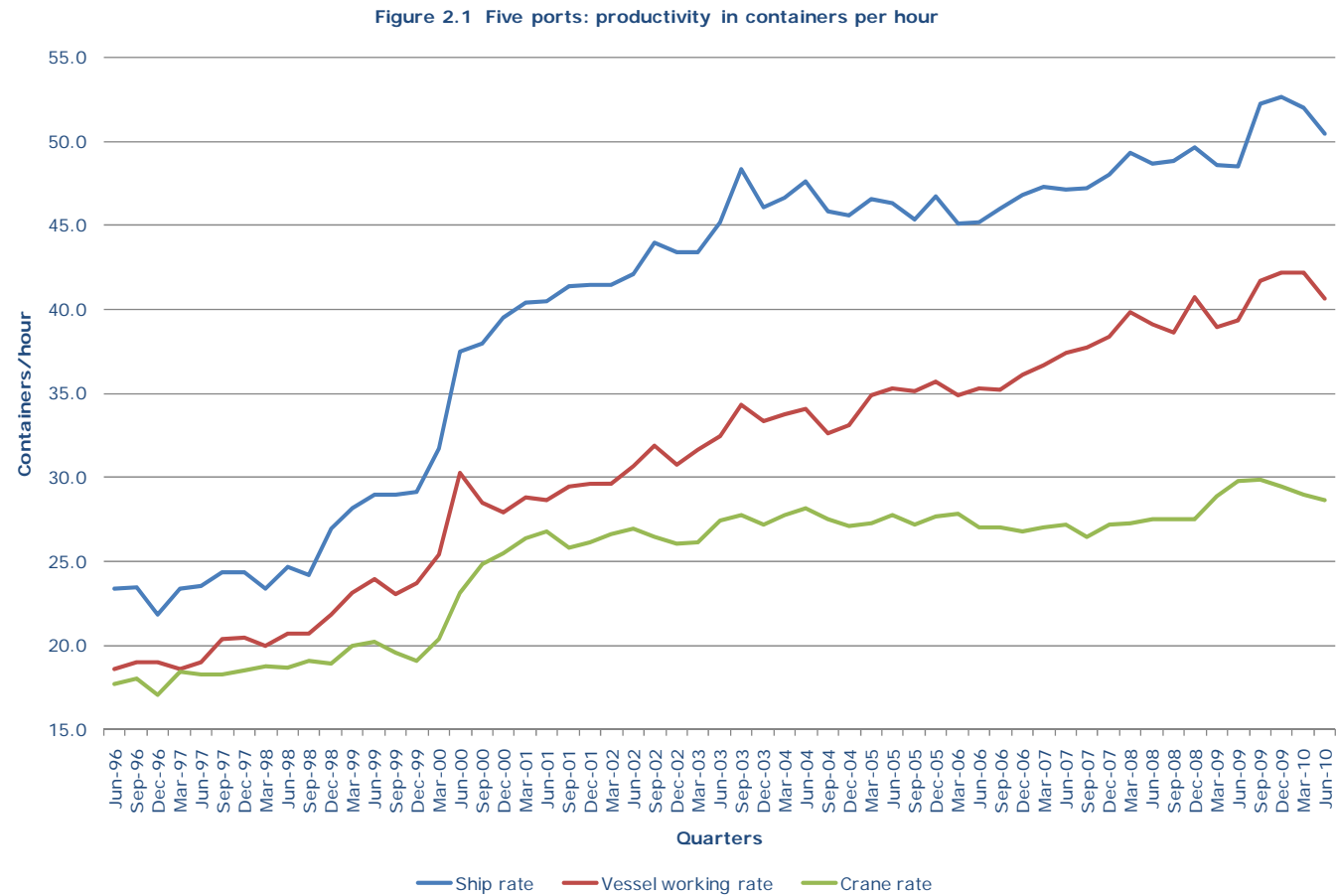
Table 2.2 Container terminal performance indicators - productivity in teus per hour

Port / Indicator	Jun-07	Sep-07	Dec-07	Mar-08	Jun-08	Sep-08	Dec-08	Mar-09	Jun-09	Sep-09	Dec-09	Mar-10	Jun-10
Five Ports													
Ships handled	1 110	1 154	1 138	1 107	1 156	1 156	1 073	0 927	0 925	932	940	878	880
Total teus	1 234 276	1 363 144	1 479 205	1 356 859	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
Crane rate	38.4	37.9	39.1	39.0	39.2	39.9	39.8	41.4	42.7	43.7	43.8	42.3	41.6
Vessel working rate	52.9	54.1	55.3	57.0	55.9	56.0	59.0	56.0	55.9	61.0	62.5	61.6	59.1
Ship rate	66.6	67.6	69.2	70.6	69.8	70.8	72.1	69.6	69.6	76.4	78.2	76.0	73.4
Brisbane													
Ships handled	262	267	254	248	255	243	231	199	191	188	202	182	181
Total teus	207 120	236 083	258 726	221 515	232 442	249 372	248 183	197 645	197 793	224 152	252 673	208 060	224 323
Crane rate	32.4	32.8	35.6	32.9	32.9	36.4	34.5	37.2	38.4	39.8	41.0	40.2	41.6
Vessel working rate	36.9	37.5	43.7	42.8	40.7	46.9	45.5	44.0	44.1	48.9	51.8	52.6	55.9
Ship rate	51.5	48.1	55.2	54.3	51.8	58.7	55.1	54.5	55.8	62.9	66.8	67.3	69.0
Sydney													
Ships handled	317	338	342	321	343	351	321	274	275	276	279	257	255
Total teus	392 505	437 332	481 442	439 755	448 857	501 480	508 196	404 554	408 159	465 307	541 938	463 230	482 719
Crane rate	38.8	36.5	37.9	39.5	39.5	39.1	39.5	42.2	43.4	43.8	42.5	40.3	38.5
Vessel working rate	52.2	53.1	55.2	58.1	57.8	52.4	56.2	54.6	54.3	58.0	58.1	56.3	50.2
Ship rate	68.8	67.2	71.1	74.5	74.9	70.9	72.0	70.2	69.4	73.7	73.7	70.6	65.0
Melbourne													
Ships handled	326	333	331	326	346	353	316	268	266	274	275	253	253
Total teus	445 563	482 599	516 425	476 655	488 594	529 223	516 431	405 493	412 653	469 802	514 533	480 498	483 141
Crane rate	40.2	41.0	41.9	41.4	42.2	43.2	43.7	43.4	45.2	46.8	47.4	46.7	46.3
Vessel working rate	63.4	66.2	65.2	66.9	65.6	68.5	73.7	67.6	69.3	76.5	78.0	75.9	74.9
Ship rate	74.2	80.1	78.9	79.3	79.5	82.3	86.8	80.6	83.5	92.6	94.1	90.7	89.9
Adelaide													
Ships handled	74	86	82	84	77	68	67	56	60	59	59	58	59
Total teus	60 134	68 175	70 647	71 066	78 420	74 603	72 937	57 903	67 378	70 747	72 937	69 230	69 135
Crane rate	39.0	38.6	39.3	38.7	38.9	38.9	35.1	37.2	36.3	34.7	35.9	35.0	34.9
Vessel working rate	43.9	45.9	39.4	46.7	52.7	53.0	42.9	46.9	42.9	45.7	47.9	52.3	46.9
Ship rate	50.8	52.9	43.8	54.4	58.6	58.6	47.4	52.8	46.4	53.3	56.9	58.8	52.5
Fremantle													
Ships handled	131	130	129	128	135	141	138	130	133	135	125	128	132
Total teus	128 954	138 955	151 965	147 868	147 337	155 613	154 428	132 250	126 357	134 973	152 681	142 314	133 832
Crane rate	39.9	39.6	39.5	38.7	38.3	37.3	38.5	41.0	42.4	43.5	44.1	40.2	39.7
Vessel working rate	48.4	47.2	49.4	48.3	43.1	41.5	48.4	47.2	42.1	45.7	50.3	48.2	46.0
Ship rate	65.3	65.7	66.2	63.5	56.8	56.6	62.1	64.0	59.0	63.9	69.8	64.4	62.7

na not available

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

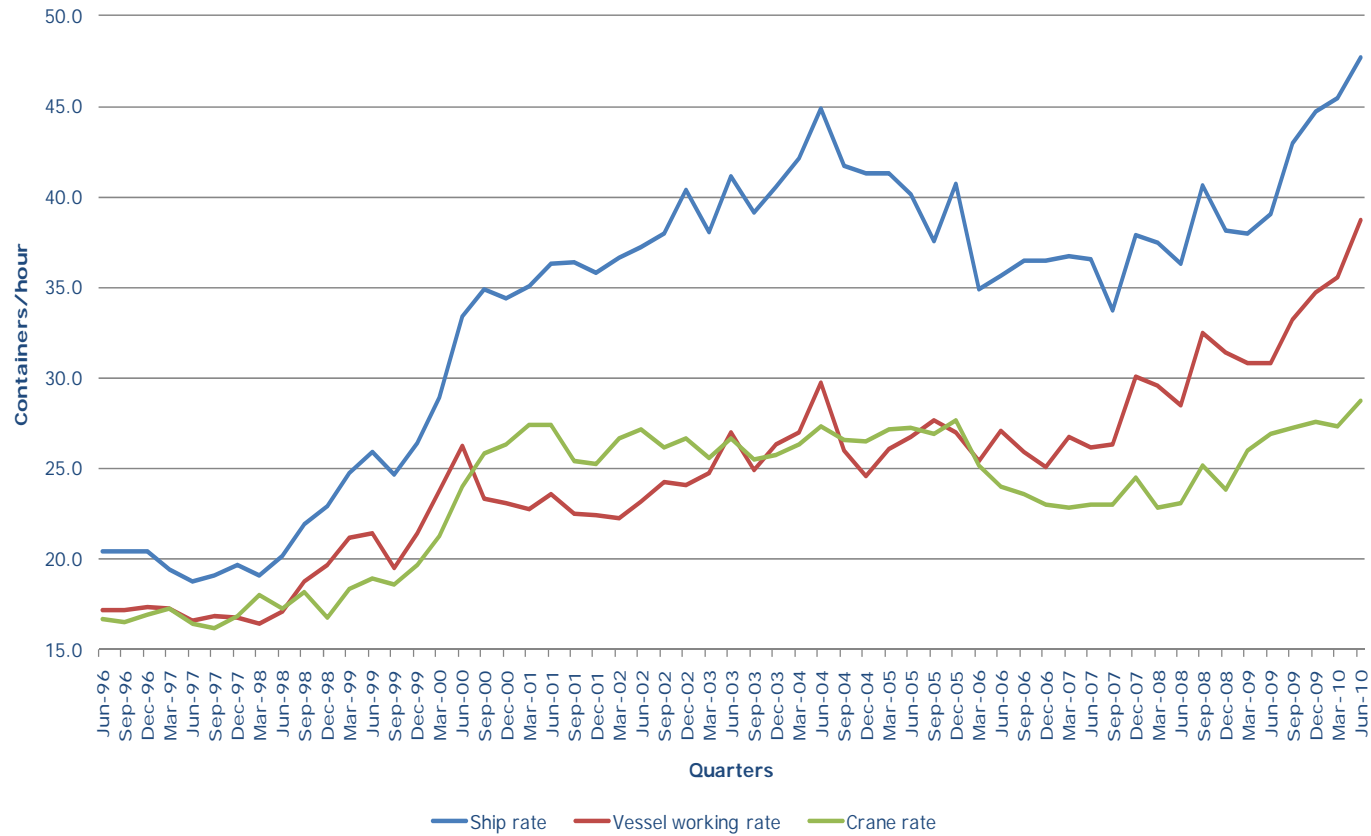
Sources Patrick, DP World.



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

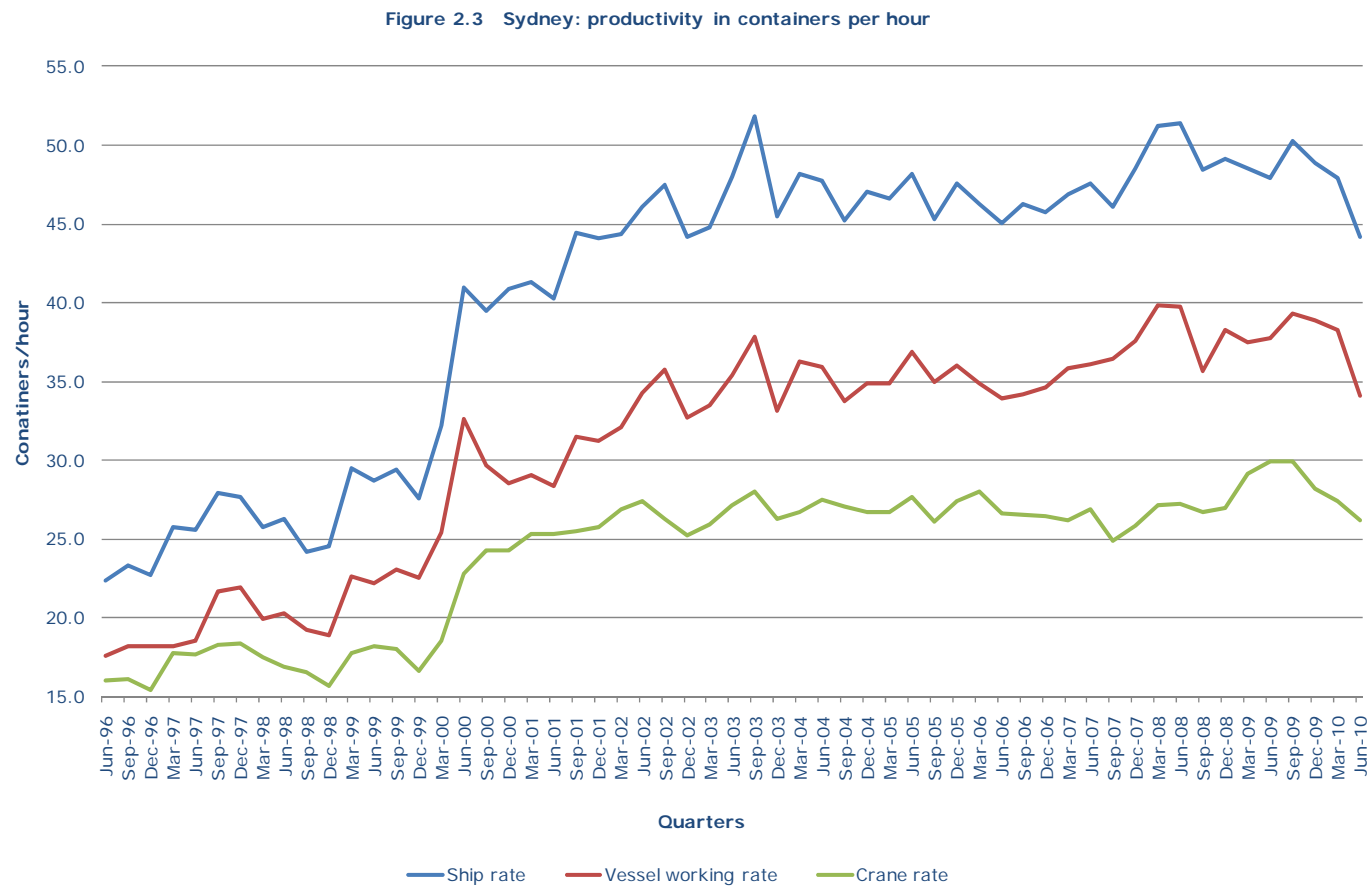
Sources: Patrick and DP World.

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.

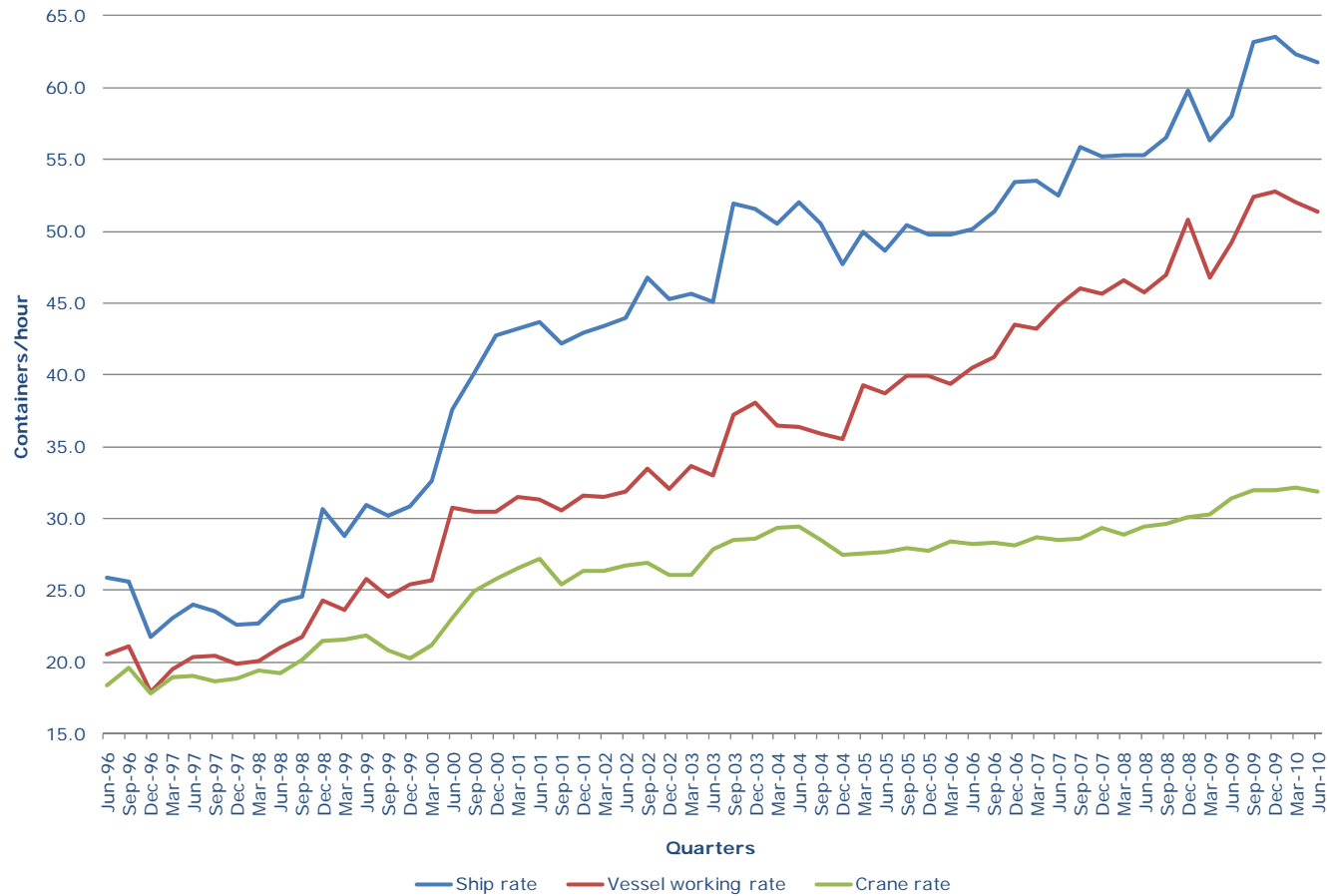
Sources: Patrick and DP World.



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

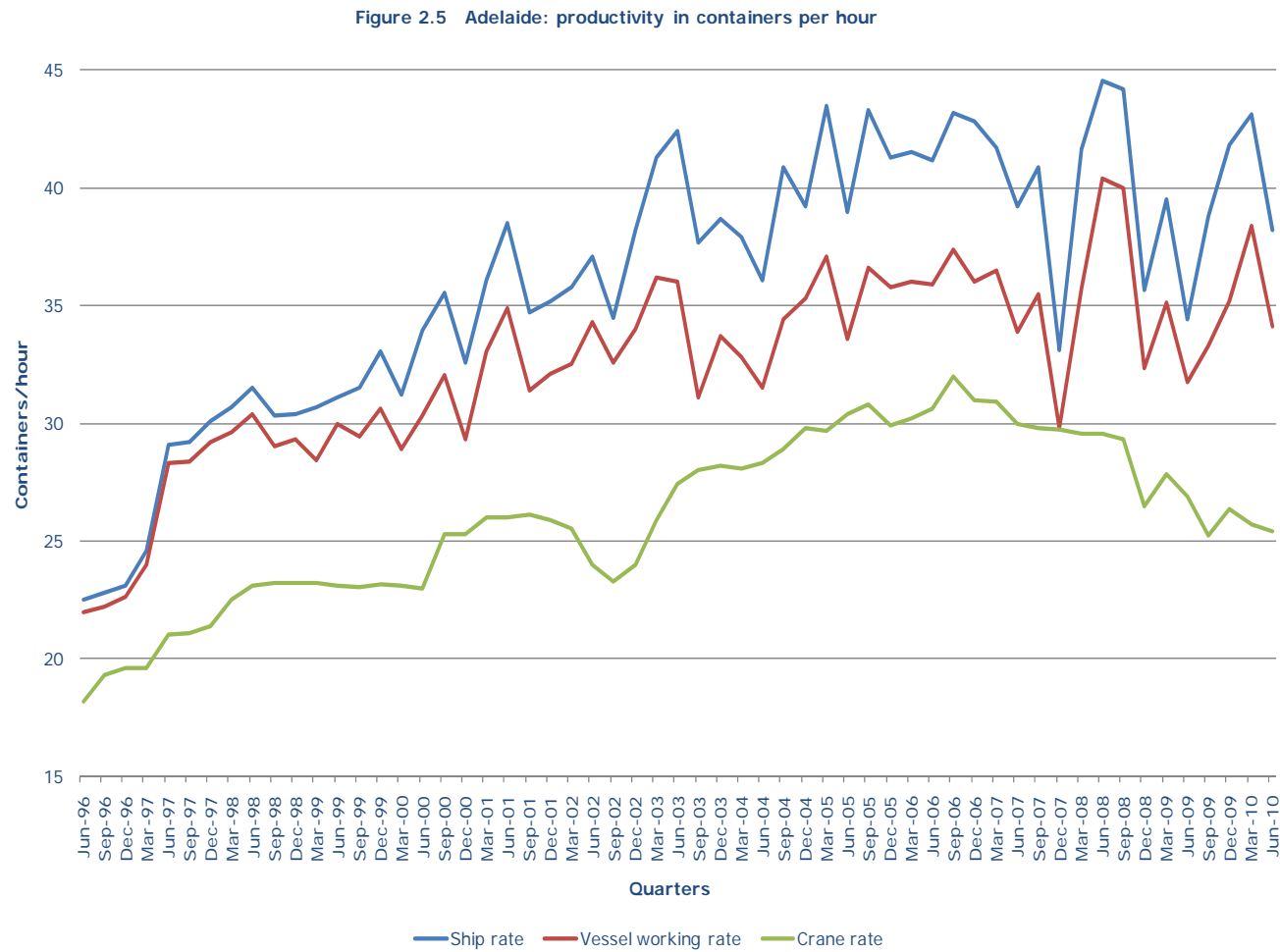
Sources: Patrick and DP World.

Figure 2.4 Melbourne: productivity in containers per hour



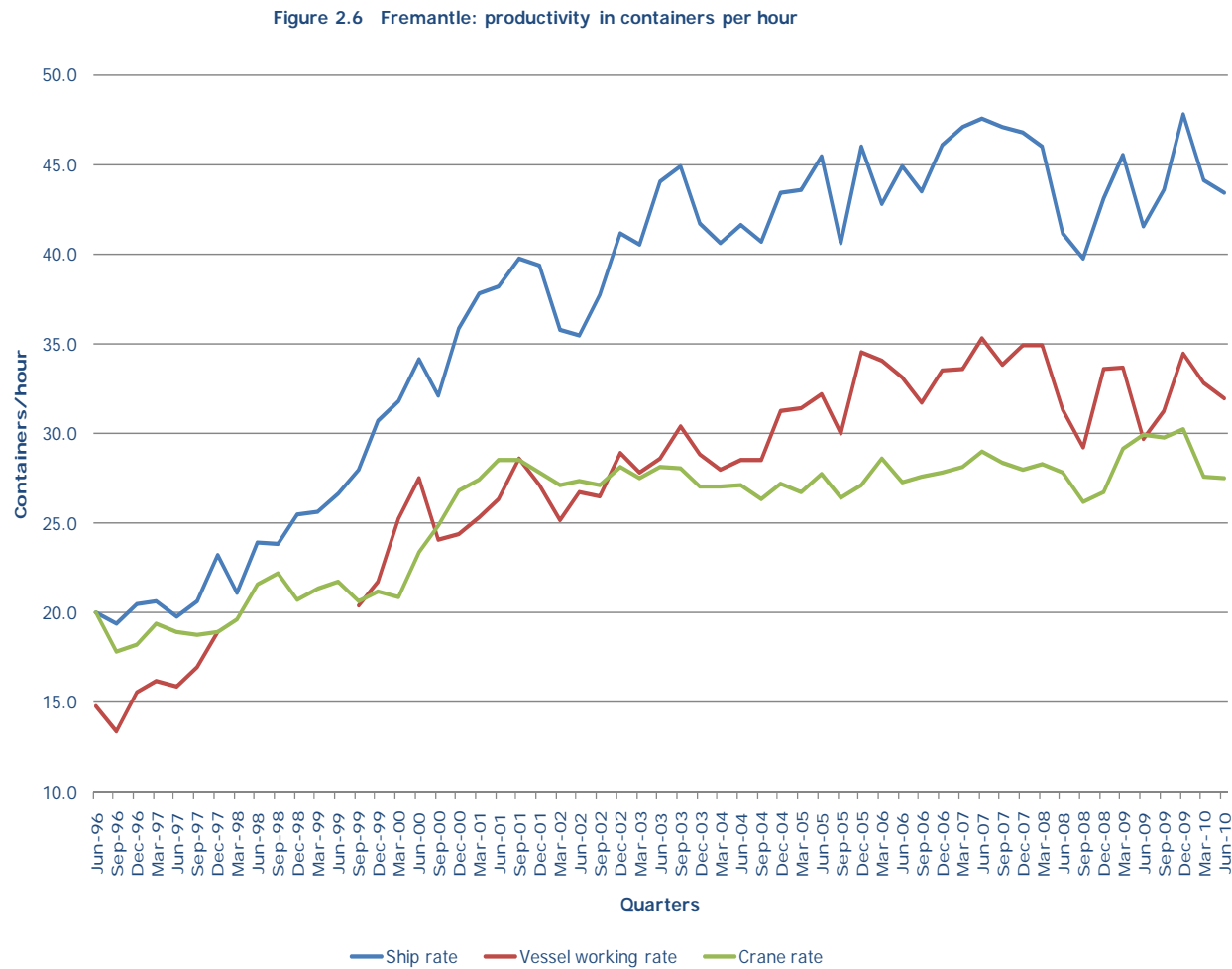
Note: These figures are based on data in Table 2.1. See explanatory notes for definition of terms.

Sources: Patrick and DP World.



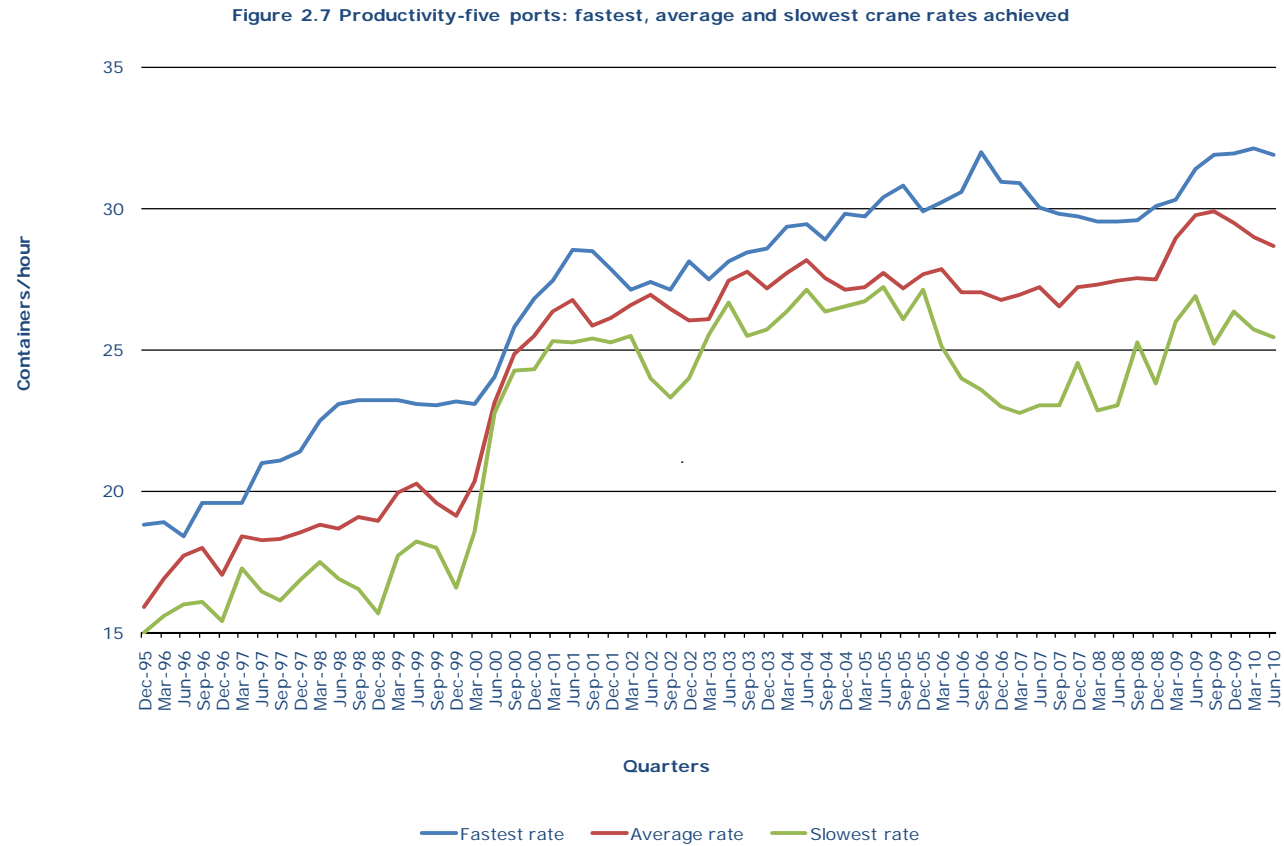
Note: These figures are based on data in Table 2.1. See explanatory notes for definition of terms.

Sources: Patrick and DP World.



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

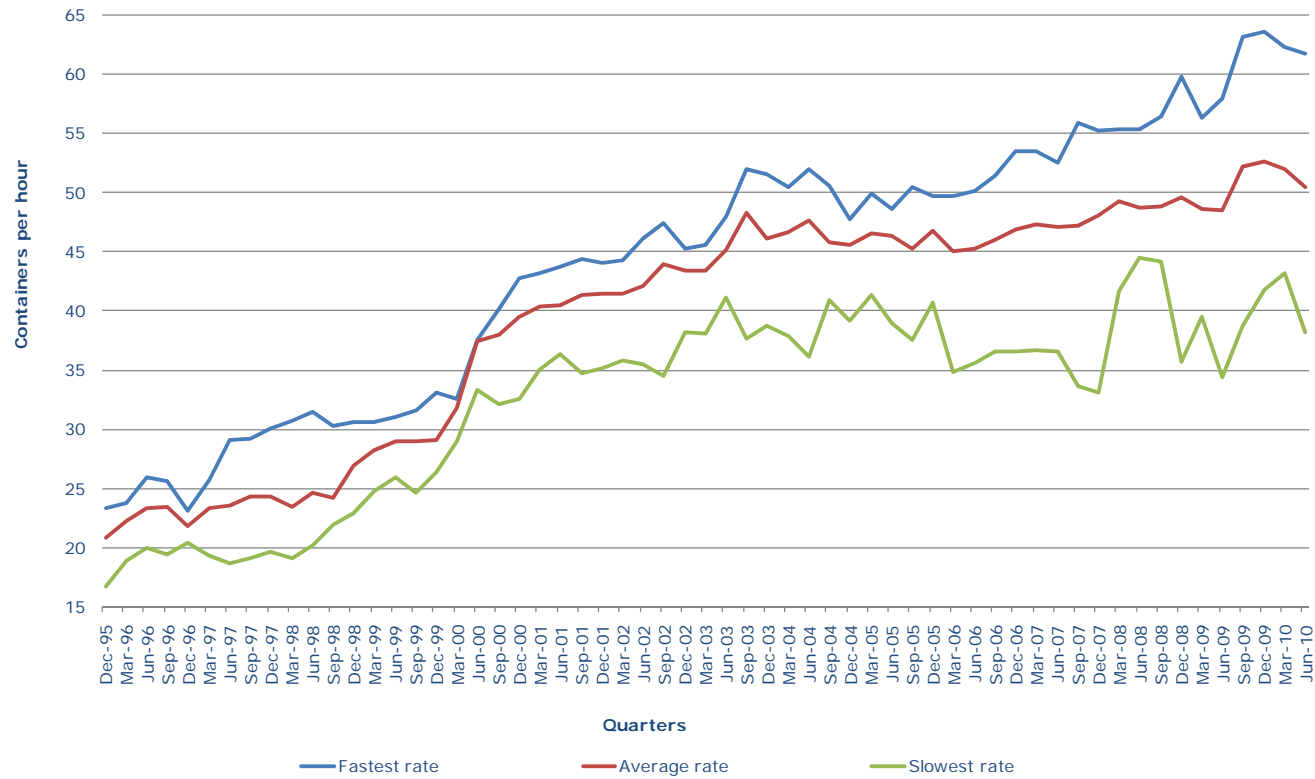
Sources: Patrick and DP World.



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 3.8. 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:

- 17 215 GT vessel represents all vessels of sizes ranging from 15 000 to 20 000;
- 37 394 GT vessel represents all vessels of sizes ranging from 35 000 to 40 000.

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 3.3. 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 [Tables 3.4](#) and [3.5](#). 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

	<i>Brisbane</i>		<i>Sydney</i>		<i>Melbourne</i>		<i>Adelaide</i>		<i>Fremantle</i>	
	<i>Jul-Dec</i>	<i>Jan-June</i>	<i>Jul-Dec</i>	<i>Jan-June</i>	<i>Jul-Dec</i>	<i>Jan-June</i>	<i>Jul-Dec</i>	<i>Jan-June</i>	<i>Jul-Dec</i>	<i>Jan-June</i>
	<i>2009</i>	<i>2010</i>	<i>2009</i>	<i>2010</i>	<i>2009</i>	<i>2010</i>	<i>2009</i>	<i>2010</i>	<i>2009</i>	<i>2010</i>
Vessel size GT 17 215										
Average Teus exchanged ^a										
All	672	699	1 003	998	1 024	1 130	813	967	1 562	1 785
Loaded	495	412	751	778	890	1 003	605	556	1 264	1 487
Empty	177	287	253	219	134	127	207	410	298	299
Loaded inwards	261	219	515	509	557	587	234	206	658	740
Loaded outwards	233	193	235	269	334	416	371	351	606	747
Ship call parameters ^a										
Number of port calls	2	3	3	6	4	5	3	2	13	8
Elapsed berth time (hrs)	19	19	30	36	25	25	25	27	38	35
Vessel size GT 37 394										
Average Teus exchanged ^b										
All	1 374	1 271	2 322	2 148	2 287	2 139	1 176	1 101	1 056	925
Loaded	1 011	968	1 570	1 488	1 865	1 753	956	903	809	698
Empty	362	303	752	660	422	387	220	198	247	227
Loaded inwards	668	620	1 175	1 090	1 152	980	447	408	546	445
Loaded outwards	343	348	395	398	713	773	509	495	263	254
Ship call parameters ^b										
Number of port calls	2	2	3	3	3	3	2	3	3	2
Elapsed berth time (hrs)	28	29	42	48	30	33	29	24	29	26

na not available

a. Mean value for ships between 15 000 and 20 000 GT; for Adelaide the mean values were calculated for ships higher than 10 000 and lower than 26 000 GT.

b. Mean value for ships between 35 000 and 40 000 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 15 000–20 000 GT, range

	<i>Brisbane</i>		<i>Sydney</i>		<i>Melbourne</i>		<i>Adelaide</i>		<i>Fremantle</i>	
	<i>Jul-Dec</i>	<i>Jan-Jun</i>	<i>Jul-Dec</i>	<i>Jan-Jun</i>	<i>Jul-Dec</i>	<i>Jan-Jun</i>	<i>Jul-Dec</i>	<i>Jan-Jun</i>	<i>Jul-Dec</i>	<i>Jan-Jun</i>
	<i>2009</i>	<i>2010</i>	<i>2009</i>	<i>2010</i>	<i>2009</i>	<i>2010</i>	<i>2009</i>	<i>2010</i>	<i>2009</i>	<i>2010</i>
Ship-based charges (\$/TEU)										
Conservancy	4.28	4.41	-	-	-	-	3.03	2.97	-	-
Tonnage	-	-	7.51	7.86	5.61	5.09	7.42	6.45	2.09	1.83
Pilotage	10.56	11.67	3.30	3.57	8.19	7.63	6.20	5.21	1.66	1.68
Towage ^a	15.67	15.07	10.33	10.92	10.60	9.61	16.37	13.76	6.79	5.94
Mooring, unmooring ^b	3.31	3.19	3.03	3.20	1.04	0.71	-	-	0.68	0.60
Berth hire ^c	-	-	-	-	-	-	-	-	-	-
Total ^c	33.82	34.34	24.17	25.55	25.44	23.04	33.02	28.39	11.22	10.05
Cargo-based charges (\$/TEU)										
Wharfage										
Imports	30.35	30.32	91.45	95.07	40.04	40.04	73.26	73.26	61.44	61.44
Exports	30.35	30.32	52.15	54.18	40.04	40.04	73.26	73.26	61.44	61.44
Harbour dues	46.67	50.43	-	-	-	-	-	-	-	-
Berth charge	-	-	-	-	-	-	-	-	18.40	18.40
Channel infrastructure fees					36.65	37.65				
Total port and related charges (\$/TEU)^d										
Loaded imports	110.83	115.08	115.61	120.62	101.01	98.61	106.28	101.65	91.06	89.89
Loaded exports	110.83	115.08	76.32	79.73	101.01	98.61	106.28	101.65	91.06	89.89
Charges per ship visit (\$/visit)										
Total ship-based charges	22 721	23 985	24 248	25 484	24 248	25 484	26 828	27 447	17 532	17 936
Empty TEUs ^e	3 051	5 162	2 835	2 558	1 359	1 283	0	0	2 762	2 768

- 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.

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

	<i>Brisbane</i>		<i>Sydney</i>		<i>Melbourne</i>		<i>Adelaide</i>		<i>Fremantle</i>	
	<i>Jul-Dec</i>	<i>Jan-Jun</i>	<i>Jul-Dec</i>	<i>Jan-Jun</i>	<i>Jul-Dec</i>	<i>Jan-Jun</i>	<i>Jul-Dec</i>	<i>Jan-Jun</i>	<i>Jul-Dec</i>	<i>Jan-Jun</i>
	<i>2009</i>	<i>2010</i>	<i>2009</i>	<i>2010</i>	<i>2009</i>	<i>2010</i>	<i>2009</i>	<i>2010</i>	<i>2009</i>	<i>2010</i>
Ship-based charges (\$/TEU)										
Conservancy	4.55	5.27	-	-	-	-	3.70	3.95	-	-
Tonnage	-	-	7.05	7.93	5.46	5.83	8.48	8.03	6.73	7.68
Pilotage	7.13	8.79	2.59	0.62	4.62	5.06	4.29	4.58	2.46	3.24
Towage ^a	9.68	10.46	4.72	5.36	5.09	5.44	14.54	15.52	14.92	17.03
Mooring, unmooring ^b	1.62	1.75	1.68	1.90	0.47	0.37	-	-	1.01	1.15
Berth hire ^c	-	-	-	-	-	-	-	-	-	-
Total ^c	22.98	26.27	16.04	15.81	15.63	16.70	31.01	32.08	25.11	29.10
Cargo-based charges (\$/TEU)										
Wharfage										
Imports	30.35	30.32	91.45	95.07	40.04	40.04	73.26	73.26	61.44	61.44
Exports	30.35	30.32	52.15	54.18	40.04	40.04	73.26	73.26	61.44	61.44
Harbour dues	46.67	48.97	-	-	-	-	-	-	-	-
Berth charge	-	-	-	-	-	-	-	-	18.40	18.40
Channel infrastructure fees	-	-	-	-	36.65	37.65	-	-	-	-
Total port and related charges (\$/TEU) ^d										
Loaded imports	100.00	107.02	107.48	110.88	91.20	92.27	104.27	105.34	104.95	108.94
Loaded exports	100.00	107.02	68.19	69.99	91.20	92.27	104.27	105.34	104.95	108.94
Charges per ship visit (\$/visit)										
Total ship-based charges	31 570	33 396	37 238	33 963	35 736	35 738	36 455	35 327	26 514	26 918
Empty TEUs ^e	6 246	5 461	8 443	7 705	4 271	3 912	0	0	2 289	2 101

- 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 interface costs for ships in the 15 000–20 000 GT range

	<i>Brisbane</i>		<i>Sydney</i>		<i>Melbourne</i>		<i>Adelaide</i>		<i>Fremantle</i>	
	<i>Jul-Dec</i>	<i>Jan-June</i>	<i>Jul-Dec</i>	<i>Jan-June</i>	<i>Jul-Dec</i>	<i>Jan-June</i>	<i>Jul-Dec</i>	<i>Jan-June</i>	<i>Jul-Dec</i>	<i>Jan-June</i>
	<i>2009</i>	<i>2010</i>	<i>2009</i>	<i>2010</i>	<i>2009</i>	<i>2010</i>	<i>2009</i>	<i>2010</i>	<i>2009</i>	<i>2010</i>
	<i>\$/TEU</i>									
Import										
Ship-based charges	34	34	24	26	25	23	33	28	11	10
Cargo-based charges	77	81	91	95	76	76	73	73	80	80
Stevedoring ^p	171	171	171	171	171	171	171	171	171	171
Customs brokers' fees	150	137	131	140	156	154	143	146	148	160
Road transport charges	338	337	369	375	448	448	299	299	319	319
Import total ^a	770	761	787	806	877	873	720	718	730	740
Export										
Ship-based charges	34	34	24	26	25	23	33	28	11	10
Cargo-based charges	77	81	52	54	76	76	73	73	80	80
Stevedoring ^p	171	171	171	171	171	171	171	171	171	171
Customs brokers' fees	95	127	116	122	126	133	100	132	120	97
Road transport charges	338	337	369	375	448	448	299	299	319	319
Export total ^a	715	750	733	748	847	852	677	704	701	677

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

	<i>Brisbane</i>		<i>Sydney</i>		<i>Melbourne</i>		<i>Adelaide</i>		<i>Fremantle</i>	
	<i>Jul-Dec</i>	<i>Jan-Jun</i>	<i>Jul-Dec</i>	<i>Jan-Jun</i>	<i>Jul-Dec</i>	<i>Jan-Jun</i>	<i>Jul-Dec</i>	<i>Jan-Jun</i>	<i>Jul-Dec</i>	<i>Jan-Jun</i>
	<i>2009</i>	<i>2010</i>	<i>2009</i>	<i>2010</i>	<i>2009</i>	<i>2010</i>	<i>2009</i>	<i>2010</i>	<i>2009</i>	<i>2010</i>
	<i>\$/TEU</i>									
Import										
Ship-based charges	23	26	16	16	16	17	31	32	25	29
Cargo-based charges	77	81	91	95	76	76	73	73	80	80
Stevedoring ^p	171	171	171	171	171	171	171	171	171	171
Customs brokers' fees	150	137	131	140	156	154	143	146	148	160
Road transport charges	338	337	369	375	448	448	299	299	319	319
Import total ^a	759	752	779	797	867	867	718	722	744	760
Export										
Ship-based charges	23	26	16	16	16	17	31	32	25	29
Cargo-based charges	77	81	52	54	76	76	73	73	80	80
Stevedoring ^p	171	171	171	171	171	171	171	171	171	171
Customs brokers' fees	95	127	116	122	126	133	100	132	120	97
Road transport charges	338	337	369	375	448	448	299	299	319	319
Export total ^a	704	742	725	738	837	845	675	708	715	696

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

	<i>Jul-Dec</i> <i>2003</i>	<i>Jan-Jun</i> <i>2004</i>	<i>Jul-Dec</i> <i>2004</i>	<i>Jan-Jun</i> <i>2005</i>	<i>Jul-Dec</i> <i>2005</i>	<i>Jan-Jun</i> <i>2006</i>	<i>Jul-Dec</i> <i>2006</i>	<i>Jan-Jun</i> <i>2007</i>	<i>Jul-Dec</i> <i>2007</i>	<i>Jan-Jun</i> <i>2008</i>	<i>Jul-Dec</i> <i>2008</i>	<i>Jan-Jun</i> <i>2009</i>	<i>Jul-Dec</i> <i>2009</i>	<i>Jan-Jun</i> <i>2010</i>
Imports in current prices	661	674	684	739	737	764	773	766	781	843	848	806	806	813
Imports in 2001 prices	623	623	621	654	635	643	634	618	618	643	623	600	598	593
Exports in current prices	614	623	636	691	692	717	726	726	732	788	793	764	764	777
Exports in 2001 prices	579	576	577	611	596	604	595	586	580	601	583	569	567	566

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 sesonally 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.

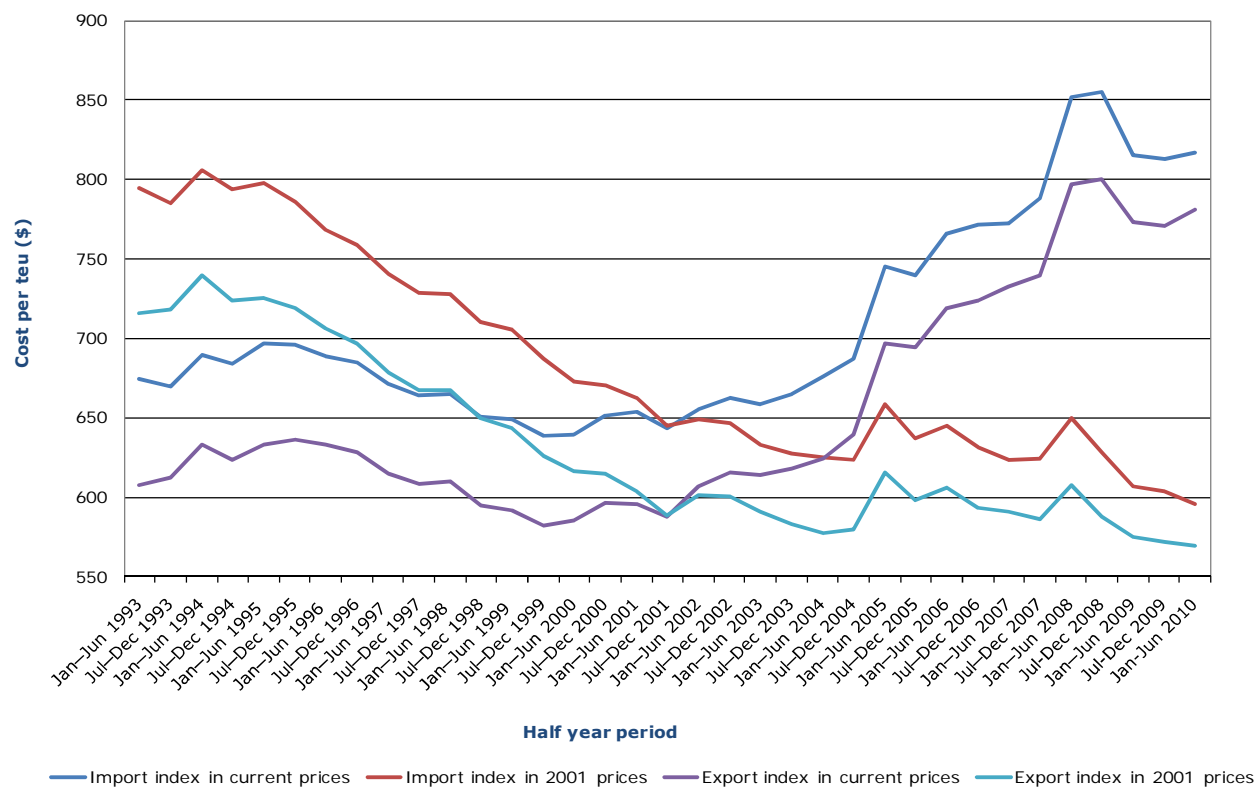
TABLE 3.7 **The national port interface cost index for ships in the 15 000–20 000 GT range**

	<i>Jan-Jun</i>	<i>Jul-Dec</i>	<i>Jan-Jun</i>	<i>Jul-Dec</i>	<i>Jan-Jun</i>	<i>Jul-Dec</i>	<i>Jan-Jun</i>	<i>Jul-Dec</i>	<i>Jan-Jun</i>	<i>Jul-Dec</i>	<i>Jan-Jun</i>	<i>Jul-Dec</i>	<i>Jan-Jun</i>	<i>Jul-Dec</i>	<i>Jan-Jun</i>
	<i>2003</i>	<i>2003</i>	<i>2004</i>	<i>2004</i>	<i>2005</i>	<i>2005</i>	<i>2006</i>	<i>2006</i>	<i>2007</i>	<i>2007</i>	<i>2008</i>	<i>2008</i>	<i>2009</i>	<i>2009</i>	<i>2010</i>
Imports in current prices	659	665	676	687	745	739	766	771	772	789	852	855	815	813	817
Imports in 2001 constant prices	633	627	625	624	659	637	645	632	623	624	649	628	607	603	596
Exports in current prices	614	618	624	639	697	694	719	724	733	740	797	800	773	771	781
Exports in 2001 constant prices	591	583	577	580	616	598	606	593	591	586	607	588	575	572	570

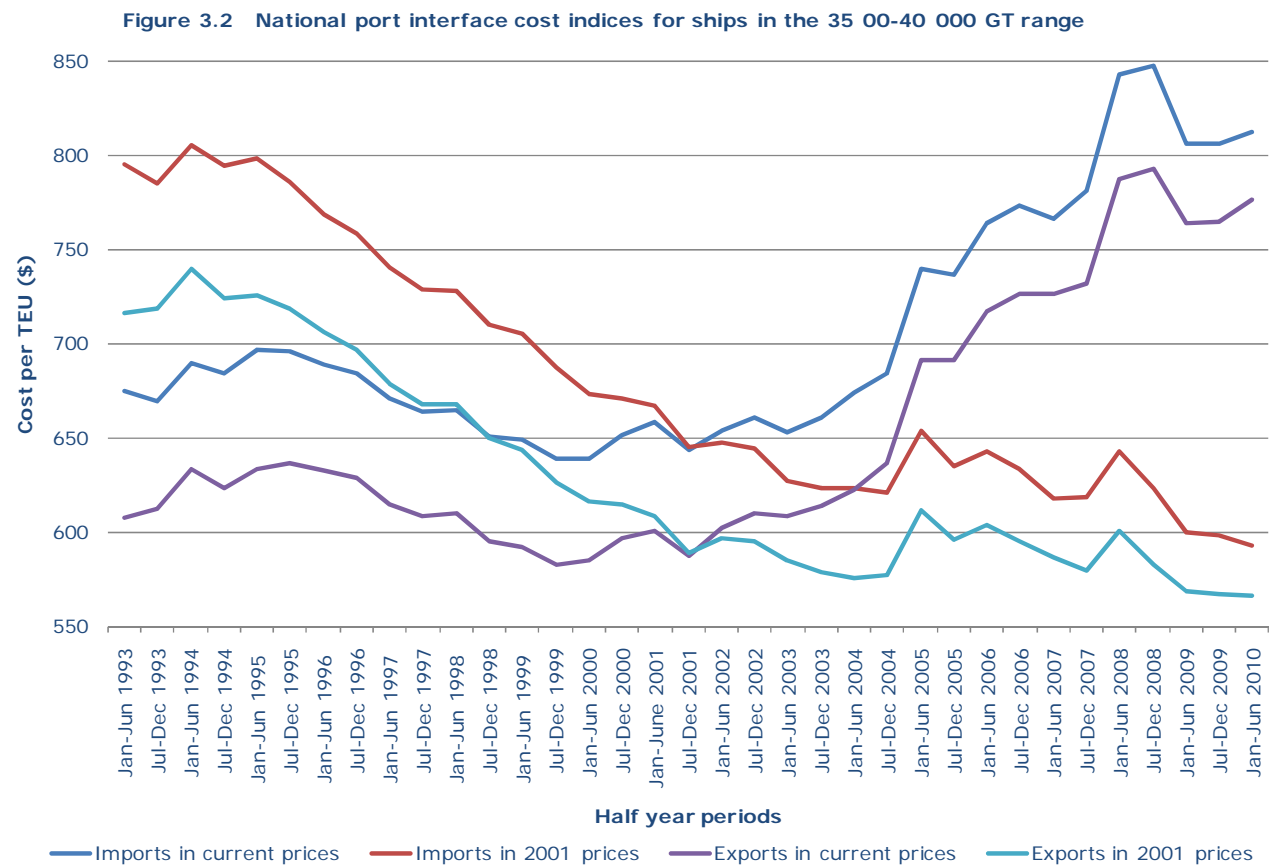
Note: Exports and imports in constant 2001 dollars are calculated by using deflator based on trend series of non-farm GDP chain volume and current prices of the seasonally adjusted series.

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 and industry sources; and ABS 5206.041 National Accounts table (seasonally adjusted).

Figure 3.1 National port interface cost indices for ships in the 15 000–20 000 GT range



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 and industry sources; and ABS 5206.041 National Accounts table (seasonally adjusted).



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 and industry sources; and ABS 5206.041 National Accounts table.

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. 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

<i>GT</i>	<i>Jan-June 2002</i>	<i>Jul-Dec 2002</i>	<i>Jan-June 2003</i>	<i>Jul-Dec 2003</i>	<i>Jan-June 2004</i>	<i>Jul-Dec 2004</i>	<i>Jan-June 2005</i>	<i>Jul-Dec 2005</i>	<i>Jan-June 2006</i>	<i>Jul-Dec 2006</i>	<i>Jan-June 2007</i>	<i>Jul-Dec 2007</i>	<i>Jan-June 2008</i>	<i>Jul-Dec 2008</i>	<i>Jan-June 2009</i>	<i>Jul-Dec 2009</i>	<i>Jan-June 2010</i>
5 000-10 000																	
Average TEUs exchanged	239	187	161	193	333	204	283	368	267	564	391	402	319	554	352	445	309
Total ship visits	66	78	75	72	93	80	71	67	93	108	144	131	159	158	120	123	137
10 000-15 000																	
Average TEUs exchanged	712	424	405	485	688	628	554	506	464	653	711	864	511	554	414	420	283
Total ship visits	79	59	53	54	40	84	89	106	136	108	116	125	103	63	46	42	31
15 000 - 20 000																	
Average TEUs exchanged	763	839	839	826	971	885	693	800	685	889	873	1 116	845	918	978	994	1 028
Total ship visits	285	223	181	191	153	266	316	439	406	430	224	209	189	210	81	84	52
20 000 - 25 000																	
Average TEUs exchanged	762	818	902	990	1 014	935	818	858	685	923	878	942	857	904	918	1 117	977
Total ship visits	233	241	182	214	199	306	321	294	374	256	163	148	207	220	134	138	87
25 000 - 30 000																	
Average TEUs exchanged	888	1 070	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
Total ship visits	186	252	286	323	344	185	332	377	395	475	558	618	545	458	362	356	381
30 000 - 35 000																	
Average TEUs exchanged	1 014	1 149	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
Total ship visits	216	232	175	257	247	191	223	141	198	156	177	235	243	205	139	131	112
35 000 - 40 000																	
Average TEUs exchanged	1 262	1 403	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
Total ship visits	203	223	214	189	225	228	227	225	178	223	313	357	333	379	320	334	375
40 000 - 45 000																	
Average TEUs exchanged	1 228	1 465	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
Total ship visits	195	172	162	186	181	143	196	165	223	249	212	173	136	139	177	184	199
45 000 - 50 000																	
Average TEUs exchanged	808	938	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
Total ship visits	5	38	72	77	75	32	65	77	88	81	154	153	145	123	129	112	98
50 000 - 55 000																	
Average TEUs exchanged	1 134	1 027	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
Total ship visits	60	55	61	69	22	71	89	60	55	55	110	101	166	225	269	270	332
55 000 and above																	
Average TEUs exchanged	1 069	1 166	1 252	0	0	681	1 308	88	0	695	659	1 457	0	290	796	579	2 538
Total ship visits	15	14	3	0	0	6	10	4	0	19	1	11	0	1	3	3	4
Total ship visits	1 543	1 587	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

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, July 2009 - June 2010

<i>Number of ship visits</i>	<i>Brisbane</i>	<i>Sydney</i>	<i>Melbourne</i>	<i>Adelaide</i>	<i>Fremantle</i>	<i>Total</i>
5000 -10 000	95	104	60	0	1	260
10 000-15 000	25	23	18	0	7	73
15 000 - 20 000	29	30	26	11	40	136
20 000 - 25 000	55	80	78	9	3	225
25 000 - 30 000	112	248	260	48	69	737
30 000 - 35 000	39	72	81	8	43	243
35 000 - 40 000	177	176	189	56	111	709
40 000 - 45 000	61	77	106	51	88	383
45 000 - 50 000	98	54	55	0	3	210
50 000 - 55 000	71	198	162	26	145	602
above 55 000	1	2	2	1	1	7
Total	763	1 064	1 037	210	511	3 585

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, 2006-2010

	<i>Jan-Jun 2006</i>	<i>Jul-Dec 2006</i>	<i>Jan-Jun 2007</i>	<i>Jul-Dec 2007</i>	<i>Jan-Jun 2008</i>	<i>Jul-Dec 2008</i>	<i>Jan-Jun 2009</i>	<i>Jul-Dec 2009</i>	<i>Jan-Jun 2010</i>
Five ports^a									
Total cargo throughput ('000 tonnes)	58 358	60 694	59 953	62 591	63 756	64 049	61 063	61 831	64 979
Non-containerised general cargo ('000 tonnes) ^a	2 506	2 522	2 768	2 701	2 826	2 855	1 842	2 153	2 321
Containerised cargo (teus exchanged)									
Full import	1 028 263	1 242 921	1 166 116	1 389 211	1 305 203	1 449 281	1 121 703	1 345 190	1 252 358
Empty import	135 758	137 911	139 096	136 768	142 714	140 312	155 333	129 206	124 477
Full export	750 402	807 702	778 137	817 213	849 152	876 847	857 981	880 174	884 712
Empty export	402 163	500 511	540 582	627 401	563 815	666 821	411 197	588 658	563 320
TOTAL	2 316 586	2 689 045	2 623 931	2 970 593	2 858 884	3 133 261	2 546 214	2 943 228	2 824 867
Average total employment ^b	1 056	1 076	1 114	1 141	1 154	1 222	1 254	1 251	1 260
Port turnaround time (hrs) ^c									
Median result	-	-	-	-	-	-	-	-	-
95th percentile	-	-	-	-	-	-	-	-	-
Brisbane									
Total cargo throughput ('000 tonnes)	13 226	13 936	14 130	15 006	14 716	15 808	16 086	15 697	15 911
Non-containerised general cargo ('000 tonnes) ^a	459	466	546	516	542	670	316	458	551
Containerised cargo (teus exchanged)									
Full import	149 226	186 666	177 073	216 280	196 074	218 787	158 988	133 943	124 430
Empty import	34 164	40 400	38 023	32 133	33 613	37 363	37 174	30 456	27 458
Full export	115 564	136 672	120 261	125 275	130 028	139 042	131 578	133 943	124 430
Empty export	71 123	75 844	100 106	114 465	92 892	104 798	68 437	100 812	96 928
TOTAL	370 077	439 582	435 463	488 153	452 607	499 990	396 177	399 154	373 246
Average total employment ^b	256	258	293	312	312	342	353	350	337
Port turnaround time (hrs) ^c									
Median result	30	36	33	35	33	26	32	33	32
95th percentile	51	57	54	54	51	45	70	76	61
Sydney									
Total cargo throughput ('000 tonnes)	13 505	14 024	13 772	14 886	14 558	14 715	13 099	14 169	13 992
Non-containerised general cargo ('000 tonnes) ^a	304	331	347	270	262	142	1	0	0
Containerised cargo (teus exchanged)									
Full import	342 216	419 784	380 056	459 364	428 179	489 703	386 403	496 239	454 790
Empty import	9 490	9 616	9 762	9 796	9 224	10 840	15 580	12 962	12 232
Full export	173 932	192 703	176 919	188 416	196 678	222 367	220 061	223 290	219 277
Empty export	168 830	213 006	218 275	248 943	237 825	262 222	176 744	261 042	247 688
TOTAL	694 468	835 109	785 012	906 519	871 906	985 132	798 788	993 533	933 987
Average total employment ^b	243	246	244	240	223	244	260	267	298
Port turnaround time (hrs) ^c									
Median result	27.8	29.5	29.6	29.8	27.9	29.6	29.0	34.6	37.9
95th percentile	48	56	53	57	47	56	54	63	72
Melbourne									
Total cargo throughput ('000 tonnes)	13 781	14 884	14 628	15 159	15 665	15 542	13 560	14 995	15 299
Non-containerised general cargo ('000 tonnes) ^a	1 081	1 061	1 175	1 184	1 251	1 273	1 028	1 055	1 130
Containerised cargo (teus exchanged)									
Full import	416 323	485 828	463 052	542 218	508 357	557 940	422 482	532 350	502 392
Empty import	60 806	55 592	54 843	47 900	50 920	48 483	59 685	47 694	50 621
Full export	339 949	355 544	343 064	354 504	372 536	359 377	353 155	375 205	391 422
Empty export	126 118	158 613	177 075	205 955	174 254	231 319	124 911	170 507	166 444
TOTAL	943 196	1 055 577	1 038 034	1 150 577	1 106 067	1 197 119	960 233	1 125 756	1 110 879
Average total employment ^b	199	196	201	209	223	228	224	217	210
Port turnaround time (hrs) ^c									
Median result	30	31	31	32	30	31	30	30	32
95th percentile	52	62	63	65	56	62	56	62	70

Table 5.1 Non-financial performance indicators, selected Australian ports, 2006-2010

	<i>Jan-Jun 2006</i>	<i>Jul-Dec 2006</i>	<i>Jan-Jun 2007</i>	<i>Jul-Dec 2007</i>	<i>Jan-Jun 2008</i>	<i>Jul-Dec 2008</i>	<i>Jan-Jun 2009</i>	<i>Jul-Dec 2009</i>	<i>Jan-Jun 2010</i>
Adelaide									
Total cargo throughput ('000 tonnes)	5 137	5 212	5 072	5 014	5 283	4 952	4 767	4 713	5 887
Non-containerised general cargo ('000 tonnes) ^a	193	181	180	196	187	190	73	105	128
Containerised cargo (teus exchanged)									
Full import	23 483	30 277	31 441	38 144	40 656	40 260	40 656	47 581	42 201
Empty import	18 024	21 342	23 583	28 340	29 018	27 862	26 461	24 052	23 564
Full export	43 954	46 606	50 233	57 587	59 075	59 382	59 075	59 748	58 801
Empty export	4 954	7 979	7 656	12 710	14 591	16 724	6 125	10 379	8 175
TOTAL	90 415	106 204	112 913	136 781	143 340	144 228	132 317	141 760	132 741
Average total employment ^b	97	97	99	103	107	107	109	112	111
Port turnaround time (hrs) ^c									
Median result	19	20	21	20	21	25	24	28	28
95th percentile	32	32	35	34	35	39	48	54	54
Fremantle									
Total cargo throughput ('000 tonnes)	12 709	12 638	12 352	12 525	13 534	13 032	13 550	12 258	13 890
Non-containerised general cargo ('000 tonnes) ^a	468	482	520	535	585	580	423	535	512
Containerised cargo (teus exchanged)									
Full import	97 015	120 366	114 494	133 205	131 937	142 591	113 174	135 077	128 545
Empty import	13 274	10 961	12 885	18 599	19 939	15 764	16 433	14 042	10 602
Full export	77 003	76 177	87 660	91 431	90 835	96 679	94 112	87 988	90 782
Empty export	31 138	45 069	37 470	45 328	44 253	51 758	34 980	45 918	44 085
TOTAL	218 430	252 573	252 509	288 563	284 964	306 792	258 699	283 025	274 014
Average total employment ^b	261	280	277	277	289	302	309	305	305
Port turnaround time (hrs) ^c									
Median result	21	25	27	26	29	31	28	26	29
95th percentile	48	54	55	51	62	67	57	46	60

- 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 significantly 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 receipt and ship arrival advice.

Explanatory notes

Stevedoring-cargo receipt

Tables 6.1a & 6.1b present the information on cargo receipt 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

Tables 6.1a & 6.1b 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.

Table 6.1 Stevedoring and ship arrival reliability indicators, March and June quarters 2010

Indicator	Brisbane		Sydney		Melbourne		Adelaide		Fremantle	
	Jan-Mar	Apr-June	Jan-Mar	Apr-June	Jan-Mar	Apr-June	Jan-Mar	Apr-June	Jan-Mar	Apr-June
Stevedoring										
Cargo receipt	93.2	88.5	76.1	75.3	93.0	93.6	0.0	0.0	95.5	92.5
Ship arrival										
Advice at 24 hrs	86.0	98.0	40.9	21.5	na	na	100.0	97.0	70.1	51.5
Advice inside 24 hrs	100.0	95.0	95.8	87.8	na	na	100.0	100	84.9	85.3

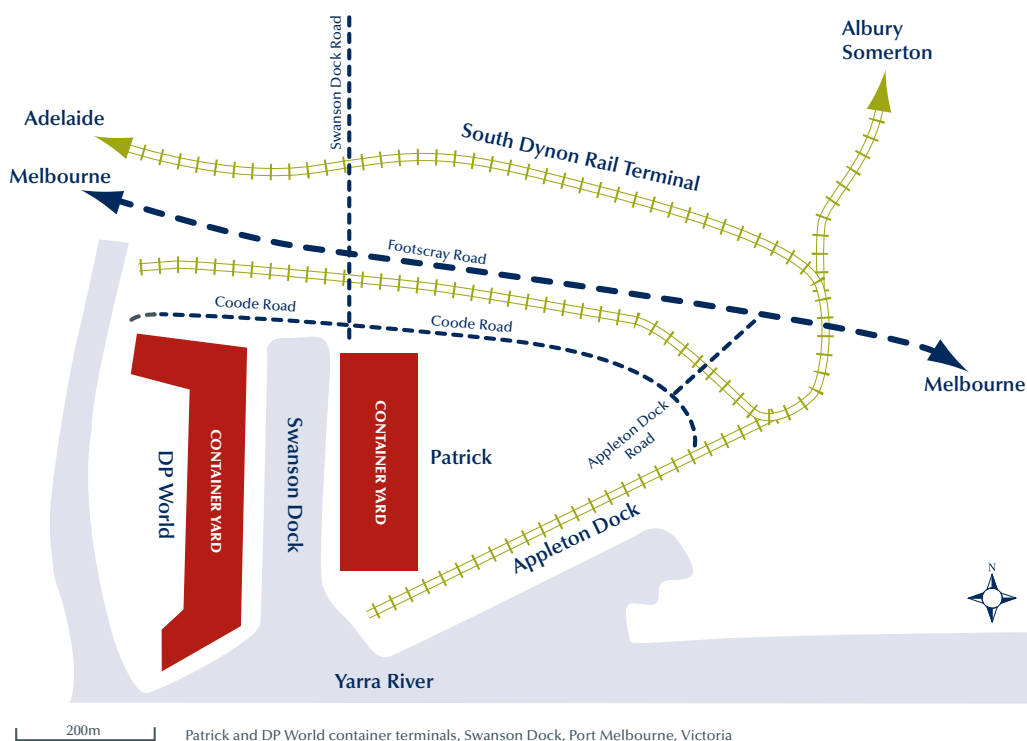
na not available

Sources: Ports Australia, Patrick, DP World Terminals

APPENDIX A

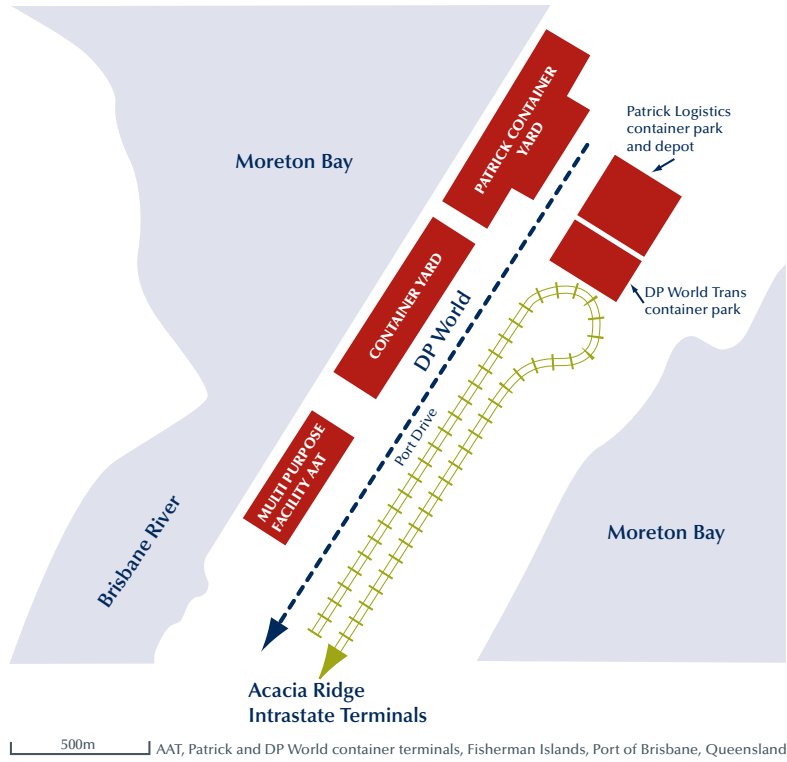
Diagrams of five major Australian container port terminals

FAI Patrick and DP World 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 through 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

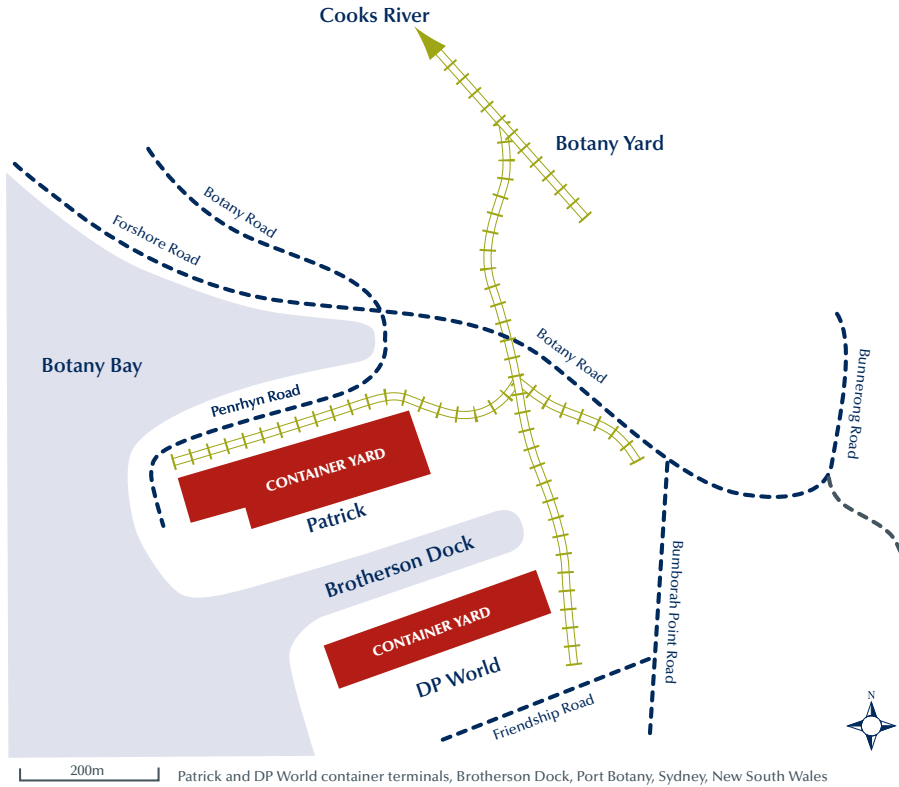


Note: This is a purpose built container terminal and includes a near dock rail terminal shared by the two stevedores for export and import containers and Australian Amalgamated Terminals (AAT) which provides a multi purpose facility with container handling capacity which can be used for motor vehicles 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: DPWorld (2007b), Google Maps Australia (2007), DOTARS (2006), Patrick (2007b), Port of Brisbane (2007).

FA3

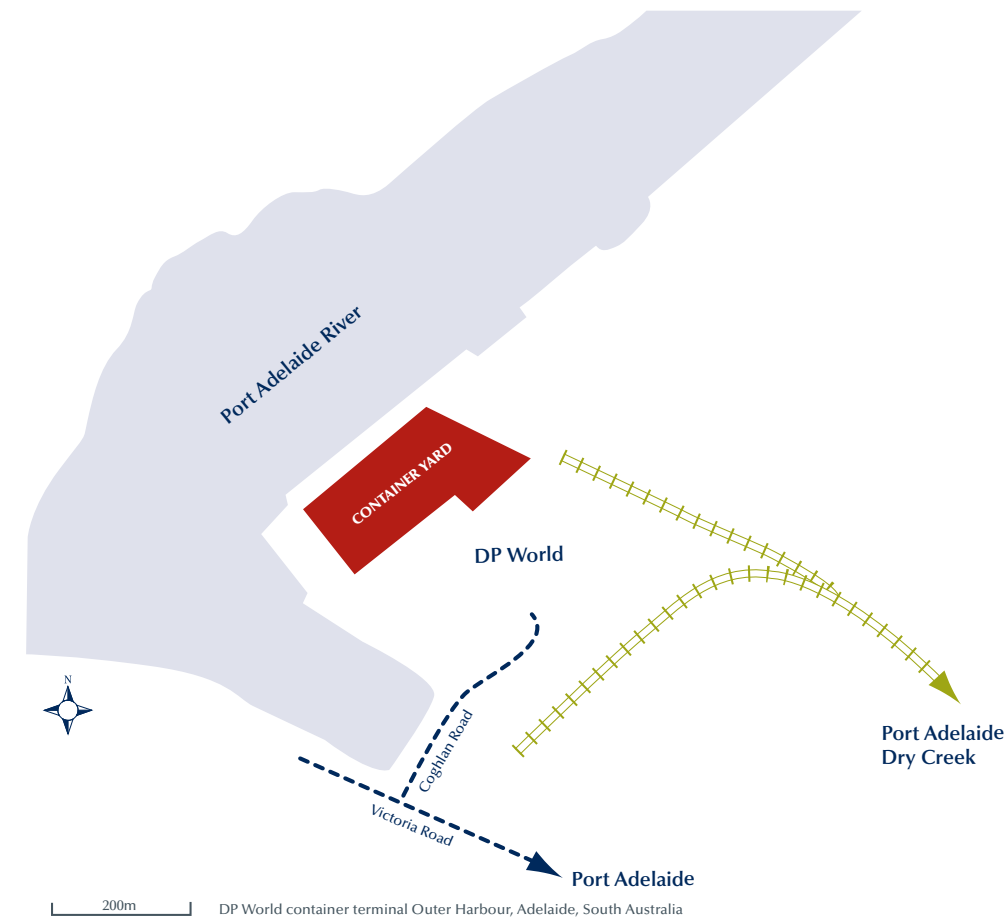
Patrick and DP World terminals—Brogherson dock, Port Botany, Sydney, New South Wales



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 Brogherson 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

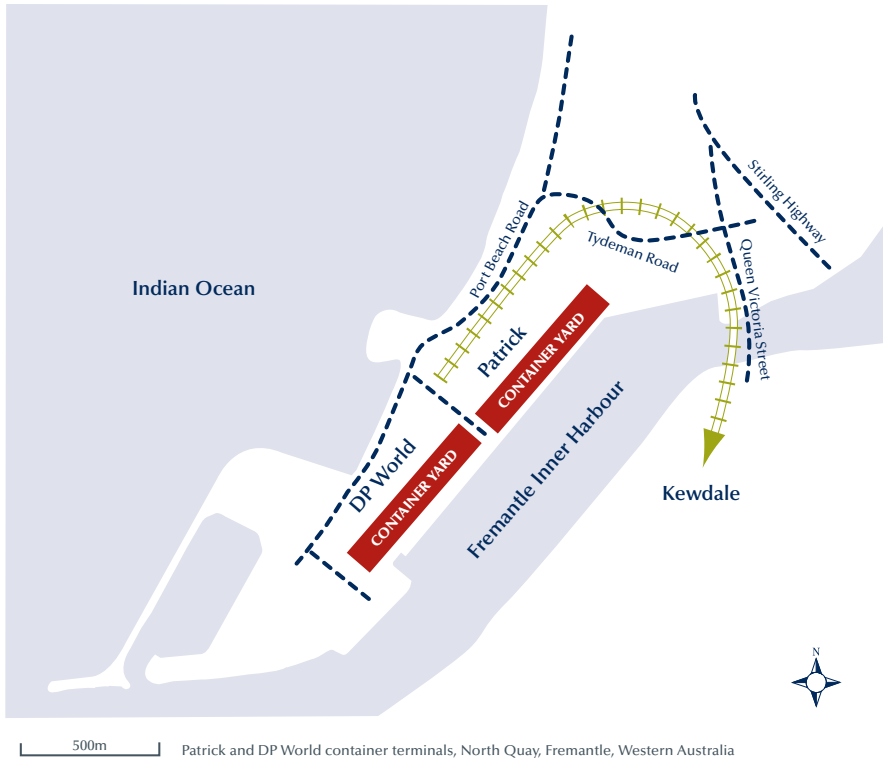


Note: This is the only container terminal at Adelaide. It is operated by DP World stevedores, is located at Pelican Point, Outer Harbour, approximately 10 kilometres from Port Adelaide. It has an on-dock rail terminal adjacent to a container depot which in turn is connected via Port Adelaide to the Dry 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



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 gauge providing access for narrow gauge 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

AAPMA	Association of Australian Ports and Marine Authorities
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
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
TEU	Twenty-foot equivalent units
TTT	Truck turnaround time
UCC	Unitized Cellular Container vessel
VBS	Vehicle Booking System

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