THE SERVICES CONTENT OF JAPANESE TRADE

This paper investigates the share of direct and indirect services trade in Japanese trade between 1985 and 1995, using data from Japanese input-output tables. The empirical analysis reveals that the share of R&D services in total services trade has been much higher throughout the period than the share of other services. The contribution of school education services gradually increased from 1985 to 1995, while that of financial services declined. These results indicate that Japan increasingly exported technology-intensive products during the period, moving away from goods intensive in financial services to those intensive in educational services. After the bubble economy burst, exports of financial services declined and Japanese banking and insurance companies rapidly withdrew from overseas markets. Financial firms in Japan lack international competitiveness. Although structural reforms have been under way in some services sectors, the analysis in this paper suggests that greater reform is needed, especially in the financial sector.

Introduction

The expansion in world trade in services has been a major topic for research in recent years. Cross-country regression analyses have confirmed that the traditional Heckscher-Ohlin-Vanek (HOV) Theorem has some validity in explaining patterns of services trade in that countries abundant in labour, or in physical capital or human capital, tend to export services that are intensive in that factor.[1] However, the evidence has been weaker than the evidence on goods trade, suggesting a more detailed analysis of services trade is needed.

One possible reason for the weak application of the HOV theorem to services trade is that most services are traded indirectly, in that they are embodied in goods trade. Services are intangible and non-storable,[2] and although technological change has enabled more services to be traded directly, most are used as intermediate inputs to produce goods. For instance, Japanese graduate students consume US research and educational services through imports of US books, but such imports are reported entirely as goods trade rather than services trade. Another example is when developing countries import machinery from industrialised countries, as various technical services such as research and development (R&D) are embodied in the machinery. Studies of the services embodied in goods trade are therefore useful to shed light on the true trade in services.

There have been a large number of studies into the factor content of trade but only a few have analysed the services embodied in goods trade. Tucker and Sundberg (1988) examined the trade of Singapore in 1973, and Australia and Thailand in 1975. Their results indicated that the half of Australian services exports were embodied in goods exports, but that the embodied services exports of Thailand and Singapore were relatively small. Grubel (1988) looked at Canadian services trade between 1973 and 1983, finding that embodied services trade rapidly increased in that period and that the net surplus (exports minus imports) of indirect services trade was larger than the deficit of direct services trade in 1983.

Sazanami and Urata (1990) came up with similar findings when analysing Japanese and US indirect services trade, estimating that in both countries indirect services trade was so large that the total of direct and indirect services trade was in net surplus. Recent analysis by Urata and Kiyota (2001) extended the framework to six East Asian countries. The results suggested that industrialised countries with large services sectors are net exporters of services via goods trade.

These previous studies have confirmed that the services trade embodied in goods trade is significant for Japan and other countries. This paper expands the analysis by investigating direct and indirect services trade (the services content of Japanese trade) between 1985 and 1995 using input-output tables from Japan's Management and Coordination Agency. The detailed industrial classification (52 service industries out of a total 184 industries) allows for an empirical analysis of the input-output structure of services production and trade. The empirical analysis reveals that the share of R&D services in the total services content of trade is much higher than the share of other services. The share of school education services gradually increased from 1985 to 1995, while the share of financial services decreased rapidly. These results indicate that Japan exported technology-intensive products throughout the period. The pattern of Japanese exports dramatically changed between 1985 and 1995 from exports of goods intensive in financial services to those intensive in education services. The recent decline in the international competitiveness of the financial sector has been behind the falling share of financial services in services trade and the exit of Japanese banking and insurance companies from abroad. Structural reform in some services sectors in Japan is under way and the results suggest greater reform is needed, particularly in the financial sector.

The model

Owing to the difficulty in obtaining stock data, flow data from Japanese input-output tables for 1985, 1990 and 1995 are used for computing direct and indirect services trade. Suppose that

services industries are indexed as $k+1, \ldots, I$. Industry i is in the goods sector (agriculture, manufacturing, etc.) if $i \leq k$ and in the services sector if $i \geq k+1$. Let S_{ti}^{h} $(t \in \{x, m\})$ be the total (direct plus indirect) trade of service i in country h, where x and m are exports and imports, respectively. S_{ti}^{Dh} and S_{ti}^{IDh} represent the direct and indirect trade of service i in country h, respectively, and $S_{ti}^{h} = S_{ti}^{Dh} + S_{ti}^{IDh}$.

Let $\mathbf{S}_{t}^{Dh}$ and $\mathbf{S}_{t}^{IDh}$ be the vectors of direct and indirect services, respectively, in country h. Denote the trade vector in country h as $\mathbf{T}^{h}$ $(\mathbf{T} \in \{\mathbf{EX}, \mathbf{IM}\})$, where $\mathbf{EX}$ and $\mathbf{IM}$ represent export and import vectors, respectively.

$$\mathbf{S}_{t}^{h} = \mathbf{S}_{t}^{Dh} + \mathbf{S}_{t}^{IDh} = \hat{\alpha}\mathbf{T}^{h} + \hat{\alpha}\mathbf{B}^{h} \cdot \hat{\beta}\mathbf{T}^{h}$$

where $\hat{\alpha}$ is a diagonal matrix of α, which takes the value of 1 if $i \geq k+1$ and 0 if $i \leq k$; and $\hat{\beta}$ is a diagonal matrix of β, which takes value of 1 if $i \leq k$ and 0 if $i \geq k+1$. $\mathbf{B}$ is a Leontief-inverse matrix. This paper calculates the services content of trade as net exports of direct and indirect services, similar to the calculation of the factor content of trade suggested by Leamer (1980) and Maskus (1985):

$$\mathbf{S}_{x}^{h} - \mathbf{S}_{m}^{h} = (\hat{\alpha}\mathbf{EX}^{h} + \hat{\alpha}\mathbf{B}^{h} \cdot \hat{\beta}\mathbf{EX}^{h}) - \left(\hat{\alpha}\mathbf{IM}^{h} + \hat{\alpha}\mathbf{B}^{h} \cdot \hat{\beta}\mathbf{IM}^{h}\right) \qquad (1)$$

Denote the vector of services output in country h as $\hat{\mathbf{S}}^{h}$. Let $(\hat{\mathbf{S}}^{h})^{-1}$ be the diagonal matrix whose elements are the inverse of services output $1/S_{i}^{h}$. The content of a particular service in services trade can be estimated by presuming that its share of services trade is the same as its share of Japanese domestic output:[3]

$$(\hat{\mathbf{S}}^{h})^{-1}\left[\mathbf{S}_{x}^{h} - \mathbf{S}_{m}^{h}\right] = (\hat{\mathbf{S}}^{h})^{-1}\left[\left(\hat{\alpha}\mathbf{EX}^{h} + \hat{\alpha}\mathbf{B}^{h} \cdot \hat{\beta}\mathbf{EX}^{h}\right) - (\hat{\alpha}\mathbf{IM}^{h} + \hat{\alpha}\mathbf{B}^{h} \cdot \hat{\beta}\mathbf{IM}^{h})\right] (2)$$

Compute the ranking of services in the services content of trade. Equation (3) is modified as:

$$(S_{xi}^{h} - S_{mi}^{h}) / S_{i}^{h}\rangle(S_{xj}^{h} - S_{mj}^{h}) / S_{j}^{h}$$

Therefore,

$$\left(\left(S_{xi}^{Dh} + S_{xi}^{IDh}\right) + \left(S_{mi}^{Dh} + S_{mi}^{IDh}\right)\right) / S_i^h \rangle \left(\left(S_{xj}^{Dh} + S_{xj}^{IDh}\right) + \left(S_{mj}^{Dh} + S_{mj}^{IDh}\right)\right) / S_j^h \qquad (3)$$

Equation (3) indicates that service i is more intensively used in the net exports of country h than service j.

In contrast with factor content analysis, the analysis of services content will not necessarily reflect the abundance of particular services used in the domestic economy since some services are used in the production of other non-tradable services.[4] The rank indicates the intensity of services used in trade, and partly the international competitiveness of services, but not the abundance of services.

Data description

The data used in the analysis come from the input-output tables published by the Management and Coordination Agency (2000) for the years 1985, 1990 and 1995. The industrial classification is constant over the period and prices are indexed, which allows a reliable time-series analysis to be performed.

The definition and sectoral coverage of trade in services in the input-output tables differ slightly from those used in the International Monetary Fund's *Balance of Payments Statistics* and by the World Trade Organisation. For instance, the tables do not include licence fees or distinguish services provided or purchased by foreign affiliates in Japan from those provided or purchased by Japanese domestic companies.

The values are converted from Japanese yen to US dollars using exchange rate data published by the IMF (2001). Although the input-output tables cover more than 500 industries, more aggregated data (for 184 industries including 52 services industries) is used so as to simplify the analysis.

Table 1 describes output and value added in Japan's services sector between 1985 and 1995, and Table 2 shows the trade in services. The share of each service industry's domestic production, value added and trade relative to the services total is reported in Table 3. These tables confirm that domestic production, value added and trade rapidly expanded between 1985 and 1995 in the services sector. The average annual growth rates of production, value added, exports and imports in services were, respectively, 15.0 per cent, 14.5 per cent, 7.8 per cent and 10.7 per cent in the 1985–90 period; and 10.8 per cent, 10.8 per cent, 21.7 per cent and 10.0 per cent between 1990 and 1995. Compared with annual average growth of GDP over the

same period (4.5 per cent in 1985–90 and 1.4 per cent in 1990–95), the growth rates of production, value added and trade in services were extremely high.[5]

An examination of the share of each services sector in the total shows some interesting differences between domestic production and trade.[6] Over the period R&D services were consistently around 1.5 per cent of both services production and value added, but appeared to be insignificant in services trade. Wholesale and retail services contributed the most to services output between 1985 and 1995. In 1995 wholesale services made up 10.7 per cent of services production and 11.7 per cent of value added, while retail services contributed 6.6 per cent to production and 7.4 per cent to value added. The shares of house rentals, construction and medical services were also high. The pattern of trade in these services varied significantly. While the wholesale sector contributed 34.7 per cent to services exports, retail services were only 0.2 per cent of services exports. Transport-related services such as ocean transport and air transport had relatively high shares. Financial services were also significant at 4.7 per cent of production in 1995, and 4.9 per cent of value added, and were also significant in trade at 5.6 per cent of services exports and 9.4 per cent of imports.

The ratio of net exports (exports minus imports) to total trade (exports plus imports) in services was quite high in 1985 (0.32) but around zero in 1990 (–0.01) and 1995 (0.00). The net export ratio of financial services was negative throughout the period and the net export ratio of insurance services gradually decreased. These results imply that Japanese services industries lost international competitiveness between 1985 and 1995.

Services likely to be significant in services trade

Research by Coe, Helpman and colleagues (Coe and Helpman 1995; Coe, Helpman and Hoffmaister 1997; Bayoumi, Coe and Helpman 1999) has suggested that OECD countries export R&D services thorough goods trade. Since most of the Japanese current account surplus is from machinery exports, this suggests that Japan exports services that are intensive in R&D services and therefore that the ranking or intensity of R&D services in the total services content is likely to be high.

Japan has a large financial services sector. Over the period Japanese financial services lost international competitiveness, and the net exports of the financial sector rapidly declined. A recent report (Toyokeizai 2001) described the exit of Japanese financial subsidiaries from overseas, and the fall in new entrants. The intensity of financial services in the services content of trade is therefore expected to have decreased between 1985 and 1995.

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Table 1 Domestic production and value added of services in Japan, 1985–95 (US$ million, 1995 constant prices)

Code	Industry	Domestic production (S)			Value added (vS)		
		1985	1990	1995	1985	1990	1995
4111	Residential construction	78,384	193,673	277,271	36,364	94,359	128,960
4112	Non-residential construction	73,545	180,193	168,496	35,186	90,775	76,756
4121	Repair of construction	25,962	49,653	86,325	11,235	20,617	37,177
4131	Public construction	62,392	142,842	256,364	30,858	69,433	120,957
4132	Other civil engineering and construction	36,402	79,891	148,703	16,387	35,203	68,267
5111	Electric power	51,521	106,108	177,945	31,294	66,150	96,550
5121	Gas supply	4,816	10,162	20,924	2,058	5,459	11,299
5122	Steam and hot water supply	153	368	1,110	92	223	633
5211	Water supply	12,990	26,701	48,467	8,251	16,620	30,506
5212	Waste disposal services	14,474	24,136	32,901	12,774	20,628	23,970
6111	Wholesale services	138,041	318,663	671,922	90,217	212,145	472,271
6112	Retail services	119,059	246,403	415,911	80,914	177,671	301,110
6211	Financial services	64,272	173,922	295,647	43,120	114,556	200,501
6212	Insurance services	15,471	44,298	90,644	6,445	29,441	64,580
6411	Real estate agencies and rental services	50,192	87,103	119,980	45,322	74,560	98,340
6421	House rent	150,650	287,527	562,405	134,371	241,984	496,137
7111	Railway passenger transport	21,832	41,926	64,854	11,520	21,209	34,142
7112	Railway freight transport	728	1,441	1,972	172	662	992
7121	Road passenger transport	20,523	34,744	48,916	16,321	27,312	38,518
7122	Road freight transport	35,404	82,782	146,469	25,962	61,676	99,344
7141	Ocean transport	12,297	14,339	19,160	5,571	2,942	3,054
7142	Coastal and island water transport	4,669	9,122	13,907	2,985	5,816	7,858
7143	Transport services in harbours	5,853	11,055	15,439	3,889	7,451	9,673
7151	Air transport	5,085	12,943	25,668	1,086	4,071	9,293
7161	Freight transport	2,339	4,184	6,338	1,735	2,950	4,347
7171	Storage facility services	4,848	10,279	17,060	2,987	6,220	11,398
7181	Packing	7,601	10,223	18,217	4,801	5,547	9,940
7189	Other transport-related services	14,473	29,697	56,802	10,687	20,156	39,079
7311	Postal services[a]	6,635	14,225	22,774	5,353	12,392	17,800
7312	Telecommunications	16,559	39,827	105,010	11,669	29,141	75,172

Code	Category						
7319	Other services related to communications	354	405	681	291	332	522
7321	Broadcasting	7,516	16,047	28,485	4,645	8,491	13,380
8111	Public administration (central)	30,327	49,425	94,181	20,126	28,395	55,953
8112	Public administration (local)	51,210	99,269	184,545	40,216	77,882	136,813
8211	School education	67,860	126,205	208,228	60,077	113,446	180,980
8213	Social education and other education	7,969	16,380	28,104	5,725	11,291	19,365
8221	Research institutions	4,928	9,817	19,908	3,841	7,369	15,624
8222	Research and development (intra-enterprise)	24,606	60,194	97,226	14,502	33,642	60,619
8311	Medical services	82,813	161,964	316,970	54,422	91,144	174,854
8312	Health	2,316	3,957	7,360	1,784	3,148	5,483
8313	Social security	14,127	35,643	60,843	10,992	26,138	41,425
8411	Other public services	24,288	29,355	49,529	18,496	19,176	32,663
8511	Advertising agencies	20,069	51,465	73,918	7,421	19,574	23,085
8512	Inquiry and information services	18,618	47,374	80,422	12,014	28,360	50,632
8513	Goods renting and leasing (except car renting)	11,940	47,600	103,348	8,085	26,903	67,380
8514	Car renting	1,008	4,240	10,019	389	2,786	7,701
8515	Car repairing	27,203	45,325	72,776	18,808	25,006	34,334
8516	Machine repairing	21,106	46,509	63,366	8,682	19,115	23,435
8519	Other business services	62,586	152,078	262,653	41,909	111,526	185,578
8611	Amusement and recreational services	48,668	114,219	143,707	34,519	80,963	97,420
8612	Eating and drinking places	76,320	136,730	243,408	44,330	72,583	114,851
8613	Hotel and lodging services	24,267	43,582	74,473	15,409	23,256	36,888
8619	Other personal services	32,397	67,762	114,356	25,658	50,664	83,929
	Services total (4111–8619)	1,719,667	3,653,973	6,276,111	1,141,968	2,358,553	4,051,539

Note: 1 Dollar values are converted from Japanese yen using the annual average exchange rate (rf) published by the IMF.

Sources: Management and Coordination Agency (2000) Input-Output Tables, 1985, 1990, 1995; International Monetary Fund (IMF) (2001) International Financial Statistics on CD-ROM.

Table 2 Trade in services in Japan, 1985–95 (US$ million, 1995 constant prices)

Code	Industry	1985 Exports (S^Dx)	1985 Imports (S^Dm)	1985 Net exports (S^Dnx)	1990 Exports (S^Dx)	1990 Imports (S^Dm)	1990 Net exports (S^Dnx)	1995 Exports (S^Dx)	1995 Imports (S^Dm)	1995 Net exports (S^Dnx)
4111	Residential construction	0	0	0	0	0	0	0	0	0
4112	Non-residential construction	0	0	0	0	0	0	0	0	0
4121	Repair of construction	0	0	0	0	0	0	0	0	0
4131	Public construction	0	0	0	0	0	0	0	0	0
4132	Other civil engineering and construction	0	0	0	0	0	0	0	0	0
5111	Electric power	76	3	73	150	15	135	261	3	259
5121	Gas supply	1	2	0	2	5	–3	1	10	–8
5122	Steam and hot water supply	0	0	0	0	0	0	0	0	0
5211	Water supply	1	3	–2	26	7	19	38	7	32
5212	Waste disposal services	0	0	0	3	0	3	4	0	4
6111	Wholesale services	12,591	1,469	11,122	13,422	1,993	11,430	32,730	1,549	31,182
6112	Retail services	42	64	–22	134	1,009	–876	223	114	108
6211	Financial services	917	1,624	–707	2,632	4,991	–2,358	5,251	8,809	–3,559
6212	Insurance services	237	164	73	430	380	51	885	2,106	–1,221
6411	Real estate agencies and rental services	0	0	0	0	0	0	0	0	0
6421	House rent	5	12	–8	32	68	–36	55	48	7
7111	Railway passenger transport	64	297	–233	202	550	–348	203	866	–664
7112	Railway freight transport	21	0	21	7	0	7	65	0	65
7121	Road passenger transport	64	570	–506	173	966	–793	224	1,359	–1,135
7122	Road freight transport	1,500	0	1,500	3,601	0	3,601	4,410	0	4,410
7141	Ocean transport	12,283	1,729	10,553	14,289	3,586	10,704	19,065	7,764	11,301
7142	Coastal and island water transport	80	22	58	41	40	1	8	54	–46
7143	Transport services in harbours	977	880	97	2,036	1,663	373	3,391	2,322	1,069
7151	Air transport	942	2,148	–1,206	2,099	5,641	–3,542	4,389	11,668	–7,279
7161	Freight transport	100	0	100	109	0	109	226	0	226

		S^D_x	S^D_m	S^D_{nx}	S^D_x	S^D_m	S^D_{nx}	S^D_x	S^D_m	S^D_{nx}
7171	Storage facility services	173	0	173	55	0	55	320	0	320
7181	Packing	0	0	0	0	0	0	0	0	0
7189	Other transport-related services	1,728	947	781	4,033	1,511	2,522	7,457	2,629	4,828
7311	Postal services	15	93	−78	44	61	−17	98	79	19
7312	Telecommunications	35	27	7	206	286	−80	411	719	−308
7319	Other services related to communications	0	0	0	0	0	0	0	0	0
7321	Broadcasting	0	1	−1	0	1	−1	0	0	0
8111	Public administration (central)	0	0	0	0	0	0	0	0	0
8112	Public administration (local)	0	0	0	0	0	0	0	0	0
8211	School education	0	0	0	0	0	0	0	0	0
8213	Social education and other education	0	0	0	0	0	0	1	2	−1
8221	Research institutions	60	61	−1	75	129	−54	229	347	−118
8222	Research and development (intra-enterprise)	0	0	0	0	0	0	0	0	0
8311	Medical services	2	4	−2	1	7	−5	1	8	−7
8312	Health	0	0	0	0	0	0	0	0	0
8313	Social security	0	0	0	0	0	0	0	0	0
8411	Other public services	213	291	−78	278	197	82	501	418	83
8511	Advertising agencies	197	1,016	−818	510	2,177	−1,667	1,088	3,584	−2,496
8512	Inquiry and information services	356	500	−144	636	1,433	−798	1,483	3,051	−1,568
8513	Goods renting and leasing (except car renting)	143	234	−91	442	857	−415	1,093	2,411	−1,319
8514	Car renting	0	0	0	0	0	0	0	0	0
8515	Car repairing	1	1	0	2	2	0	1	3	−1
8516	Machine repairing	0	0	0	0	0	0	0	0	0
8519	Other business services	918	1,517	−599	1,974	3,752	−1,778	4,937	7,534	−2,596
8611	Amusement and recreational services	58	316	−258	244	2,242	−1,998	284	2,327	−2,044
8612	Eating and drinking places	336	1,415	−1,079	898	6,088	−5,190	1,375	10,148	−8,773
8613	Hotel and lodging services	603	2,606	−2,002	1,877	11,245	−9,369	2,959	17,362	−14,403
8619	Other personal services	20	17	4	25	42	−18	54	61	−7
	Services total (4111–8619)	37,369	19,102	18,267	55,206	56,598	−1,391	94,210	93,304	906

Notes: 1 S^D_x, S^D_m and S^D_{nx} ($= S^D_x - S^D_m$) are direct exports, imports and net exports, respectively.
2 For other notes and sources, see Table 1.

Table 3 Shares of services production and trade, 1985–95

Code	Industry	Domestic production 1985	1990	1995	Value added 1985	1990	1995	Share (%) Exports 1985	1990	1995	Imports 1985	1990	1995	Net export ratio 1985	1990	1995
4111	Residential construction	4.6	5.3	4.4	3.2	4.0	3.2	0.0	0.0	0.0	0.0	0.0	0.0	n.a.	n.a.	n.a.
4112	Non-residential construction	4.3	4.9	2.7	3.1	3.8	1.9	0.0	0.0	0.0	0.0	0.0	0.0	n.a.	n.a.	n.a.
4121	Repair of construction	1.5	1.4	1.4	1.0	0.9	0.9	0.0	0.0	0.0	0.0	0.0	0.0	n.a.	n.a.	n.a.
4131	Public construction	3.6	3.9	4.1	2.7	2.9	3.0	0.0	0.0	0.0	0.0	0.0	0.0	n.a.	n.a.	n.a.
4132	Other civil engineering and construction	2.1	2.2	2.4	1.4	1.5	1.7	0.0	0.0	0.0	0.0	0.0	0.0	n.a.	n.a.	n.a.
5111	Electric power	3.0	2.9	2.8	2.7	2.8	2.4	0.2	0.3	0.3	0.0	0.0	0.0	0.93	0.82	0.98
5121	Gas supply	0.3	0.3	0.3	0.2	0.2	0.3	0.0	0.0	0.0	0.0	0.0	0.0	−0.08	−0.44	−0.75
5122	Steam and hot water supply	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	n.a.	n.a.	n.a.
5211	Water supply	0.8	0.7	0.8	0.7	0.7	0.8	0.0	0.0	0.0	0.0	0.0	0.0	−0.37	0.57	0.70
5212	Waste disposal services	0.8	0.7	0.5	1.1	0.9	0.6	0.0	0.0	0.0	0.0	0.0	0.0	n.a.	1.00	1.00
6111	Wholesale services	8.0	8.7	10.7	7.9	9.0	11.7	33.7	24.3	34.7	7.7	3.5	1.7	0.79	0.74	0.91
6112	Retail services	6.9	6.7	6.6	7.1	7.5	7.4	0.1	0.2	0.2	0.3	1.8	0.1	−0.20	−0.77	0.32
6211	Financial services	3.7	4.8	4.7	3.8	4.9	4.9	2.5	4.8	5.6	8.5	8.8	9.4	−0.28	−0.31	−0.25
6212	Insurance services	0.9	1.2	1.4	0.6	1.2	1.6	0.6	0.8	0.9	0.9	0.7	2.3	0.18	0.06	−0.41
6411	Real estate agencies and rental services	2.9	2.4	1.9	4.0	3.2	2.4	0.0	0.0	0.0	0.0	0.0	0.0	n.a.	n.a.	n.a.
6421	House rent	8.8	7.9	9.0	11.8	10.3	12.2	0.0	0.1	0.1	0.1	0.1	0.1	−0.46	−0.36	0.07
7111	Railway passenger transport	1.3	1.1	1.0	1.0	0.9	0.8	0.2	0.4	0.2	1.6	1.0	0.9	−0.65	−0.46	−0.62
7112	Railway freight transport	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	1.00	1.00	1.00
7121	Road passenger transport	1.2	1.0	0.8	1.4	1.2	1.0	0.2	0.3	0.2	3.0	1.7	1.5	−0.80	−0.70	−0.72
7122	Road freight transport	2.1	2.3	2.3	2.3	2.6	2.5	4.0	6.5	4.7	0.0	0.0	0.0	1.00	1.00	1.00
7141	Ocean transport	0.7	0.4	0.3	0.5	0.1	0.1	32.9	25.9	20.2	9.1	6.3	8.3	0.75	0.60	0.42
7142	Coastal and island water transport	0.3	0.2	0.2	0.3	0.2	0.2	0.2	0.1	0.0	0.1	0.1	0.1	0.56	0.02	−0.75
7143	Transport service in harbours	0.3	0.3	0.2	0.3	0.3	0.2	2.6	3.7	3.6	4.6	2.9	2.5	0.05	0.10	0.19
7151	Air transport	0.3	0.4	0.4	0.1	0.2	0.2	2.5	3.8	4.7	11.2	10.0	12.5	−0.39	−0.46	−0.45
7161	Freight transport	0.1	0.1	0.1	0.2	0.1	0.1	0.3	0.2	0.2	0.0	0.0	0.0	1.00	1.00	1.00
7171	Storage facility services	0.3	0.3	0.3	0.3	0.3	0.3	0.5	0.1	0.3	0.0	0.0	0.0	1.00	1.00	1.00
7181	Packing	0.4	0.3	0.3	0.4	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	n.a.	n.a.	n.a.
7189	Other transport-related services	0.8	0.8	0.9	0.9	0.9	1.0	4.6	7.3	7.9	5.0	2.7	2.8	0.29	0.45	0.48
7311	Postal services	0.4	0.4	0.4	0.5	0.5	0.4	0.0	0.1	0.1	0.5	0.1	0.1	−0.72	−0.16	0.11
7312	Telecommunications	1.0	1.1	1.7	1.0	1.2	1.9	0.1	0.4	0.4	0.1	0.5	0.8	0.12	−0.16	−0.27

Code	Service											Net export ratio		
7319	Other services related to communications	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	n.a.	n.a.	n.a.
7321	Broadcasting	0.4	0.4	0.5	0.4	0.4	0.3	0.0	0.0	0.0	0.0	−0.37	−0.50	1.00
8111	Public administration (central)	1.8	1.4	1.5	1.8	1.2	1.4	0.0	0.0	0.0	0.0	n.a.	n.a.	n.a.
8112	Public administration (local)	3.0	2.7	2.9	3.5	3.3	3.4	0.0	0.0	0.0	0.0	n.a.	n.a.	n.a.
8211	School education	3.9	3.5	3.3	5.3	4.8	4.5	0.0	0.0	0.0	0.0	n.a.	n.a.	n.a.
8213	Social education and other education	0.5	0.4	0.4	0.5	0.5	0.5	0.0	0.0	0.0	0.0	n.a.	−0.68	−0.62
8221	Research institutions	0.3	0.3	0.3	0.3	0.3	0.4	0.2	0.1	0.2	0.4	−0.01	−0.26	−0.20
8222	Research and development (intra-enterprise)	1.4	1.6	1.5	1.3	1.4	1.5	0.0	0.0	0.0	0.0	n.a.	n.a.	n.a.
8311	Medical services	4.8	4.4	5.1	4.8	3.9	4.3	0.0	0.0	0.0	0.0	−0.37	−0.66	−0.85
8312	Health	0.1	0.1	0.1	0.2	0.1	0.1	0.0	0.0	0.0	0.0	n.a.	n.a.	n.a.
8313	Social security	0.8	1.0	1.0	1.0	1.1	1.0	0.0	0.0	0.0	0.0	n.a.	−0.48	n.a.
8411	Other public services	1.4	0.8	0.8	1.6	0.8	0.8	0.6	0.5	0.5	0.4	−0.15	0.17	0.09
8511	Advertising agencies	1.2	1.4	1.2	0.6	0.8	0.6	0.5	0.9	1.2	3.8	−0.67	−0.62	−0.53
8512	Inquiry and information services	1.1	1.3	1.3	1.1	1.2	1.2	1.0	1.2	1.6	3.3	−0.17	−0.39	−0.35
8513	Goods renting and leasing (except car renting)	0.7	1.3	1.6	0.7	1.1	1.7	0.4	0.8	1.2	2.6	−0.24	−0.32	−0.38
8514	Car renting	0.1	0.1	0.2	0.0	0.1	0.2	0.0	0.0	0.0	0.0	n.a.	0.38	−0.88
8515	Car repairing	1.6	1.2	1.2	1.6	1.1	0.8	0.0	0.0	0.0	0.0	0.15	0.07	−0.33
8516	Machine repairing	1.2	1.3	1.0	0.8	0.8	0.6	0.0	0.0	0.0	0.0	n.a.	−0.52	−0.71
8519	Other business services	3.6	4.2	4.2	3.7	4.7	4.6	2.5	3.6	5.2	8.1	−0.25	−0.31	−0.21
8611	Amusement and recreational services	2.8	3.1	2.3	3.0	3.4	2.4	0.2	0.4	0.3	2.5	−0.69	−0.80	−0.78
8612	Eating and drinking places	4.4	3.7	3.9	3.9	3.1	2.8	0.9	1.6	1.5	10.9	−0.62	−0.74	−0.76
8613	Hotel and lodging services	1.4	1.2	1.2	1.3	1.0	0.9	1.6	3.4	3.1	18.6	−0.62	−0.71	−0.71
8619	Other personal services	1.9	1.9	1.8	2.2	2.1	2.1	0.1	0.0	0.1	0.1	0.10	−0.26	−0.06
	Services total (4111–8619)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	0.32	−0.01	0.00

Notes:
1 n.a. means not available.
2 The net export ratio is defined as net exports (export − imports) divided by gross exports (exports + imports).
3 For other notes and sources, see Table 1.

Traditional HOV regression analysis by Urata (1983) and Kimura and Kohama (1995) revealed that Japan exports goods that are human-capital intensive. This in turn implies that Japan exports educational services through goods trade and that the ranking of school education is likely to be high.

As Deardorff (1985) suggests, transportation services are also likely to be important in goods trade since transportation is required for the international trade in goods. Because Japan is an island country and a net exporter, the services content of air and ocean transportation services is likely to be high.

Japan economic structure and recent research on services trade therefore suggest that four services were likely to have been key components of the services content of Japanese exports: R&D services, financial services, school education services and transportation services. Changing macroeconomic conditions after 1985 are likely to have resulted in shifts in the significance of these services.

The services content of Japanese trade, 1985–95

Table 4 illustrates the direct (S_t^D), indirect (S_t^{ID}) and net $-(S_{nx} = (S_x^D + S_x^{ID}) - (S_m^D + S_m^{ID}))$ — services trade in Japan. Indirect services trade is defined as the services embodied in goods trade. These tables confirm that Japan's indirect services trade is larger than its direct services trade. Indirect exports and imports of services were twice as large as direct exports and imports throughout the period (except for imports in 1995). In 1990 net indirect service exports were large enough to cover the deficit in direct services trade. Therefore, total (direct plus indirect) services trade was in net surplus during the period, which is consistent with the results of Grubel (1988), Sazanami and Urata (1990) and Urata and Kiyota (2001).

At a sectoral level, net exports of services (direct plus indirect), S_{nx}, are relatively large in the wholesale, ocean transport and R&D services sectors. Although wholesale and R&D services trade grew rapidly between 1985 and 1995, the pattern of trade was quite different. Most of the net surplus in wholesale trade was from direct service trade, while all of the R&D services trade was from indirect trade.

Table 5 reports the services content ratio for each service, S_{nx}/S, which is defined as net exports of direct and indirect services divided by domestic production. The services content

ratio describes the intensity of that service in services trade. The larger the ratio, the larger the intensity.

The services content ratio for total services gradually decreased from 0.036 in 1985, to 0.013 in 1990 and to 0.007 in 1995. Since services production and value added both expanded over the period, this suggests that Japanese services lost international competitiveness.

Table 5 also indicates that Japan exports goods that are intensive in R&D services. This might be because Japanese companies are highly technological. Ocean transport services had the top ranking, but air transport services were low. This could be because of the way transport services trade is defined. For instance, when Japanese people fly Japan Airlines to Australia, transportation trade does not occur, but when they fly Qantas, Australia exports transportation services to Japan. Therefore, care is needed in discussing trade in transportation services.[7]

Education services were ranked low until after 1990. Until recently Japanese companies provided in-house training to their graduate employees. The economic downturn has increased demand for employees who are already trained. The increased intensity of school education services has probably been the result of more school students completing school in order to go on to university.[8]

As expected, financial services declined in rank after 1985, from 15th to 31st in 1990 and to 44th in 1995. The declining significance of financial service in Japanese trade is a reflection of the poor performance of the financial sector since the burst of the asset market bubble in the late 1980s.

In sum the services content of trade is a reflection of what is happening in the domestic economy: competitive services are ranked highly while abundant but less competitive services are lower ranked. The services content analysis illustrates the international competitiveness of Japan's services.

Alternative specifications of the model

Adjustment for trade volumes

One main problem with the model is that services trade will consistently be in surplus because the Japanese trade balance has consistently been in surplus. An adjustment can be made to compensate for the fact that Japan's exports are much larger than its imports. Following

Table 4 Direct and indirect services trade in Japan, 1985 (US$ million, 1995 constant prices)

Code	Industry	Direct Services Trade ($S^D t$)			Indirect Services Trade ($S^{ID} t$)			Net services exports ($S nx$)
		Exports ($S^D x$)	Imports ($S^D m$)	Net exports ($S^D nx$)	Exports ($S^{ID} x$)	Imports ($S^{ID} m$)	Net exports ($S^{ID} nx$)	
4111	Residential construction	0	0	0	0	0	0	0
4112	Non-residential construction	0	0	0	0	0	0	0
4121	Repair of construction	0	0	0	1,840	908	931	931
4131	Public construction	0	0	0	0	0	0	0
4132	Other civil engineering and construction	0	0	0	0	0	0	0
5111	Electric power	76	3	73	8,427	5,461	2,967	3,039
5121	Gas supply	1	2	0	225	62	163	162
5122	Steam and hot water supply	0	0	0	12	5	7	7
5211	Water supply	1	3	-2	689	409	280	278
5212	Waste disposal services	0	0	0	833	463	370	370
6111	Wholesale services	12,591	1,469	11,122	12,920	4,415	8,505	19,627
6112	Retail services	42	64	-22	1,322	949	373	352
6211	Financial services	917	1,624	-707	8,947	4,362	4,585	3,878
6212	Insurance services	237	164	73	749	596	153	226
6411	Real estate agencies and rental services	0	0	0	4,727	2,422	2,304	2,304
6421	House rent	5	12	-8	0	0	0	-8
7111	Railway passenger transport	64	297	-233	1,180	495	685	452
7112	Railway freight transport	21	0	21	73	45	28	49
7121	Road passenger transport	64	570	-506	1,077	461	616	110
7122	Road freight transport	1,500	0	1,500	3,870	2,109	1,761	3,261
7141	Ocean transport	12,283	1,729	10,553	1	0	1	10,554
7142	Coastal and island water transport	80	22	58	703	394	309	367
7143	Transport service in harbours	977	880	97	832	433	399	496
7151	Air transport	942	2,148	-1,206	471	199	272	-934
7161	Freight transport	100	0	100	287	133	154	254
7171	Storage facility services	173	0	173	453	253	199	373
7181	Packing	0	0	0	1,610	393	1,218	1,218
7189	Other transport-related services	1,728	947	781	756	503	253	1,034

7311	Postal services	15	93	-78	577	267	310	232
7312	Telecommunications	35	27	7	955	507	448	455
7319	Other services related to communications	0	0	0	17	9	8	8
7321	Broadcasting	0	1	0	725	245	480	480
8111	Public administration (central)	0	0	0	121	51	70	70
8112	Public administration (local)	0	0	0	168	71	98	98
8211	School education	0	0	0	0	0	0	0
8213	Social education and other education	0	0	0	194	64	130	130
8221	Research institutions	60	61	-1	512	279	232	232
8222	Research and development (intra-enterprise)	0	0	0	8,676	1,645	7,031	7,031
8311	Medical services	2	4	-2	0	0	0	-2
8312	Health	0	0	0	13	6	6	6
8313	Social security	0	0	0	0	0	0	0
8411	Other public services	213	291	-78	1,564	677	887	809
8511	Advertising agencies	197	1,016	-818	2,617	878	1,739	921
8512	Inquiry and information services	356	500	-144	1,192	377	815	671
8513	Goods renting and leasing (except car renting)	143	234	-91	1,884	597	1,287	1,196
8514	Car renting	0	0	0	61	62	-1	-1
8515	Car repairing	1	1	0	1,172	1,092	80	81
8516	Machine repairing	0	0	0	3,618	1,976	1,641	1,641
8519	Other business services	918	1,517	-599	4,945	2,025	2,920	2,321
8611	Amusement and recreational services	58	316	-258	145	50	95	-163
8612	Eating and drinking places	336	1,415	-1,079	0	0	0	-1,079
8613	Hotel and lodging services	603	2,606	-2,002	0	0	0	-2,002
8619	Other personal services	20	17	4	10	4	7	10
	Services total (4111–8619)	34,760	18,031	16,729	81,169	36,352	44,817	61,545

Notes:
1. Direct services exports and imports, S^D_x and S^D_m, are from Table 2.
2. Indirect services exports and imports, S^{ID}_x and S^{ID}_m, are defined as the services trade embodied in goods trade.
3. S^D_{nx}, S^{ID}_{nx} and S_{nx} (= $S^D_{nx} + S^{ID}_{nx}$) are net exports of direct, indirect and total (direct plus indirect) services trade, respectively. For more details, see the text.
4. For other notes and sources, see Table 1.

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Table 4 (continued) Direct and indirect services trade, 1990 (US$ million, 1995 constant prices)

Code	Industry	Direct Services Trade ($S^D t$)			Indirect Services Trade ($S^{ID} t$)			Net services exports
		Exports	Imports exports	Net	Exports	Imports exports	Net services	Net services exports
		($S^D x$)	($S^D m$)	($S^D nx$)	($S^{ID} x$)	($S^{ID} m$)	($S^{ID} nx$)	($S nx$)
4111	Residential construction	0	0	0	0	0	0	0
4112	Non-residential construction	0	0	0	0	0	0	0
4121	Repair of construction	0	0	0	3,475	2,386	1,089	1,089
4131	Public construction	0	0	0	0	0	0	0
4132	Other civil engineering and construction	0	0	0	0	0	0	0
5111	Electric power	150	15	135	12,737	10,359	2,377	2,512
5121	Gas supply	2	5	–3	373	188	185	182
5122	Steam and hot water supply	0	0	0	40	26	13	13
5211	Water supply	26	7	19	1,063	921	142	161
5212	Waste disposal services	3	0	3	1,017	657	361	364
6111	Wholesale services	13,422	1,993	11,430	23,044	12,844	10,200	21,630
6112	Retail services	134	1,009	–876	1,991	1,850	141	–735
6211	Financial services	2,632	4,991	–2,358	13,434	10,638	2,796	438
6212	Insurance services	430	380	51	1,385	1,605	–221	–170
6411	Real estate agencies and rental services	0	0	0	6,780	4,812	1,969	1,969
6421	House rent	32	68	–36	0	0	0	–36
7111	Railway passenger transport	202	550	–348	1,607	1,253	354	6
7112	Railway freight transport	7	0	7	128	93	35	42
7121	Road passenger transport	173	966	–793	1,067	757	310	–482
7122	Road freight transport	3,601	0	3,601	6,121	4,946	1,175	4,776
7141	Ocean transport	14,289	3,586	10,704	2	1	1	10,705
7142	Coastal and island water transport	41	40	1	883	663	220	221
7143	Transport service in harbours	2,036	1,663	373	1,097	1,098	–1	372
7151	Air transport	2,099	5,641	–3,542	646	490	156	–3,386
7161	Freight transport	109	0	109	369	243	126	235
7171	Storage facility services	55	0	55	952	818	133	188
7181	Packing	0	0	0	1,422	584	838	838
7189	Other transport-related services	4,033	1,511	2,522	1,097	1,130	–33	2,489

Code	Service							
7311	Postal services	44	61	−17	900	582	318	301
7312	Telecommunications	206	286	−80	1,826	1,374	452	372
7319	Other services related to communications	0	0	0	18	13	5	5
7321	Broadcasting	0	1	−1	1,210	666	545	544
8111	Public administration (central)	0	0	0	5	3	2	2
8112	Public administration (local)	0	0	0	225	142	83	83
8211	School education	0	0	0	0	0	0	0
8213	Social education and other education	0	1	−1	295	152	143	142
8221	Research institutions	75	129	−54	816	456	360	306
8222	Research and development (intra-enterprise)	0	0	0	17,590	6,543	11,047	11,047
8311	Medical services	1	7	−5	0	0	0	−5
8312	Health	0	0	0	2	1	0	0
8313	Social security	0	0	0	0	0	0	0
8411	Other public services	278	197	82	648	504	144	226
8511	Advertising agencies	510	2,177	−1,667	5,211	2,855	2,355	688
8512	Inquiry and information services	636	1,433	−798	2,673	1,499	1,174	376
8513	Goods renting and leasing (except car renting)	442	857	−415	5,529	2,821	2,708	2,293
8514	Car renting	0	0	0	234	355	−121	−121
8515	Car repairing	2	2	0	1,565	2,181	−616	−616
8516	Machine repairing	0	0	0	6,509	4,577	1,932	1,932
8519	Other business services	1,974	3,752	−1,778	9,070	5,454	3,616	1,838
8611	Amusement and recreational services	244	2,242	−1,998	592	274	317	−1,681
8612	Eating and drinking places	898	6,088	−5,190	0	0	0	−5,190
8613	Hotel and lodging services	1,877	11,245	−9,369	0	0	0	−9,369
8619	Other personal services	25	42	−18	276	168	108	91
	Services total (4111–8619)	50,689	50,945	−256	135,922	88,981	46,941	46,685

Table 4 (continued) Direct (St^D) and indirect (St^{ID}) services trade in Japan, 1995 (US$ million, 1995 constant prices)

Code	Industry	Direct Services Trade (S^{D}t)			Indirect Services Trade (S^{ID}t)			Net Services exports
		Exports	Imports	Net exports	Exports	Imports	Net exports	
		(S^{D}x)	(S^{D}m)	(S^{D}nx)	(S^{ID}x)	(S^{ID}m)	(S^{ID}nx)	(Snx)
4111	Residential construction	0	0	0	0	0	0	0
4112	Non-residential construction	0	0	0	0	0	0	0
4121	Repair of construction	0	0	0	5,547	4,424	1,123	1,123
4131	Public construction	0	0	0	0	0	0	0
4132	Other civil engineering and construction	0	0	0	0	0	0	0
5111	Electric power	261	3	259	18,260	16,216	2,044	2,303
5121	Gas supply	1	10	-8	741	465	276	268
5122	Steam and hot water supply	0	0	0	71	65	6	6
5211	Water supply	38	7	32	1,692	1,606	86	118
5212	Waste disposal services	4	0	4	849	740	108	113
6111	Wholesale services	32,730	1,549	31,182	39,942	30,742	9,201	40,382
6112	Retail services	223	114	108	2,695	3,332	-638	-529
6211	Financial services	5,251	8,809	-3,559	20,759	19,808	952	-2,607
6212	Insurance services	885	2,106	-1,221	1,806	2,344	-538	-1,759
6411	Real estate agencies and rental services	0	0	0	7,906	7,131	775	775
6421	House rent	55	48	7	0	0	0	7
7111	Railway passenger transport	203	866	-664	2,188	1,989	199	-465
7112	Railway freight transport	65	0	65	158	135	23	88
7121	Road passenger transport	224	1,359	-1,135	1,350	1,169	182	-954
7122	Road freight transport	4,410	0	4,410	8,190	7,666	524	4,935
7141	Ocean transport	19,065	7,764	11,301	6	5	1	11,302
7142	Coastal and island water transport	8	54	-46	1,328	1,180	148	101
7143	Transport service in harbours	3,391	2,322	1,069	1,932	1,878	54	1,124
7151	Air transport	4,389	11,668	-7,279	1,058	994	64	-7,215
7161	Freight transport	226	0	226	470	414	56	282

7171	Storage facility services	320	0	320	1,287	1,518	−231	89
7181	Packing	0	0	0	2,201	1,239	962	962
7189	Other transport-related services	7,457	2,629	4,828	1,730	2,033	−303	4,525
7311	Postal services	98	79	19	1,190	978	212	231
7312	Telecommunications	411	719	−308	3,809	3,629	180	−128
7319	Other services related to communications	0	0	0	25	23	2	2
7321	Broadcasting	0	0	0	1,682	1,272	410	410
8111	Public administration (central)	0	0	0	174	154	20	20
8112	Public administration (local)	0	0	0	404	357	47	47
8211	School education	0	0	0	0	0	0	0
8213	Social education and other education	0	2	−1	437	289	149	147
8221	Research institutions	229	347	−118	1,690	1,138	552	434
8222	Research and development (intra-enterprise)	0	0	0	26,961	13,040	13,921	13,921
8311	Medical services	1	8	−7	0	0	0	−7
8312	Health	0	0	0	2	2	0	0
8313	Social security	0	0	0	0	0	0	0
8411	Other public services	501	418	83	961	878	83	166
8511	Advertising agencies	1,088	3,584	−2,496	6,531	4,933	1,598	−898
8512	Inquiry and information services	1,483	3,051	−1,568	3,765	2,718	1,047	−521
8513	Goods renting and leasing (except car renting)	1,093	2,411	−1,319	10,946	7,612	3,334	2,015
8514	Car renting	0	0	0	462	736	−275	−275
8515	Car repairing	1	3	−1	2,108	3,116	−1,008	−1,009
8516	Machine repairing	0	0	0	8,584	7,582	1,001	1,001
8519	Other business services	4,937	7,534	−2,596	11,021	9,090	1,932	−665
8611	Amusement and recreational services	284	2,327	−2,044	735	561	175	−1,869
8612	Eating and drinking places	1,375	10,148	−8,773	0	0	0	−8,773
8613	Hotel and lodging services	2,959	17,362	−14,403	0	0	0	−14,403
8619	Other personal services	54	61	−7	397	310	88	80
	Services total (4111–8619)	93,720	87,362	6,358	212,680	172,915	39,765	46,124

Leontief (1953) and Urata and Kiyota (2001), the services content is computed by using approximately US$1 million of exports and US$1 million of imports. Table 6 provides the results of the analysis, giving useful information for a time-series comparison of patterns of trade and production. The service is more intensively traded if the ratio is greater than 1 and less intensively traded if it is smaller than 1.

The results indicate that the services content of the US$1 million of exports and US$1 million of imports gradually decreased from 1985 to 1995. The services content of exports fell from US$582,460 in 1985 to US$513,913 in 1995. There was a similar decline in the services content of imports from US$522,264 to US$485,450. Since the decline in imports was more rapid than in exports, the services content ratio decreased between 1985 (1.115) and 1995 (1.059).

The rank of R&D services remained high after the adjustment for trade volumes. The rank of R&D services was in the top two between 1985 and 1995 in both Tables 5 and 6. Financial services declined in rank, similar to the finding in Table 5, showing that the results for R&D and financial services do not depend on the volume traded. On the other hand, transportation services ranked lower in Table 6 than in Table 5. In 1995 ocean transport services ranked 21st in contrast to its top rank in Table 5. This result suggests that the ranking is sensitive to the volume of goods trade. Table 6 shows school education services to be rising in rank more rapidly than in Table 5.

Adjustment for intermediate inputs

Another problem with the original model is that it may be overestimating the output of services because the service content is defined as domestic production (sales) caused by trade, which includes intermediate inputs. Some of these inputs will be goods consumed by service producers. The larger the cost of the intermediate inputs, the larger the sales of services.

One possible remedy would be to focus on value added rather than production by multiplying the services content of trade in Table 4 by the value-added ratio (value added divided by domestic production in Table 1). However, this remedy is meaningless since equation (4) suggests that the weight for value added cancels itself out from the numerator and the denominator $\left(\left(v_{xi}^h S_{xi}^h - v_i^h S_{mi}^h \right) / v_i^h S_i^h = \left(S_{xi}^h - S_{mi}^h \right) / S_i^h \right)$ because it is assumed that the value added of exports of good i is the same as that of imports of good i. In order to compute the value added of imports correctly, value-added data for all imported goods would be needed. This extremely difficult task is beyond the scope of this paper and remains on the author's future research agenda.

Conclusion

This paper reveals that the services content ratio is higher for R&D services than for other services during the period 1985 to 1995. The rank of school education services gradually increased over the period while the rank of financial services decreased. These results indicate that Japan increased its exports of technology-intensive products throughout the period, moving away from goods intensive in financial services to those intensive in educational services. The decline in the content of financial services, together with the fact that Japanese banking and insurance companies are rapidly exiting from abroad, contests to the decline in the international competitiveness of the financial sector. Structural reform in some services sectors is still underway and more reform is needed, especially in the financial sector.

A few words of caution are needed. The use of the input-output table in estimating the services content of exports may be problematic. Production technologies used in exports tend to be different from those used in the production of goods sold in the domestic market, but the table does not distinguish between them. This is likely to be a particular problem in the cases of transportation and distribution services. Export production uses fewer transportation services, retail services or wholesale services than domestic production does.

The services content of imports analysed here is the content used in the production of import-competing goods rather than imports. It would be difficult to calculate the services contents of imports as this would require the input-output tables of all exporting countries. However, this does not cause a problem if the production technologies, or input-output relations, are identical between countries, as is assumed in the HOV model.

The results for imports need to be carefully interpreted. Japan is a highly industrialised country, so the value-added ratio (value added divided by domestic production) for exports is likely to be higher than that for imports, implying an underestimation of the services content of net exports. The remedy to this problem is again the analysis of all exporting countries' input-output tables or of the information on value added by country and commodity (industry).

The analysis in this paper could be extended in at least two directions. An international comparison would be very interesting, as the difference in R&D services content between industrialised and developing countries would shed some light on technology transfer. Such a comparison would also contribute to the construction of world services trade data. Second, an analysis of other types of services, such as commercial presence, could also be done. This paper focuses only on direct and indirect services trade, but consumption abroad and commercial presence (through foreign direct investment) are likely to be other important modes of services

Table 5   Services content of Japanese trade, with factor intensity rankings, 1985–95

Code	Industry	1985 Ratio =Snx / S	1985 Rank	1990 Ratio =Snx / S	1990 Rank	1995 Ratio =Snx / S	1995 Rank
4111	Residential construction	0.000	43	0.000	40	0.000	33
4112	Non-residential construction	0.000	44	0.000	39	0.000	34
4121	Repair of construction	0.036	23	0.022	18	0.013	14
4131	Public construction	0.000	42	0.000	38	0.000	36
4132	Other civil engineering and construction	0.000	46	0.000	37	0.000	37
5111	Electric power	0.059	16	0.024	16	0.013	15
5121	Gas supply	0.034	25	0.018	21	0.013	16
5122	Steam and hot water supply	0.045	20	0.037	10	0.006	20
5211	Water supply	0.021	30	0.006	30	0.002	26
5212	Waste disposal services	0.026	28	0.015	22	0.003	23
6111	Wholesale services	0.142	4	0.068	5	0.060	5
6112	Retail services	0.003	36	-0.003	45	-0.001	40
6211	Financial services	0.060	15	0.003	31	-0.009	44
6212	Insurance services	0.015	33	-0.004	46	-0.019	48
6411	Real estate agencies and rental services	0.046	18	0.023	17	0.006	19
6421	House rent	0.000	48	0.000	44	0.000	31
7111	Railway passenger transport	0.021	31	0.000	34	-0.007	43
7112	Railway freight transport	0.068	13	0.029	14	0.045	7
7121	Road passenger transport	0.005	34	-0.014	48	-0.019	49
7122	Road freight transport	0.092	7	0.058	6	0.034	9
7141	Ocean transport	0.858	1	0.747	1	0.590	1
7142	Coastal and island water transport	0.079	9	0.024	15	0.007	18
7143	Transport service in harbours	0.085	8	0.034	12	0.073	4
7151	Air transport	-0.184	53	-0.262	53	-0.281	53
7161	Freight transport	0.109	5	0.056	7	0.045	8
7171	Storage facility service	0.077	11	0.018	20	0.005	22
7181	Packing	0.160	3	0.082	4	0.053	6
7189	Other transport-related services	0.071	12	0.084	3	0.080	3
7311	Postal services	0.035	24	0.021	19	0.010	17
7312	Telecommunications	0.028	27	0.009	26	-0.001	39

Code							
7319	Other services related to communications	0.022	29	0.012	25	0.003	25
7321	Broadcasting	0.064	14	0.034	11	0.014	13
8111	Public administration (central)	0.002	38	0.000	36	0.000	29
8112	Public administration (local)	0.002	39	0.001	33	0.000	28
8211	School education	0.000	41	0.000	41	0.000	32
8213	Social education and other education	0.016	32	0.009	27	0.005	21
8221	Research institutions	0.047	17	0.031	13	0.022	10
8222	Research and development (intra-enterprise)	0.286	2	0.184	2	0.143	2
8311	Medical services	0.000	47	0.000	43	0.000	38
8312	Health	0.003	37	0.000	35	0.000	30
8313	Social security	0.000	45	0.000	42	0.000	35
8411	Other public services	0.033	26	0.008	29	0.003	24
8511	Advertising agencies	0.046	19	0.013	23	-0.012	45
8512	Inquiry and information services	0.036	22	0.008	28	-0.006	42
8513	Goods renting and leasing (except car renting)	0.100	6	0.048	8	0.020	11
8514	Car renting	-0.001	49	-0.028	50	-0.027	50
8515	Car repairing	0.003	35	-0.014	47	-0.014	47
8516	Machine repairing	0.078	10	0.042	9	0.016	12
8519	Other business services	0.037	21	0.012	24	-0.003	41
8611	Amusement and recreational services	-0.003	50	-0.015	49	-0.013	46
8612	Eating and drinking places	-0.014	51	-0.038	51	-0.036	51
8613	Hotel and lodging services	-0.083	52	-0.215	52	-0.193	52
8619	Other personal services	0.000	40	0.001	32	0.001	27
	Services total (4111–8619)	0.036		0.013		0.007	

Notes: 1 Snx (= $S^{D}nx + S^{ID}nx$) and S are net exports of total (direct plus indirect) services trade from Table 4 and domestic production from Table 1, respectively.

2 Rank is computed from Ratio (services content ratio).

3 For other notes and sources, see Table 1.

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Table 6   Services content of Japanese trade with factor intensity rankings: adjustment of trade volume (US$, 1995 constant prices)

Code	Industry	1985 Sx	1985 Services content Sm	1985 Ratio	1985 Rank	1990 Sx	1990 Services content Sm	1990 Ratio	1990 Rank	1995 Sx	1995 Services content Sm	1995 Ratio	1995 Rank
4111	Residential construction	0	0	1.508	11	0	0	1.136	20	0	0	0.756	43
4112	Non-residential construction	0	0	13.791	1	0	0	1.347	8	0	0	0.789	42
4121	Repair of construction	13,201	13,051	1.011	30	13,831	13,311	1.039	27	13,970	12,975	1.077	17
4131	Public construction	0	0	0.966	33	0	0	1.237	15	0	0	0.662	47
4132	Other civil engineering and construction	0	0	1.227	18	0	0	1.478	4	0	0	−1.323	52
5111	Electric power	60,473	78,451	0.771	46	50,685	57,783	0.877	41	45,990	47,563	0.967	29
5121	Gas supply	1,615	898	1.799	5	1,484	1,050	1.413	5	1,866	1,363	1.369	5
5122	Steam and hot water supply	83	68	1.224	19	157	145	1.083	26	179	191	0.941	33
5211	Water supply	4,943	5,876	0.841	44	4,228	5,137	0.823	43	4,261	4,709	0.905	38
5212	Waste disposal services	5,977	6,654	0.898	40	4,048	3,662	1.105	23	2,137	2,171	0.984	24
6111	Wholesale services	92,712	63,425	1.462	14	91,703	71,640	1.280	11	100,597	90,167	1.116	15
6112	Retail services	9,488	13,633	0.696	49	7,922	10,317	0.768	44	6,787	9,774	0.694	46
6211	Financial services	64,202	62,672	1.024	29	53,462	59,339	0.901	39	52,283	58,097	0.900	40
6212	Insurance services	5,378	8,564	0.628	50	5,510	8,954	0.615	48	4,549	6,875	0.662	48
6411	Real estate agencies and rental services	33,917	34,799	0.975	32	26,982	26,839	1.005	30	19,911	20,916	0.952	31
6421	House rent	0	0	2.395	3	0	0	1.270	14	0	0	0.325	51
7111	Railway passenger transport	8,471	7,117	1.190	23	6,395	6,987	0.915	38	5,510	5,834	0.944	32
7112	Railway freight transport	527	649	0.812	45	511	518	0.985	32	397	395	1.006	20
7121	Road passenger transport	7,729	6,621	1.167	25	4,247	4,221	1.006	29	3,401	3,428	0.992	23
7122	Road freight transport	27,768	30,296	0.917	37	24,359	27,587	0.883	40	20,626	22,484	0.917	36
7141	Ocean transport	7	4	1.612	7	9	7	1.170	19	14	14	1.005	21
7142	Coastal and island water transport	5,048	5,664	0.891	43	3,514	3,698	0.950	34	3,344	3,461	0.966	30
7143	Transport service in harbours	5,973	6,220	0.960	34	4,366	6,123	0.713	45	4,866	5,507	0.884	41
7151	Air transport	3,380	2,856	1.184	24	2,571	2,733	0.941	36	2,664	2,915	0.914	37
7161	Freight transport	2,063	1,917	1.076	28	1,469	1,356	1.083	25	1,185	1,214	0.976	25
7171	Storage facility services	3,249	3,640	0.893	41	3,787	4,564	0.830	42	3,241	4,451	0.728	45
7181	Packing	11,556	5,644	2.047	4	5,660	3,258	1.737	2	5,544	3,635	1.525	4

Code	Item											
7189	Other transport-related services	5,422	7,223	0.751	48	4,367	6,302	0.693	46	4,357	5,964	0.731	44
7311	Postal services	4,139	3,836	1.079	27	3,580	3,246	1.103	24	2,997	2,868	1.045	18
7312	Telecommunications	6,852	7,282	0.941	36	7,267	7,666	0.948	35	9,593	10,643	0.901	39
7319	Other services related to communications	122	129	0.941	35	71	72	0.975	33	64	69	0.933	35
7321	Broadcasting	5,202	3,518	1.479	13	4,817	3,714	1.297	10	4,236	3,731	1.135	13
8111	Public administration (central)	866	728	1.190	21	18	16	1.129	22	438	451	0.971	27
8112	Public administration (local)	1,208	1,015	1.190	22	897	795	1.129	21	1,018	1,048	0.971	28
8211	School education	0	0	0.755	47	0	0	0.018	53	0	0	1.679	3
8213	Social education and other education	1,391	915	1.521	10	1,174	845	1.389	7	1,101	846	1.301	7
8221	Research institution	3,672	4,014	0.915	38	3,248	2,546	1.276	12	4,256	3,338	1.275	8
8222	Research and development (intra-enterprise)	62,258	23,633	2.634	2	70,000	36,494	1.918	1	67,903	38,248	1.775	2
8311	Medical services	0	0	1.326	17	0	0	1.218	16	0	0	-1.717	53
8312	Health	91	93	0.989	31	7	7	0.992	31	6	6	0.994	22
8313	Social security	0	0	1.728	6	0	0	0.521	50	0	0	3.704	1
8411	Other public services	11,220	9,724	1.154	26	2,578	2,809	0.918	37	2,421	2,577	0.940	34
8511	Advertising agencies	18,780	12,610	1.489	12	20,735	15,925	1.302	9	16,448	14,468	1.137	12
8512	Inquiry and information services	8,557	5,418	1.579	8	10,636	8,360	1.272	13	9,483	7,973	1.189	10
8513	Goods renting and leasing (except car renting)	13,518	8,579	1.576	9	22,004	15,735	1.398	6	27,568	22,326	1.235	9
8514	Car renting	438	894	0.490	52	931	1,978	0.471	52	1,163	2,160	0.539	50
8515	Car repairing	8,410	15,684	0.536	51	6,227	12,167	0.512	51	5,309	9,140	0.581	49
8516	Machine repairing	25,960	28,392	0.914	39	25,901	25,528	1.015	28	21,619	22,239	0.972	26
8519	Other business services	35,482	29,089	1.220	20	36,093	30,421	1.186	17	27,758	26,660	1.041	19
8611	Amusement and recreational services	1,038	719	1.442	15	2,354	1,531	1.538	3	1,852	1,644	1.126	14
8612	Eating and drinking places	0	0	-3.762	53	0	0	0.685	47	0	0	1.159	11
8613	Hotel and lodging services	0	0	0.892	42	0	0	0.600	49	0	0	1.329	6
8619	Other personal services	73	51	1.416	16	1,099	938	1.172	18	1,001	909	1.101	16
	Services total	582,460	522,264	1.115		540,901	496,327	1.090		513,913	485,450	1.059	

Notes: 1 The services content is computed from the US$ value of goods trade.

2 Ratio is defined as the ratio of exports and imports of services content in the table. Rank is based on the services content ratio.

3 For other notes and sources, see Table 1.

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trade. The input-output table used in this paper cannot distinguish between foreign and Japanese affiliates in Japan, but such transactions are important as the activities of multinational enterprises have expanded. Data availability and quality will be barriers to extending this work.

Notes

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1	See, for example, Dick and Dicke (1979), Sapir and Lutz (1981), Sazanami and Urata (1990) and Urata and Kiyota (2001).
2	The importance of factor and intermediate services trade is also stressed by Markusen (1989) and Melvin (1989).
3	For the derivation of equation (2), see the appendix.
4	For more on rank proposition see, for instance, Bowen, Leamer and Sveikauskas (1987) and Kohler (1991).
5	The GDP growth rate is computed using GDP market prices (in 1995 US dollars) from World Bank (2000).
6	Unless otherwise noted, the discussions in this section refer to the data for 1995.
7	This point was covered in Snape (2001).
8	According to the Minister's Secretariat of the Ministry of Education (2001), the number of Masters and Doctoral graduates in Japan rose from 18,872 in 1980 to 49,700 in 1995.

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Appendix: Derivation of equation (2)

In deriving equation (2), the country index *h* is dropped to simplify the analysis, without losing generality. The total (direct plus indirect) services content is defined as:

$$\hat{\mathbf{S}}^{-1}\mathbf{S}_t = \hat{\mathbf{S}}^{-1}\left[\mathbf{S}_t^D + \mathbf{S}_t^{ID}\right]$$

The direct services content is the direct trade in services divided by the domestic output of services:

$$\hat{\mathbf{S}}^{-1}\hat{\mathbf{S}}_t^D = \hat{\mathbf{S}}^{-1}[\alpha\mathbf{T}]$$

where α is a diagonal matrix of α, which takes the value of 1 if $i \geq k+1$ and 0 if $i \leq k$. Since the indirect services are defined as the services embodied in goods trade, it is formalised as:

$$\hat{\mathbf{S}}^{-1}\mathbf{S}_t^{ID} = \hat{\mathbf{S}}^{-1}\left[\hat{\alpha}(\mathbf{I}-\mathbf{A})^{-1}\cdot\hat{\beta}\Gamma\right] = \hat{\mathbf{S}}^{-1}\left[\hat{\alpha}\mathbf{B}\cdot\mathbf{T}\right]$$

where $\hat{\beta}$ is a diagonal matrix of β, which takes the value of 1 if $i \geq k$ and 0 if $i \leq k+1$. From these equations, the total (direct plus indirect) services content of exports and imports are, respectively:

$$\left(\hat{\mathbf{S}}^h\right)^{-1}\left[\mathbf{S}_x^h - \mathbf{S}_m^h\right] = \left(\hat{\mathbf{S}}^h\right)^{-1}\left[\left(\hat{\alpha}\mathbf{EX}^h = \hat{\alpha}\mathbf{B}^h\cdot\hat{\beta}\mathbf{EX}^h\right) - \left(\hat{\alpha}\mathbf{IM}^h + \hat{\alpha}\mathbf{B}^h\cdot\hat{\beta}\mathbf{IM}^h\right)\right] ,$$

which corresponds to equation (2).

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