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An input-output analysis of the Turkish construction sector, 1973–1990: a note

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Using the four input–output tables compiled in Turkey to date, the aim of this paper is to examine the construction sector's role in the Turkish economy and analyse its relationships with the other sectors of the national economy. Analysis results show that the share of construction in Gross National Product (GNP) and National Income (NI) tend to increase whereas the GNP share of manufacturing is relatively stable and that of services tend to increase after an abrupt decrease in 1985; backward linkage indicators and output multipliers, as well as forward linkage indicators and input multipliers of construction industry are stable; and finally, direct and total construction inputs from manufacturing show relative stability and those from services tend to increase in recent years. These findings point out the similarities between the Turkish construction industry and some advanced industrial countries (AICs) like Japan and Italy showing signs of growing 'maturity' of the Turkish economy.

Keywords: Input–output analysis, backward and forward linkage indicators, output and input multipliers, Turkish construction sector

Introduction

This paper briefly analyses the economic role of the construction sector in the Turkish economy using the four input–output (IO) tables compiled to date. As an economy develops, the construction sector changes its economic role. In this process, the construction sector gradually turns away from manufacturing, its main partner in the earlier phases of economic development, toward services. For a more detailed discussion of this process, see for example Bon (1991, 1992), Bon and Pietroforte (1990, 1993). These studies show many similarities between the US, UK, Italy and Japan. Particularly, the results of the Turkish input–output analysis show similarities with the Japanese case, so this paper follows the main structure of the paper by Bon and Yashiro (1996).

To the best of our knowledge, there are no published input–output studies of the Turkish construction sector

itself, let alone studies that encompass all four tables published to date. However, Bocutoglu (1990) uses input–output data in his investigation of industrial economics, but he treats construction as a part of the service sector. Construction sector as such is not analysed in that study.

We will first briefly discuss the place of IO analysis in the study of construction sector's role in the overall economic activity using the construction sector's input and output profiles (for further details see Bon, 1988, 1991). We will then introduce the Turkish IO tables. We will proceed by presenting the key findings of the research, and finally offer our conclusions.

Input–output analysis of construction technology

Input–output analysis is based on the idea that commodities are needed in the current production of

other commodities. National income accounts provide the necessary data for IO analysis. An IO table shows the intersectoral flows in monetary terms for a particular year where the flows represent intermediate goods and services. In addition to the interindustrial flows, there appears a final demand column showing where the final products go and a value-added row showing where the primary inputs come from. The construction sector is typically represented by one row and column. The construction row shows where the construction sector's output goes, while the construction column shows where the construction inputs come from. The construction sector's input and output profiles offer a *sui generis* representation of construction technology (for details, see Bon, 1991).

Turkish input-output tables

In this paper we use four Turkish input-output tables compiled between 1973 and 1990, which are presented in Appendix 1. Furthermore, the aggregation scheme that is used for the analysis is presented in Appendix 2. The food processing sector, which is a comparatively important industry in a newly industrialized country (NIC) like Turkey, is treated separately from the manufacturing sector. It should be noted that the aggregation scheme used here is far from arbitrary and represents the basic structure of the economy. Further disaggregation of sectors is possible; however, it is not attempted for reasons of space.

Although the constructed IO tables are based on the officially published IO tables that are compiled by State

Institute of Statistics of the Turkish Government, some further adjustments have been made in order to make Turkish IO tables compatible with those of other countries. The major problem was the missing values of construction maintenance and repair (M&R) services that constitute the interindustry outputs of Turkish construction sector. These data, originally collected under final demand values for building services, are separated and entered into the tables as construction output flows to other industries. However, due to the lack of data, maintenance and repair values are highly conservative as they do not include the output of other construction services like infrastructure facilities and repair services carried out by unregistered companies which are known to dominate the maintenance and repair sector in Turkey.

Key findings

The results of analysis are presented in Table 1 which shows the twelve data series obtained from the four Turkish IO tables compiled between 1973 and 1990. Key findings will be highlighted by using six figures with data in pairs.

Figure 1 shows the trend of shares of construction in GNP and NI from 1973 to 1990. It goes without saying that IO tables are not necessary for the calculation of these shares; nevertheless, they provide more accurate data than standard accounts because of the double-entry accounting rules under which they are compiled. The shares of construction in GNP and NI can be used as indicators of the changing role of the construction

Table 1 Data series from Turkish input-output tables, 1973–1990

	1973	1979	1985	1990
Share of construction in GNP	0.0847	0.1002	0.0873	0.1249
Share of construction in NI	0.0454	0.0378	0.0418	0.0551
Share of agriculture in GNP	0.1713	0.1729	0.1198	0.1293
Share of mining in GNP	0.0038	0.0063	0.0067	0.0075
Share of food processing in GNP	0.1070	0.1107	0.1098	0.0798
Share of manufacturing in GNP	0.2579	0.2313	0.2820	0.2578
Share of trade in GNP	0.0820	0.0755	0.1047	0.1010
Share of transport in GNP	0.0838	0.0941	0.1318	0.1174
Share of services in GNP	0.1980	0.2010	0.1443	0.1701
Share of utilities in GNP	0.0115	0.0080	0.0135	0.0122
Construction backward linkage indicators	0.4770	0.6307	0.5321	0.5637
Construction output multipliers	1.7932	2.0708	1.9215	1.9366
Construction forward linkage indicators	0.0242	0.0205	0.0215	0.0105
Construction input multipliers	1.0339	1.0297	1.0319	1.0159
Direct construction inputs from manufacturing	0.3682	0.3836	0.3965	0.3877
Total construction inputs from manufacturing	0.5298	0.6246	0.5924	0.5822
Direct construction inputs from services	0.0252	0.0099	0.0079	0.0278
Total construction inputs from services	0.0504	0.0410	0.0328	0.0613

sector at various stages of economic growth and development. It has been argued that construction activity follows the bell-shaped pattern of development of the manufacturing sector, its primary supplier and the old engine of economic growth (Bon, 1992). The analysis of the Turkish IO tables shows that shares of construction in GNP and NI tend to increase. The increasing trend of the construction sector's share in GNP is an expected finding as Turkey can be placed at the transition point between a less developed country (LDC) and a newly industrialized country (NIC). In the recent period, the GNP share of construction is about 12% and NI share is approximately 5%. The share of construction in NI is about one half of GNP share, which has to do with the fact that construction is an assembly industry in which the production of materials and components takes place mainly in manufacturing, that is, off the construction site.

For comparison with the construction sector, the GNP shares of manufacturing and services are shown in Figure 2. The GNP share of the manufacturing industry decreases between 1973 and 1979, increases between 1979 and 1985, and decreases again after 1985. However, the increasing and decreasing trends which are just in opposite directions with the trend of construction are so slight that the GNP share of manufacturing industry is relatively stable around 25% and it has still the highest share in GNP. Similar to the construction sector, the share of services in GNP tend to increase after an abrupt decrease in 1985. The slight decreasing trend of GNP share of manufacturing and increasing trend of GNP share of services in recent years point out that these sectors may be changing places as old and new engines of economic development. However, it is clear that data associated with more recent years should be analysed in order to be able to talk about 'the change of guards' in the Turkish economy.

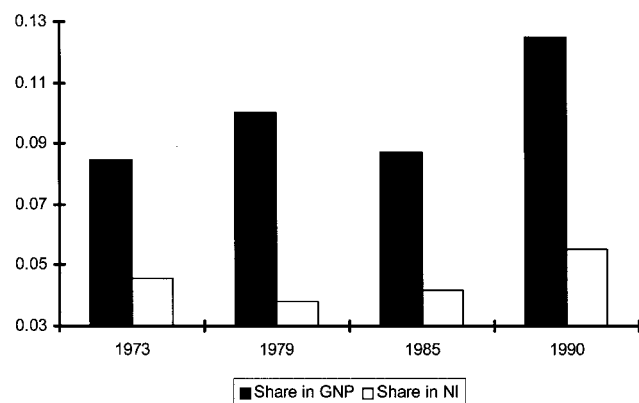


Figure 1 Construction sector's share in GNP and NI

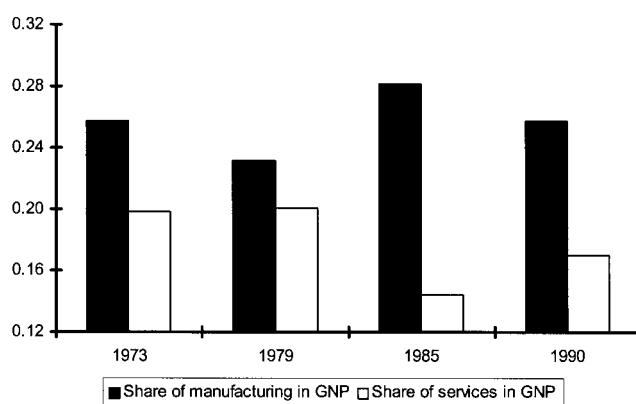


Figure 2 Shares of manufacturing and services in GNP

The 'pull effect' of the construction industry is analysed in Figure 3. The backward linkage indicators measure the proportion of a sector's direct inputs that come from other sectors of the national economy, rather than primary inputs. The output multipliers, also called total backward linkage indicators, measure the total effect of a monetary unit change in final demand for the goods and services of the construction sector on the output of all sectors. The backward linkage indicators and output multipliers are both showing stable trends suggesting Turkey's NIC status. The construction industry has one of the highest backward linkage indicators among all sectors giving a rough indication that the economic pull of the construction sector is very strong in Turkey. This is to be expected, as it assembles the products of all other sectors. As the backward linkage indicator is above 0.50, it shows that the majority of materials and components are manufactured off-site.

Figure 4 presents the forward linkage indicators and input multipliers that measure the 'push effect' of

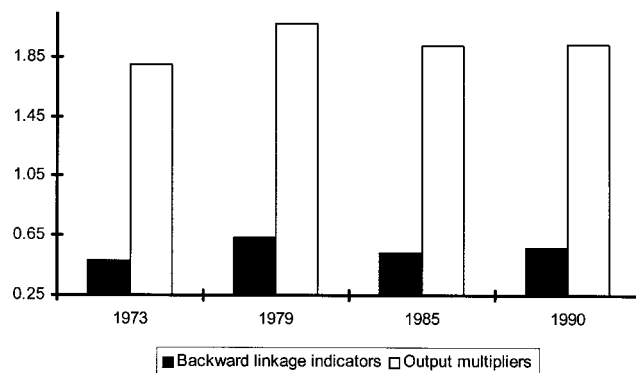


Figure 3 Construction backward linkage indicators and output multipliers

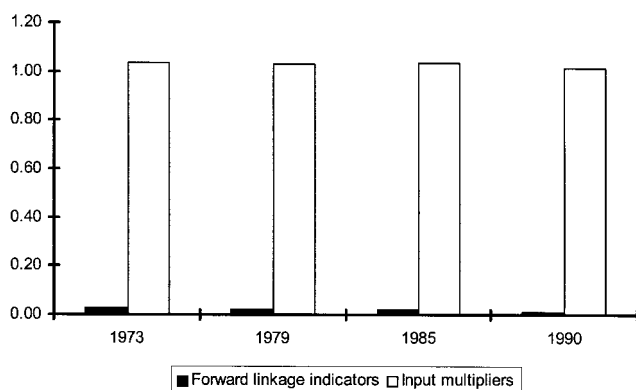


Figure 4 Construction forward linkages and input multipliers

construction sector on the Turkish economy. The forward linkage indicator shows the proportion of a sector's direct output that goes to other sectors of the national economy rather than to final consumption. The input multiplier measures the effect of a monetary unit change in primary input available to a sector on the input of all industries. The strength of the M&R construction subsector can be analysed by measuring the forward linkage indicators and input multipliers (for greater detail see Bon, 1991, and Bon and Pietroforte, 1993). The analysis shows that the main consumer of M&R services in Turkey is the service sector followed by transportation and trade services. Figure 4 shows that the percentage of direct construction output going to other industries is around 2% (the lowest value among all sectors) and it decreases to as low as 1% in 1990. The input multiplier of the Turkish construction industry is stable at around 1.0, pointing out the weakness of the M&R sector. This result may stem in part from the fact that the data associated with M&R activities are not reliable as explained above.

Figure 5 presents direct and total construction inputs coming from manufacturing. The direct inputs, also known as technical coefficients, show the proportion of direct inputs of construction coming from manufacturing. The total manufacturing inputs represent the change in manufacturing outputs resulting from a monetary unit change in final demand for goods and services of the construction sector. Results show that both the direct and total inputs from manufacturing remain stable. Still, around 0.38 TL (Turkish Lira) per 1 TL of the construction input comes from manufacturing while the total effect of a 1 TL change in construction sector's final demand can be as high as 0.60 TL.

The direct and total construction inputs from services, both of which are growing in recent years, are shown in Figure 6. Around 0.02 TL per 1 TL of construction inputs comes from services. The total

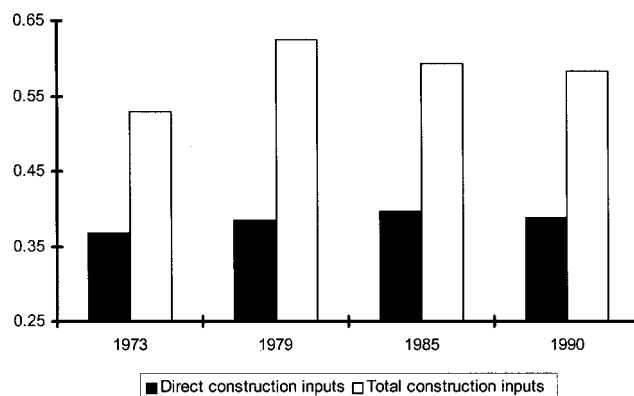


Figure 5 Direct and total construction inputs from manufacturing

effect is around 0.06 TL per 1 TL change in construction sector's final demand. Although the inputs from services increase, it is not possible to conclude that the manufacturing and service sectors are changing places as main suppliers of the construction industry because the direct inputs coming from manufacturing are still approximately ten times bigger than the direct inputs from the services. The results show the growing importance of services as a supplier for the construction industry, however it is clear that service sector is far from replacing the manufacturing industry.

Finally, the instability of direct construction input patterns during different periods should be noted. Although, direct input shares are relatively stable for the manufacturing industry, which is the main supplier of construction industry in Turkey, it is examined that construction input patterns are changing in different sectors. In recent years (1985–90), construction input shares of all sectors except trade and services tend to decrease which can be explained by changes in the construction technology.

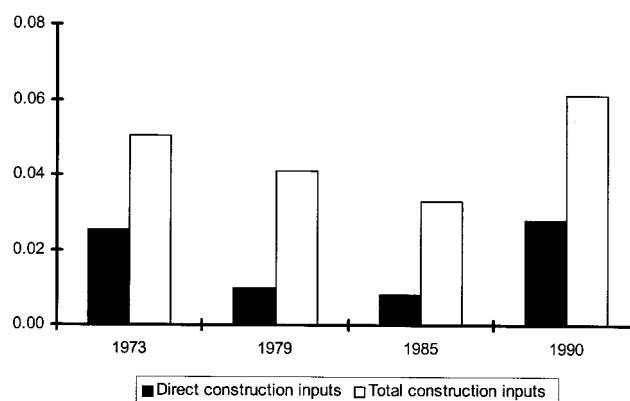


Figure 6 Direct and total construction inputs from services

Conclusions

The analysis presented here confirms that general trends in construction technology discussed by Bon (1991, 1992) hold true for a NIC like Turkey and the analysis shows similarities with Japanese and Italian construction sectors.

The increasing GNP and NI shares of construction demonstrate that, as far as the inverted U-shaped relationship between GNP share of construction and GNP per capita is concerned (see Bon, 1992), Turkey can be placed at the transition point between LDC and NIC during the analysis period. It should also be noted that the most recent data is for year 1990 and it has been nine years after that date. More recent data should be incorporated into the analysis in order to be able to draw more reliable conclusions.

One of the major findings of the study is that, like in AICs, the GNP share of the service sector is growing whereas that of the manufacturing sector remains stable in recent years. Similarly, construction inputs from the services sector tend to increase, however, it should be noted that services is far from dominating the construction inputs and the manufacturing industry is still the main supplier of construction industry.

The analysis points at the stable trend of construction backward linkage indicators and output multipliers, as well as forward linkage indicators and input multipliers during the recent years. The lower figures for forward linkage indicators and input multipliers demonstrate the weakness of M&R sector in Turkey. This may be partly due to the fact that reliable data associated with these activities are lacking in Turkey. However, it is clear that the economic pull of the construction industry is one of the highest among all sectors and the government, being the main purchaser of construction output in Turkey, can use the construction industry as an instrument to increase the overall economic output.

It should be finally noted that NICs and LDCs are likely to play an increasingly important role in the international trade of material-intensive and labour-intensive construction materials and components. Although the

poor quality or lack of economic data concerning those countries makes it harder to carry out input-output analysis, the available data should be analysed as thoroughly as possible. In this way, it may be possible to make a comparative analysis of construction technology between various countries that can offer useful policy guidelines.

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APPENDIX 1 IO Tables

1973 INPUT-OUTPUT TABLE (current Turkish Liras)

	1	2	3	4	5	6	7	8	9	
	Agriculture	Mining	Food Pro.	Manufacturing	Trade	Transport	Services	Utilities	Construction	Total
										Output
1	Agriculture	17 825	102	19 269	9 860	0	341	448	37	56 354
2	Mining	0	20	180	6 662	0	231	153	266	1 240
3	Food Processing	1 317	3	5 350	693	0	70	2 883	0	35 215
4	Manufacturing	4 465	626	2 894	41 645	1 012	10 258	1 627	969	84 853
5	Trade	862	135	2 690	7 798	283	859	999	1 074	26 978
6	Transport	1 428	82	1 522	4 037	49	1 119	780	1 012	27 567
7	Services	3 250	425	966	4 189	3 066	856	2 470	444	65 132
8	Utilities	15	173	345	2 094	574	20	834	239	3 781
9	Construction	6	0	9	26	66	143	421	0	27 878
	Value Added	75 068	7538	12 306	81 865	36 765	24 087	70 902	5524	14 942
	Total Input	104 236	9104	45 531	158 869	41 815	37 984	81 517	8075	28 570

1979 INPUT-OUTPUT TABLE (current Turkish Liras)

	1	2	3	4	5	6	7	8	9	
	Agriculture	Mining	Food Pro.	Manufacturing	Trade	Transport	Services	Utilities	Construction	Total
										Output
1	Agriculture	90 525	422	174 986	46 651	123	1 681	1 659	320	457 888
2	Mining	0	289	1 433	56 715	30	208	1 227	5 848	16 557
3	Food Processing	16 651	68	32 085	6 328	0	534	17 302	0	293 083
4	Manufacturing	49 099	5 868	24 539	371 265	7 460	111 980	21 280	103 929	612 358
5	Trade	14 345	1 059	18 940	91 491	1 356	9 764	13 217	346	199 965
6	Transport	13 816	1 693	11 816	58 462	5 732	21 360	8 511	2 020	249 198
7	Services	22 318	2 493	5 201	36 922	17 558	9 353	13 479	2 685	532 215
8	Utilities	183	1 373	2 795	15 902	3 264	1 398	5 811	0	21 089
9	Construction	44	0	163	217	578	1 083	3 330	0	265 357
	Value Added	567 282	70 605	94 109	631 535	330 451	257 266	558 983	100 048	37 431
	Total Input	774 263	83 870	366 067	1 315 488	366 552	414 627	644 799	53 488	270 918

1985 INPUT-OUTPUT TABLE (current million Turkish Liras)

	1	2	3	4	5	6	7	8	9			
	Agriculture	Mining	Food	Manufacturing	Trade	Transport	Services	Utilities	Construction	Final Demand	Total Output	
			Pro.									
1	Agriculture	953 947	17 377	1 642 312	546 862	9 269	2 852	33 898	1 285	36	4 406 753	7 614 591
2	Mining	12	1 874	17 203	2 207 846	2 384	3 804	10 217	94 775	92 082	245 366	2 675 563
3	Food Processing	173 567	183	617 454	107 557	0	5 664	200 651	1 826	0	4 040 676	5 147 578
4	Manufacturing	845 937	93 810	331 251	5 511 807	195 802	2 028 079	337 283	285 312	1 301 750	10 371 511	21 302 542
5	Trade	52 154	3 052	438 279	849 830	68 811	198 884	123 728	28 614	90 833	3 851 705	5 705 890
6	Transport	236 140	32 832	134 858	669 093	115 067	388 920	93 704	43 727	217 824	4 849 855	6 782 020
7	Services	184 981	21 881	96 601	599 123	383 298	128 942	135 548	40 020	25 963	5 308 132	6 924 489
8	Utilities	24 150	28 755	83 721	613 884	139 298	30 031	133 763	81 624	18 755	497 215	1 651 196
9	Construction	468	0	328	2 298	8 951	18 201	35 806	4 431	0	3 212 889	3 283 373
	Value Added	5 143 235	2 475 799	1 785 571	10 194 242	4 783 010	3 976 643	5 819 891	1 069 582	1 536 130		
	Total Input	7 614 591	2 675 563	5 147 578	21 302 542	5 705 890	6 782 020	6 924 489	1 651 196	3 283 373		

1990 INPUT-OUTPUT TABLE (current million Turkish Liras)

	1	2	3	4	5	6	7	8	9			
	Agriculture	Mining	Food Pro.	Manufacturing	Trade	Transport	Services	Utilities	Construction	Final Demand	Total Output	
1	Agriculture	14 926 387	58 962	15 874 331	6 241 122	20 173	107 244	2 826 792	4 984	660	59 458 718	99 519 373
2	Mining	12 621	14 410	172 144	12 586 471	33 939	303 768	74 412	1 350 424	1 227 334	3 442 963	19 218 486
3	Food Processing	2 062 461	3 498	7 397 854	841 724	2 780	579 501	2 807 304	2 101	0	36 700 733	50 397 956
4	Manufacturing	6 348 082	804 307	2 981 011	68 556 980	2 128 541	17 389 004	6 427 805	2 033 170	22 512 136	118 541 706	24 722 742
5	Trade	1 663 125	161 238	1 895 855	11 135 791	1 170 295	3 570 348	2 308 652	565 460	3 563 907	46 466 371	72 501 042
6	Transport	2 653 528	212 666	2 037 547	8 339 862	2 525 425	3 389 022	2 114 602	565 365	3 500 713	53 993 494	79 332 224
7	Services	3 111 546	224 956	1 143 836	6 680 906	7 430 972	2 846 459	5 163 178	216 363	1 614 116	78 248 909	106 681 241
8	Utilities	237 636	248 845	755 327	5 989 901	1 685 937	441 621	2 231 489	827 283	309 417	5 605 913	18 333 369
9	Construction	7 904	0	10 657	41 607	90 253	81 588	361 013	18 855	0	57 448 165	58 060 042
	Value Added	68 496 083	17 489 604	18 129 394	127 308 378	57 412 727	50 623 669	82 365 994	12 749 364	25 331 759		
	Total Input	99 519 373	19 218 486	50 397 956	247 722 742	72 501 042	79 332 224	106 681 241	18 333 369	58 060 042		

APPENDIX 2: Aggregation scheme of Turkish IO tables

Sector	Description
1. Agriculture	1. Agriculture 2. Animal Husbandry 3. Forestry 4. Fisheries
2. Mining	5. Coal Mining 6. Crude Petroleum and Natural Gas Production 7. Iron Ore Mining 8. Non-Ferrous Ore Mining 9. Non-Metallic Mineral Mining 10. Stone Quarrying
3. Food Processing	11. Slaughtering, Preparing and Preserving Meat 12. Canning and Preserving of Fruits and Vegetables 13. Manufacturing of Vegetable, Animal Oils and Fats 14. Grain Mill Products 15. Sugar 16. Manufacturing of Other Food Products 17. Alcoholic Beverages 18. Soft Drinks and Carbonated Water Industries 19. Tobacco Manufacturing
4. Manufacturing	20. Ginning 21. Manufacturing of Textiles 22. Manufacturing or Wearing Apparel 23. Manufacturing of Leather and Fur Products 24. Manufacturing of Footwear 25. Manufacturing of Wood and Wood Products 26. Manufacturing of Wood Furniture and Fixtures 27. Manufacturing of Paper and Paper Products 28. Printing, Publication and Allied Industries 29. Manufacturing of Fertilizers 30. Manufacturing of Drugs and Medicines 31. Manufacturing of Other Chemical Products 32. Petroleum Refineries

APPENDIX 2 Continued

Sector	Description
	33. Manufacturing of Petroleum and Coal Products
	34. Manufacturing of Rubber Products
	35. Manufacturing of Plastic Products
	36. Manufacturing of Glass and Glass Products
	37. Manufacturing of Cement
	38. Manufacturing of Other Non-Metallic Mineral Products
	39. Manufacturing of Iron and Steel
	40. Manufacturing of Non-Ferrous Metals
	41. Manufacturing of Fabricated Metal Products
	42. Manufacturing of Machinery
	43. Manufacturing of Agriculture Machinery and Equipment
	44. Manufacturing of Electrical Machinery
	45. Manufacturing of Shipbuilding and Repairing
	46. Manufacturing of Railroad Equipment
	47. Manufacturing of Land Transport Vehicles and Equipment
	48. Manufacturing of Other Transport Equipment
	49. Other Manufacturing Industries
5. Trade	54. Wholesale and Retail Trade
6. Transport	56. Railway Transport
	57. Other Land Transport
	58. Water Transport
	59. Air Transport
7. Services	55. Restaurants and Hotels
	61. Financial Institutions and Insurance
	62. Personal and Professional Services
	63. Public Services
	64. Ownership of Dwellings
8. Utilities	50. Electricity
	51. Gas Manufacture and Water Works
	60. Communications
9. Construction	52. Building Construction
	53. Other Construction