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Abstract

Industrial districts (ID) and small scale industrial estates are important regional development tools that have been extensively utilized by the Turkish authorities as part of Turkish industrialization programs, with varying degrees of success. The empirical part of the study is carried out one of the oldest industrial zone in Turkey, Ankara (Sincan). Following the determination of innovative capacity of the firms, the study investigates the intra- and inter-ID firm relationships, and its possible implications for firm level innovation activity. In the first stage of this study, the purpose is to explore vertical I/O (input-output) inter-firm links. Following the relationship mapping, a background structure is obtained for supply chains and the relative focal firm positions are observed. For this end, a survey is employed to 207 firms. The analysis of cross-tabulations provides valuable insights on the relationship between innovative capacity of firms and their interactions with the environment. According to a latest formal report, four firms from the district are placed among the 500 largest firms in Turkey. The results of the study will further give evidence for developing Turkish ID innovation policies.

Keywords: Interfirm relations; innovation, industrial district, Turkey.

JEL Code: O33

1. Introduction

Innovation in industrial districts has a key role for competitive advantage of firms. The intra- and inter-ID firm relationships and its possible implications for firm level innovation activity have been widely examined in literature. However, existing literature have methodological and empirical difficulties. The methodological difficulty is that some of the studies concentrate on existing clusters by employing standard technical tools without rigorous attempt to analyze social aspects of the inter-firm relations. Besides, the empirical difficulty is about the geography of applications. Although the studies on developing countries are actually limited in number, most of the studies used data from the developed countries. The present study contributes to this inadequate literature on developing countries concentrating on Turkish industrial districts case.

The studies on industrial clusters in developing countries have moved into an intriguing transition phase (Bell and Albu, 1999). There is an increasing suspicion on the dynamics of clusters in Turkish case. The ultimate aim of this study is to present evidence on inter-firm relations in a Turkish industrial district towards a second step of detailed clustering analysis. This study is the first step to explore possible opportunities to analyze Turkish clusters with their own peculiarities. According to Lundvall (1985), repeated interactions can eventually give rise to significant learning and innovation. In this context, relationships are considered as coordinating devices for resource creation and knowledge diffusion which are very important for innovation. New combinations of sources of knowledge and skill are developed; an environment for the exploitation of complementarities is created; potential innovations are explored and realized during this process.

In this study, the purpose is to explore vertical I/O (input-output) inter-firm links. Following the relationship mapping, a background structure is obtained for supply chains and the relative focal firm positions are observed. For this end, a survey is applied to 207 firms. The next section reviews the available evidence on inter-firm relations. Section 3 sums up research methodology and main

characteristics of the firms in the sample. The analysis of cross-tabulations in Section 4 provides valuable insights on the relationship between innovative capacity of firms and their interactions with the environment. The results of the study will further give evidence for developing Turkish ID innovation policies.

2. Inter-Firm Relations in Retrospect

In this study, literature review is revealed in two parts .The first part focuses on the firm innovation and relationships. The second part presents the studies of inter-firm relationships in developing countries.

2.1. Firm Innovation and Relationships

The first research on inter-organizational relationships is Coase's study of the nature of firm in 1937. Besides, Williamson (1975, 1985) made significant contribution to the literature. Trust and power are two different prototypes of managing inter-firm relations. Although these two patterns seem to be distinct, they are interconnected. First of all, they are generally produced at the inter-personal level, and then transmitted to organizational level. Secondly, power is also contributing to build up trust between firms. In either way, these mechanisms may be transmitted to cooperative and collaborative activity. Such activities positively contribute the competitiveness of firms.

The network structures between markets and hierarchies are investigated in the literature (Thorelli, 1986; Easton and Araujo, 1994; Ford and McDowell, 1999; Hillebrand and Biemans, 2003). The relations linked to other relations resulting in a system of interdependent relations mechanism is explained in the study of Anderson et al. (1994). Wilkinson and Young (2002) mention exchange relations as well as other types of relations with actual and potential suppliers, other firms and organizations such as governmental instrumentalities, competitors, and complementors. It is hypothesized by Ritter and Gemünden (2003) that a firm's degree of

network competence has a positive impact on its degree of technological interweavement; a firm's degree of network competence has a positive impact on its innovation success; a firm's degree of technological interweavement has a positive impact on its product and process innovation success; and a company's degree of network competence is positively influenced by the degree of access to resources, the extent of network orientation taken by a company's human resource management, the integration of a company's communication structure, and the openness of its corporate culture. Figure 1 shows the antecedents and impacts of network competence.

Insert figure 1 about here

According to a study of Day (1994), Johnson and Sohi (2003) examined the impacts of inter-firm relationships on learning. Figure 2 shows their model of learning activities in buyer-seller relationships.

Insert figure 2 about here

In a local production system, exchange and creation of knowledge takes place at both vertical dimension (Hakansson, 1987 and Hakansson and Johanson, 2001) and horizontal dimension (Maskell, 2001).[i] On the other hand, according to some researches (Lorenzoni and Lipparini, 1999; Maskell and Lorenzen, 2004) as the firms establish horizontal links, they are able to monitor, compare, select and imitate competitors' activities; engage in learning and continuous improvement by observing, discussing and comparing dissimilar solutions; share opportunities and threats; effectively share a communal social structure.

The literature on theory of inter-firm relationships is large and multi-dimensional. In this part of the study, the main theoretical underpinnings in conformity with the scope of the research are underlined. Trust and power are the main driving forces of developing inter-firm relations in the context of cooperative and collaborative activities. These types of activities through learning

and creating a knowledge base have significant repercussions on innovativeness and consequent competitive power.

2.2. The Studies of Inter-firm Relationships in Developing Countries

In literature the dynamics of technological change in industry is generally ignored for developing countries. However, in recent years, the researchers discovered the vital importance of differences in inter-firm relations in those countries. They mentioned that policies for the support of local industry towards innovativeness and competitiveness should be incorporated with a rigorous attempt of identifying inter-firm relations.

Humphrey and Schmitz (1998) analyzed the trust and inter-firm relations in developing and transition economies. Meyer-Stamer (1998) investigated industrial clusters in Santa Catarina state of Brazil where an enormously non-cooperative culture exists. Schmitz (1999) inspects export-oriented firms in the south of Brazil. In a further study of local cooperation in industrial clusters of South Asia and Latin America, Schmitz (2000) discussed three conclusions. First, cooperating firms seem to perform better. Second, the vertical cooperation is prevailing as a result of competitive pressures. Third, vertical cooperation arouses when major enhancements in quality and speed are entailed yet weakens subsequently. Visser (1999) examined clusters of local garment industry in Peru. Pietrobelli and Barrera (2002) explained Colombian fashion sector at their study. Altenburg and Meyer-Stamer (1999) examined Latin American clusters in detail and they concluded that Latin American clusters are more complex and interactive clusters. Rabelotti (1999) studied the effects on trade liberalization on the cooperative behavior of shoe firms in a local cluster of Mexico. Rabelotti and Schmitz (1999) made a comparative study of internal heterogeneity of industrial districts in Italy, Brazil and Mexico. Sandee and Weijland (1989) examined the changes in rural cottage industry clusters in Central Java, Indonesia. Indian woolen knitwear cluster to grasp the facts for the adjustment in a labor-intensive export industry

to external crises is analyzed by Tewari (1999). Knorringa (1999) studied on Indian footwear cluster in Agra and found negative relationship between increased cooperation with other local producers and increased cooperation with buyers. Nadvi (1999) claimed that to meet global quality standards necessitates greater local cooperation between producers and suppliers in his study on Pakistan's surgical instrument cluster. There are limited numbers of cluster studies in Africa (McCormick, 1999; Oyelaran-Oyeyinka 2004).

UNCTAD (1998) proposed five types of clusters, namely informal clusters, organized clusters, innovative clusters, technology parks and incubators, export-processing zones in a study of clusters in developing countries. Five cases on Ghana, Pakistan, India, China, and Mexico are examined in this study. It is mentioned that clustering and networking help SMEs to overcome the problems of isolation and powerlessness, thus, in turn, enhance their competitive capability through the emergence of linkages between firms providing economies of scale and scope.[ii]

One of the most comprehensive studies on Turkish clusters is carried out by Öz (2004). In this study, four different clusters of furniture, textile, carpet, and leather clothing are examined. Armatlı-Köroğlu (2004) and Eraydın and Armatlı-Köroğlu (2005) investigated three clusters having different innovative capacities in Turkey. These studies find out differences in regional and external networks caused by the differences in production organization and historical differences. Oba and Semercioöz (2005) noted the antecedents of trust in a Turkish industrial district and concluded that informal institutional arrangements are more significant than formal ones and reputation and expertise of other firms is more influential than family-friendship relations as antecedents of trust.

According to the historical and geographical differences different types of inter-firm relations are created. Some studies claimed that collectivity is not as important as some researchers thought. However, the available evidence still demonstrated that inter-firm relations

and collaboration among firms is one of the major determinants of innovative capacity though not the only one.

3. Research Methodology and Firm Characteristics

The study is a combination of theoretical and empirical work. The research methodology used for the study is questionnaire survey. The research population is the firms in Ankara 1 Industrial District in Sincan.

Ankara 1 Industrial District which started for establishing at 1978 has been on operation since 1990. District is established on a huge area of 400 with 400 hectares of total area. Ankara 1 Industrial district is one of the most important SME industry complexes in Turkey with an employment capacity of 20,000 and 189 places of manufacturing from several sectors. Machine and equipment industry, iron industry, vehicle instrument industry, textile industry, petrol-chemistry industry, electric-electronic industry, construction industry, mining industry, plastic industry, aluminum industry are the main manufacturing sectors where 207 firms have facilitates.

In order to support all modern city life for firms operating in the district, electrical network, natural gas network, water and dirty water network are structured for continuous service. In district electrical consumption is approximately 170.000.000 kwh per years where natural gas consumption reaches 23.400.000 sm^3 per year.

Ankara 1 Industrial District is a centre of sufficient social and technical facilitates which brings all support units, required for manufacturing quality such as environment laboratory, education centers, lecture hall and meeting room, cafeteria building, banks, dispensary, post and communication services are available.

The questionnaire is applied to 207 firms operating in 18 different sectors in 2005. The majority of the firms belong to metal industry (38.16%), machinery and equipment (13.53%). The average firm size is around 33 (Table 1). However, 47% of the firms can be treated as small-

sized establishments employing 1-24 workers and 47% of the firms are medium-sized establishments employing 25-150 workers[iii]. 6% of the firms do not respond to the size question. The questionnaire is composed of eight parts, namely the information about the manager of the firm, the general information about the firm, systems and processes, the services obtained outside the firm, the performance of the firm, the future needs of the firm, clustering activities, the memberships to professional organizations. Thus, the questionnaire provides detailed information on the surveyed firms. In terms of the employee profile of the workers, it is found that 16.46% of the employees are university (12.63%) and higher vocational school (3.83%) graduates. On the other hand, 36.97% of the employees are graduated from the high school (22.72%) and vocational high school (14.25%). On overall, only 22.79% of the employees are endowed with some sort of a vocational education. Firms are also asked whether they engage in R&D activities. 53.14% of the firms in our sample claim that they engage in R&D activities. The ICT infrastructure of the firms is not as strong as expected. 78.74% of the firms have access to the internet while 58.94% have their own web page. As a tool of increasing information flows inside the firm, 54.11% of the firms utilize an intra-firm network. The weakest point is observed for the B2B trade activities; only 17.39% of the firms in the sample are exploiting the advantages of B2B portals. Table 1 summarizes the main characteristics of the firms in the survey. As noted before, the average firm size is 33.29. Thus, the sample average indicates the dominance of the small-sized establishments. The average firm age is just above the age of the industrial district. The oldest firms are established in 1976 meaning that even for the oldest firms we are analyzing the development path for a thirty-year time span. Approximately one half of the firms in the district are exporters. The firms that are not exporting report that they have difficulties in access to global markets and in finding necessary resources (capital, technology, material…etc.). Another important reason is the size of the domestic market. The domestic market is large enough for the

sustainability of the firms. As a measure of the production compatible with international standards 38.65% of the firms have at least one international standard certificate. The dominant one is ISO 9000. Considering that around 50% of the firms are exporters, some firms in our sample are not producing and exporting compatible with the global standards. 33.82% of the firms are producing in accordance to national standards. Almost 70% of the firms are planning new investments in the near future. The dominant investment motive is related with the production while about 15% of the firms are planning new R&D investments. More than one quarter of the establishments carry out test procedures by using their own laboratories whereas more than half of the firms apply to external laboratories. This figures show that around 20% of the firms do not use any test procedure during and after the production.

Insert table 1 about here

In order to identify the main characteristics of the firms in a more enhanced way, it would be better to portray the future needs of the firms. For this end, the firms are asked for their future needs. The most popular answer is additional financial resources for investment as expected. The underdeveloped financial markets for commercial credits associated with unstable macroeconomic environment makes this need the most vital problem for most of the firms. The market-oriented problems follow this need. The size of the national markets and access to international markets are relevant for more than half of the firms. However, what is interesting is the need for technological improvements. Although the firms do not make significant R&D investments they are in urgent need of technological improvements. As we previously find evidence on the lack of skills of existing labor force, the firms demand skilled labor. The lack of skilled labor has close connection with the inadequate national education policy. The resources allocated to the vocational training at a national scale exhibit a decreasing tendency which, in turn, causes problems in skilled labor pool. Improvement of quality, additional capital, trade

marking, product innovation, training appear to be fundamental needs of the firms, almost one third of the firms treat them as significant future needs.

Insert table 2 about here

In sum, the firms in a developing industrial district suffer from many structural problems. The significance of these problems is that they call for urgent mitigation measures. The structural character of the problems such as the improvements in financial and labor markets necessitates consistent long-term policies. The previous experience of our research team together with the findings of our earlier study (Durgut and Erdil, 2005) verifies that these problems are not only relevant at the regional level but at the national level.

4. Inter-Firm Relations in Ankara Industrial District

In this section, what we aim is to unearth the inter-firm relations in Ankara industrial district. For this end, particular variables[iv] are cross tabulated with clustering questions. We have basically six questions for clustering. We explore whether firms establish relations with other firms in the same industrial district, in the same province, in another province or abroad on certain grounds, namely machinery and equipment purchased, spare parts purchased, maintenance and repair service purchased, raw materials and intermediate goods purchased, products sold, and rival firms. In fact, the firms are asked to list the geography of five different firms to which they have the listed relation. However, the review of the data demonstrates that only the responses for the first two firms produce noteworthy results.[v] Table 3 illustrates the results of cross tabulations. In terms of the export status of the firm, significant differences are observed for obtaining machinery and equipment for our sample. As expected, the exporter firms generally purchase machinery and equipment from abroad (35%) possibly because of attaining international standards in production. On the other hand, non-exporters overwhelmingly obtain machinery and equipment from the firms in another province (41%). Because of the nature of the

spare parts, maintenance and repair services and the need for on-time service, these services are acquired from the same province. This behavior is not differentiated in terms of the export status of the firm. Exporter firms relatively purchase raw materials and intermediate goods from abroad (13.9%) as compared to non-exporters (7.6%). Non-exporters generally acquire them from the same province (44.3%) while exporters from the different province (36.6%). The exporter firms have also strong national and local market connections, 47% of the customers of those firms are in the same province as 29% of the customers in the different province. The non-exporters have weaker customer ties as well in the national market; they generally serve for the local market (45.8%). For non-exporters, most of the rival firms are established in the same industrial district (38.1%) and same province (36.9%). The rival firms of the exporters are, in general, located in the same province (30%) and in the different province. The 16% of the exporters notes that they have significant rival firms in the global markets. The main reason behind this low ratio is possibly due to insufficient information on international markets.

Insert table 3 about here

As a next point of analysis, we concentrate on the registered trade mark. It is interesting to note that approximately one third of the firms having trade mark purchase machinery and equipment from abroad. The share of the same and different province is more or less same. The firms without trade mark generally obtain them from the same province (39.1%). For all categories of firms, the spare parts, maintenance and repair parts are commonly purchased from the same province. This fact is also valid for the raw material and intermediate goods purchases. The firms with trade mark are more inclined to obtain them from the world markets. Both the owners and non-owners of a trade mark sell their final goods mostly in the same province (44.3% and 53.5% respectively) even though trade mark-owners have more access to national markets (36.4%). Another interesting point is the fact that there are no significant difference between

owners and non-owners in world markets. Thus, it is possible to conclude that trade mark-owners do not become globally known suppliers. The rivals of non-trade mark owners are located in the same district (43.7%) whereas the owner's rivals are generally in the different province (40.9%).

The firms having own laboratory purchase machinery and equipment more often from abroad (40%) because of the fact that R&D-based firms may transfer know-how from abroad as compared to others. Again the firms with on laboratory tend to obtain raw materials and intermediate goods from abroad as compares to non-owners of laboratory. The firms carrying out test and quality procedures inside the firm have more access to national markets (42.6%) while the local market is dominant for the others (53.4%). Such a differentiation is also observed for the case of the rival firms. The non-owners of a laboratory have more rivals inside the same industrial district (36.6%) as the owners have more rivals in different provinces (40%). In percentage terms, the ratio of rivals in international markets for owners (14.5%) is double of the non-owners (7.6%).

External laboratory use for the case of machinery and equipment purchased is concentrated in the same province (36.2%) followed by other provinces (30.5%). The dominance of the same province is also observed for the case of spare parts purchased (50%), repair and maintenance services purchase (56.7%). Moreover, these firms more often obtain the raw materials and intermediate products again from the same province (37.1%). The consistency of the superiority of the same province is also observed for customers; the firms using external laboratories have more access to the local markets as compared to others (44.9%). The highest rate is reached for the same industrial district (36.6%). Finally, it is important to note that firms having own laboratory are more articulated to the national and international markets as compared to the firms using external laboratories.

The firms attempting product innovation and improvement develop more close relationships with the firms in the same province for all types of relationships we reviewed. However, more than one quarter of such firms purchase their machinery and equipment from abroad. The undeniable dominance of the same province alternative (34.8%) is also threatened for the case of rival firms by different provinces choice (33.3%). Thus, it is possible to claim that firms engaged with innovation activities have more access to national and international markets than the others. Finally, the same pattern is also observed for the answers on the needs for product innovation.

5. Concluding Remarks and Directions for Future Research

The results presented in this study are the early outcomes of a continuing study. However, even this early stage produces significant results on the attitudes of Turkish firms. It is argued that inter-firm relations and collaboration among firms is one of the determinants of innovative capacity. Our review of Ankara 1 Industrial district demonstrates the existence of some structural problems. Although more than half of the firms are somewhat integrated to the global markets through their exports, around one third of them do not have either a national or international standard's certificates. Moreover, the existence of financial problems and macro economic instability impede them to invest on R&D activities which in turn critical repercussions on their innovative activities. The mismatch between the technology and the skilled labor seems to be another serious problem. The firms in the district has established close vertical I/O relationships with the local and national firms yet the links with the same industrial district seem to be weakest meaning that firms are not able to fully exploit the advantages of agglomeration, in other words complementary relations such as providing repair and maintenance services do not exist. The relationships are generally established at the national level except for the cases of purchase of

spare parts, repair and maintenance services as expected. Only for the case of machinery and equipment purchased, we perceived some international linkages.

In the next step of the research, for a sample of firms, the quality of the relations together with the impacts of these relations on the firm's performance will be examined. The existence of leader firms will also be investigated. The final stage will concentrate on those firms. In conclusion, this study is a contribution to the considerably poor literature on developing country experiences of inter-firms relations.

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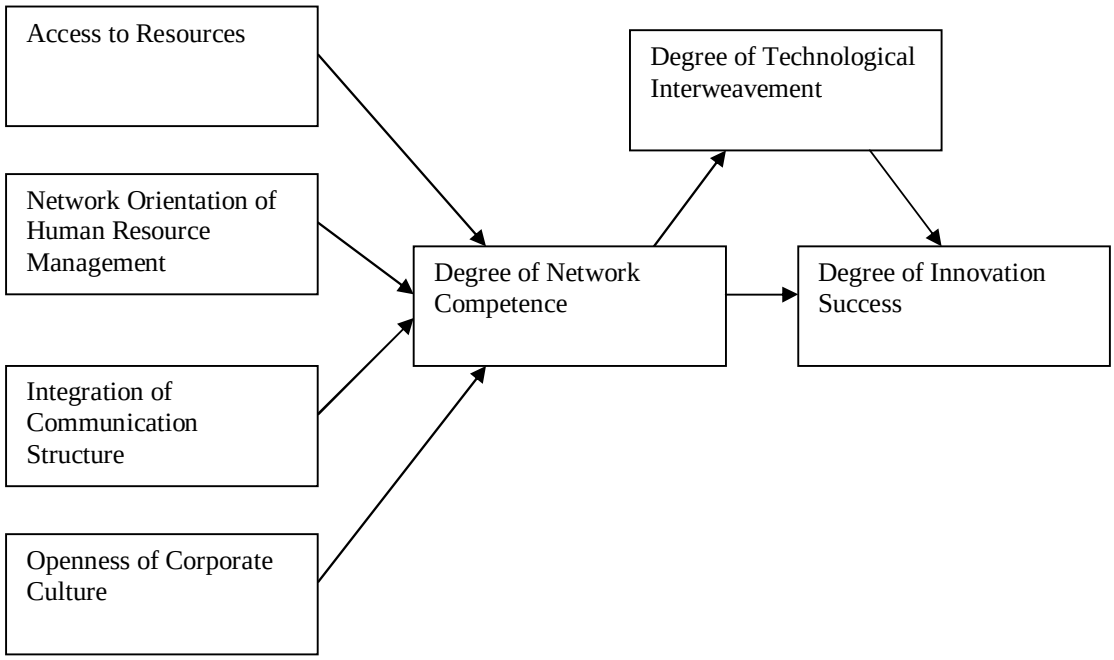
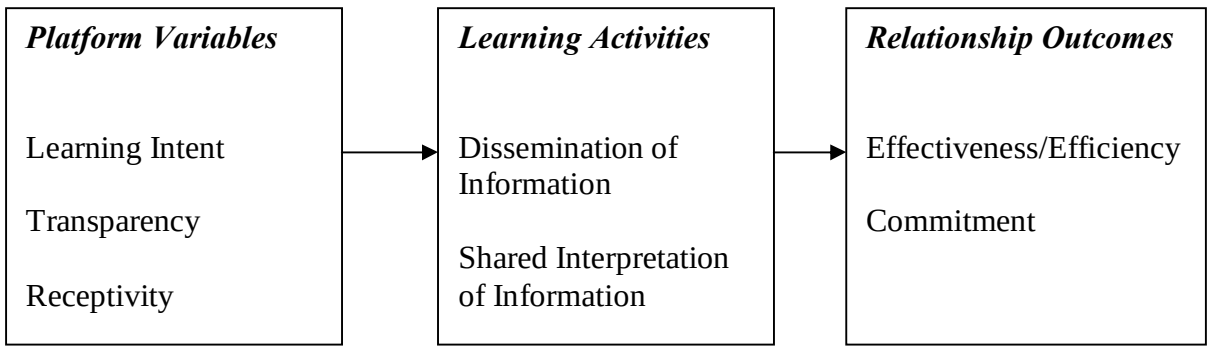
Figure 1: Antecedents and Impacts of Network Competence



Source: Ritter and Gemünden, 2003.

Figure 2: Learning Activities in Buyer-Seller Relationships



Source: Johnson and Sohi, 2003.

Table 1: Main Characteristics of the Firms in Ankara 1. Industrial District

Firm Characteristics	
Average Firm Size	33.29
Average Firm Age	15.63
Exporter Firms	50.24%
International Standards Certificates	38.65%
National Standards Certificates	33.82%
Trade Mark Ownership	43.96%
Planned Investment	69.57%
Planned R&D Investment	14.49%
Own Laboratory	27.54%
Use of External Laboratory	52.66%

Table 2: The Future Needs of the Firms in Ankara 1 Industrial District

Needs (%)	
Additional Financial Resources for Investment	59.42
Access to World Markets	53.62
Growth in Domestic Market	50.24
Technological Improvements	50.24
Skilled Labor	46.38
Improvement of Quality	43.48
Decreasing Costs	43.00
Additional Capital	42.03
Trade Marking	37.20
Product Innovation	34.78
On-the-Job-Training	33.82
Managerial Training	32.37
New Technology in Information Systems	31.40
Automation	31.40
Restructuring of the Firm	30.92
Additional Skilled Managers	30.43
Planned Maintenance System	28.99
Investment in New Markets	26.09
Basic Skills Training	26.09
Consultation	24.15
Introduction of E-Commerce	23.67
New Distribution Channels	21.74
International Collaboration/Partnership	15.46
National Collaboration/Partnership	6.28

Table 3: Inter-Firm Relations in Ankara 1. Industrial District

		Machinery and Equipment Purchased										Spare Parts Purchased									
		1		2		3		4		TOTAL		1		2		3		4		TOTAL	
		count	%	count	%	count	%	count	%	count	%	count	%	count	%	count	%	count	%	count	%
Export Status	Firm 1	1	5	26	34	35	100					12	12.2	45	45.9	23	23.5	18	18.4	98	100
		2	9	11.1	36	44.4	23	28.4	13	16	81	100	16	19.8	47	58	16	19.8	2	2.5	81	100
	Firm 2	1	4	5.1	21	26.9	32	41	21	26.9	78	100	8	9.3	32	37.2	34	39.5	12	14	86	100
		2	6	13.6	14	31.8	20	45.5	4	9.1	44	100	6	15	16	40	16	40	2	5	40	100
Trade Mark	Firm 1	1	4	4.6	27	31	28	32.2	28	32.2	87	100	9	10.6	41	48.2	22	25.9	13	15.3	85	100
		2	7	10.1	27	39.1	21	30.4	14	20.3	69	100	15	22.7	38	55.1	12	17.4	4	5.8	69	100
		3	13	7.3	60	33.9	56	31.6	48	27.1	177	100	3	14.3	8	38.1	7	33.3	3	14.3	21	100
	Firm 2	1	5	7	18	25.4	36	50.7	12	16.9	71	100	5	6.8	31	42.5	32	43.8	5	6.8	73	100
		2	4	9.8	14	34.1	13	31.7	10	24.4	41	100	9	20.9	16	37.2	13	30.2	5	11.6	43	100
		3	2	16.7	4	33.3	4	33.3	2	16.7	12	100	15	11.8	50	39.4	48	37.8	14	11	127	100
Own Laboratory	Firm 1	1	3	5.5	11	20	19	34.5	22	40	55	100	6	11.1	23	42.6	13	24.1	12	22.2	54	100
		2	11	8.5	53	41.1	38	29.5	27	20.9	129	100	21	16.5	69	54.3	28	22	9	7.1	127	100
	Firm 2	1	3	6.8	8	18.2	20	45.5	13	29.5	44	100	4	8.9	16	35.6	17	37.8	8	17.8	45	100
		2	8	10	28	35	32	40	12	15	80	100	11	13.6	30	37	33	40.7	7	8.6	81	100
Use of External Laboratory	Firm 1	1	9	8.6	38	36.2	32	30.5	26	24.8	105	100	16	15.4	52	50	25	24	11	10.6	104	100
		2	3	6.3	18	37.5	15	31.3	12	25	48	100	11	22.9	24	50	11	22.9	2	4.2	48	100
	Firm 2	1	7	10.1	19	27.5	32	46.4	11	15.9	69	100	11	15.3	26	36.1	28	38.9	7	9.7	72	100
		2	2	6.9	10	34.5	9	31	8	27.6	29	100	2	6.1	17	51.5	10	30.3	4	12.1	33	100
Attempts for New Product Development	Firm 1	1	13	9.4	47	33.8	43	30.9	36	25.9	139	100	20	14.4	71	51.1	30	21.6	18	12.9	139	100
		2	1	2.3	18	40.9	15	34.1	10	22.7	44	100	9	20.9	21	48.8	10	23.3	3	7	43	100
	Firm 2	1	8	8.2	30	30.9	42	43.3	17	17.5	97	100	9	8.9	42	43.6	39	38.6	11	10.9	101	100
		2	3	10.7	6	21.4	10	35.7	9	32.1	28	100	4	15.4	7	26.9	11	42.3	4	15.4	26	100
Need for New Product Development	Firm 1	1	6	8.7	25	36.2	25	36.2	13	18.8	69	100	14	20	33	47.1	16	22.9	7	10	70	100
		2	8	6.7	40	33.3	36	30	36	30	120	100	16	13.7	61	52.1	26	22.2	14	12	117	100
	Firm 2	1	3	6.4	14	29.8	20	42.6	10	21.3	47	100	3	7	19	44.2	17	39.5	4	9.3	43	100
		2	8	10	22	27.5	33	41.3	17	21.3	80	100	12	13.6	31	35.2	34	38.6	11	12.5	88	100

		Maintenance Service Purchased										Raw Materials and Int. Goods Purchased									
		1		2		3		4		TOTAL		1		2		3		4		TOTAL	
		count	%	count	%	count	%	count	%	count	%	count	%	count	%	count	%	count	%	count	%
Export Status	Firm 1	1	17	21	42	51.9	17	21	5	6.2	81	100	17	16.8	33	32.7	37	36.6	14	13.9	101	100
		2	14	20.6	45	66.2	9	13.2			68	100	19	24.1	35	44.3	19	24.1	6	7.6	79	100
	Firm 2	1	7	11.1	30	47.6	22	34.9	4	6.3	63	100	8	9.3	28	32.6	35	40.7	15	17.4	86	100
		2	4	16	12	48	9	36			25	100	4	8.3	20	41.7	19	39.6	5	10.4	48	100
Trade Mark	Firm 1	1	10	13.7	40	54.8	19	26	4	5.5	73	100	11	12.5	36	40.9	29	33	12	13.6	88	100
		2	15	27.3	35	63.6	5	9.1			55	100	23	33.3	24	34.8	17	24.6	5	7.2	69	100
		3	5	29.4	9	52.9	3	17.6			17	100	3	15.8	4	21.1	9	47.4	3	15.8	19	100
	Firm 2	1	4	7.4	28	51.9	18	33.3	4	7.4	54	100	8	11.3	23	32.4	27	38	13	18.3	71	100
		2	7	29.2	9	37.5	8	33.3			24	100	4	8.5	21	44.7	18	38.3	4	8.5	47	100
		3	2	20	6	60	2	20			10	100		8	61.5	5	38.5				13	100
Own Laboratory	Firm 1	1	6	13.6	21	47.7	13	29.5	4	9.1	44	100	8	14.8	16	29.6	19	35.2	11	20.4	54	100
		2	26	24.3	68	63.6	12	11.2	1	0.9	107	100	29	22.7	52	40.6	38	29.7	9	7	128	100
	Firm 2	1	3	9.4	15	46.9	11	34.4	3	9.4	32	100	6	12.8	11	23.4	21	44.7	9	19.1	47	100
		2	10	18.2	26	47.3	18	32.7	1	1.8	55	100	6	6.7	39	43.8	33	37.1	11	12.4	89	100
Use of External Laboratory	Firm 1	1	22	24.4	51	56.7	15	16.7	2	2.2	90	100	27	25.7	39	37.1	31	29.5	8	7.6	105	100
		2	7	19.4	23	63.9	5	13.9	1	2.8	36	100	9	19.1	17	36.2	15	31.9	6	12.8	47	100
	Firm 2	1	8	15.1	28	52.8	16	30.2	1	1.9	53	100	9	12	31	41.3	26	34.7	9	12	75	100
		2	4	21.1	7	36.8	6	31.6	2	10.5	19	100			15	42.9	16	45.7	4	11.4	35	100
Attempts for New Product Development	Firm 1	1	22	19.1	67	58.3	22	19.1	4	3.5	115	100	22	15.9	54	39.1	45	32.6	17	12.3	138	100
		2	9	25.7	22	62.9	4	11.4			35	100	15	34.9	14	32.6	12	27.9	2	4.7	43	100
	Firm 2	1	9	12.9	35	50	22	31.4	4	5.7	70	100	11	10.5	35	33.3	43	41	16	15.2	105	100
		2	2	11.8	8	47.1	7	41.2			17	100	1	3.6	15	53.6	8	28.6	4	14.3	28	100
Need for New Product Development	Firm 1	1	14	22.6	37	59.7	9	14.5	2	3.2	62	100	17	25	24	35.3	23	33.8	4	5.9	68	100
		2	19	20.2	54	57.4	18	19.1	3	3.2	94	100	22	18.5	45	37.8	35	29.4	17	14.3	119	100
	Firm 2	1	2	7.1	13	46.4	11	39.3	2	7.1	28	100	1	2	17	33.3	22	43.1	11	21.6	51	100
		2	11	17.5	30	47.6	20	31.7	2	3.2	63	100	11	12.6	35	40.2	32	36.8	9	10.3	87	100

		Products Sold										Rival Firms									
		1		2		3		4		TOTAL		1		2		3		4		TOTAL	
		count	%	count	%	count	%	count	%	count	%	count	%	count	%	count	%	count	%	count	%
Export Status	Firm 1	1	7	7	47	47	29	29	17	17	100	100	21	21	30	30	33	33	16	16	100	100
		2	15	18.1	38	45.8	28	33.7	2	2.4	83	100	32	38.1	31	36.9	20	23.8	1	1.2	84	100
	Firm 2	1	2	2.1	19	20	55	57.9	19	20	95	100	3	3.6	26	31.3	45	54.2	9	10.8	83	100
		2	2	3	34	51.5	29	43.9	1	1.5	66	100	6	9.5	23	36.5	33	52.4	1	1.6	63	100
Trade Mark	Firm 1	1	9	10.2	39	44.3	32	36.4	8	9.1	88	100	10	11.4	32	36.4	36	40.9	10	11.4	88	100
		2	9	12.7	38	53.5	18	25.4	6	8.5	71	100	31	43.7	23	32.4	13	18.3	4	5.6	71	100
		3	2	10	9	45	6	30	3	15	20	100	8	38.1	7	33.3	3	14.3	3	14.3	21	100
	Firm 2	1	2	2.4	29	34.5	42	50	11	13.1	84	100	4	5.3	20	26.7	44	58.7	7	9.3	75	100
		2	2	3.2	19	30.6	36	58.1	5	8.1	62	100	5	9.6	23	44.2	21	40.4	3	5.8	52	100
		3			4	25	8	50	4	25	16	100			5	27.8	13	72.2			18	100
Own Laboratory	Firm 1	1	7	13	18	33.3	23	42.6	6	11.1	54	100	6	10.9	19	34.5	22	40	8	14.5	55	100
		2	15	11.5	70	53.4	33	25.2	13	9.9	131	100	48	36.6	42	32.1	31	23.7	10	7.6	131	100
	Firm 2	1			21	39.6	26	49.1	6	11.3	53	100	2	4.1	16	32.7	26	53.1	5	10.2	49	100
		2	4	3.6	32	29.1	61	55.5	13	11.8	110	100	7	7.1	37	37.4	51	51.5	4	4	99	100
Use of External Laboratory	Firm 1	1	13	12.1	48	44.9	34	31.8	12	11.2	107	100	34	32.1	32	30.2	31	29.2	9	8.5	106	100
		2	5	10.2	32	65.3	8	16.3	4	8.2	49	100	17	34	19	38	11	22	3	6	50	100
	Firm 2	1	4	4.3	30	32.3	45	48.4	14	15.1	93	100	7	8.8	29	36.3	40	50	4	5	80	100
		2			11	26.2	28	66.7	3	7.1	42	100			16	39	22	53.7	3	7.3	41	100
Attempts for New Product Development	Firm 1	1	17	12.1	64	45.7	44	31.4	15	10.7	140	100	30	21.9	49	34.8	47	33.3	15	10.6	141	100
		2	5	11.1	23	51.1	14	31.1	3	6.7	45	100	24	53.3	12	26.7	7	15.6	2	4.4	45	100
	Firm 2	1	4	3.2	44	35.2	61	48.8	16	12.8	125	100	5	4.4	36	31.6	64	56.1	9	7.9	114	100
		2			10	27.8	22	61.1	4	11.1	36	100	3	9.1	16	48.5	13	39.4	1	3	33	100
Need for New Product Development	Firm 1	1	6	8.6	32	45.7	27	38.6	5	7.1	70	100	24	34.3	23	32.9	15	21.4	8	11.4	70	100
		2	17	14	58	47.9	32	26.4	14	11.6	121	100	32	26.2	40	32.8	40	32.8	10	8.2	122	100
	Firm 2	1	1	1.7	22	37.9	26	44.8	9	15.5	58	100	2	3.6	20	36.4	31	56.4	2	3.6	55	100
		2	3	2.8	33	30.3	62	56.9	11	10.1	109	100	7	7.2	33	34	49	50.5	8	8.2	97	100

NOTES

[i] For a more recent detailed review of those concepts, see Basant, 2002.
[ii] For a detailed discussion all available studies on knowledge flows and industrial clusters for developing countries, see Basant (2002)
[iii] The equality of the number of small and medium-sized firms occur just by chance, it is not a result of a purposeful sample selection criteria.
[iv] These are the export status of the firm, trade mark ownership, use of own laboratory, use of external laboratory, attempts for product innovation and/or improvement, and need for product innovation and/or improvement.
[v] However, in what follows we summarize the results of the first firm because of space limitations. The results of the answers for the second firm do not significantly diverge from the general conclusions.