IMPACT OF PRIVATIZATION ON RD ACTIVITIES: THE CASE OF TURKISH TELECOMMUNICATIONS INDUSTRY

Ansal, Hacer and Soyak, Alkan

IAMOT

1999

IMPACT OF PRIVATIZATION ON R&D ACTIVITIES : THE CASE OF TURKISH TELECOMMUNICATIONS INDUSTRY

Hacer K. Ansal,
Istanbul Technical University, Macka, Istanbul, e-mail: ansalh@sariyer.cc.itu.edu.tr
and
Alkan Soyak, Marmara University, Bahcelievler, Istanbul

Abstract

The debates surrounding privatization have generally focused on comparison of the productivity performances of public and private firms in different countries on the bases of quantitative methods. The main purpose of this paper is to draw attention to a very important repercussion of foreign ownership through privatization that is the changing nature of the privatized firms' R&D activities in a strategically very important industrial sector in a developing country. After presenting the case studies conducted in the two most important Turkish telecommunication equipment manufacturing firms with the background of the sector's development history in Turkey, the paper will exhibit the impact of foreign ownership on the nature of firms' R&D activities after privatization as a result of the parent firm's global firm strategy. Finally, it will draw policy implications of such changes for developing countries' technology capability development efforts as well as the countries' technological dependence in a strategically important industry.

Keywords: Turkey, telecommunications industry, privatization, foreign ownership, R&D activities.

Introduction

The privatization of public enterprises has emerged to be one of the key issues that has continuously dominated the governments' economic agenda in recent years. It has been particularly important issue for many developing countries, since they sought the assistance of the international financial institutions -the IMF and the World Bank- in order to solve their balance-of payments and economic problems. Such assistance had invariably been subjected to a conditionality that has involved "privatization of government-owned enterprises".

In the literature, the debates surrounding privatization have generally focused on comparison of the productivity performances of public and private firms in different countries on the bases of quantitative methods. Considering privatization only in terms of micro-level productivity, prevents us to recognize the importance of technological capability accumulation to generate technical change in national, sectoral and firm level as well as the nature and direction of technical change activities in privatized firms.

The main purpose of this paper is to draw attention to a very important repercussion of foreign ownership through privatization, namely the changing nature of the privatized firms' R&D activities in a strategically important industrial sector in a developing country. After presenting the case studies conducted in the two most important Turkish telecommunication equipment manufacturing firms together with the background of the sector's development history in Turkey, the paper exhibits the impact of foreign ownership on the nature and direction of firms' R&D activities as a result of the parent firm's global firm strategy after privatization. Then it discusses some policy implications of such changes for developing countries' technology capability development efforts as well as the countries' technological dependence in a strategically important industry.

Technical Change Activities in Developing Countries

Traditional approaches to technology minimize the role of technological activity in developing countries and the need for government policies to support, protect and induce such activity for industrial development (Pack and Westpal, 1986). A number of unconventional approaches, in contrast, assign a central role to indigenous technological effort in mastering new technologies, adapting them to local conditions and even more importantly, generating technological changes. Firm-level analysis of technology shows that gaining mastery of a new technology requires skills, effort and investments in innovative activities because firms' technological progress is built upon their own efforts, experience and skills (Dosi, 1988; Atkinson and Stiglitz, 1969; Nelson, 1987). Some case studies (e.g.on the Brazilian steel industry) reveals that research efforts increased after privatization and it has been concluded that technological strategies of the firms do not depend on the nature of ownership in terms of public/private (Paula and Camargos, 1998).

On the other hand, the studies on the impact of local/foreign ownership have focussed mainly on efficiency comparisons in developing countries. The effect of foreign ownership on the direction of R&D activities, however, has not drawn much attention of researchers. Some case studies acknowledge the advantage of subsidy firms, in comparison to the locally owned ones, in obtaining technological knowledge from their parent companies and achieving much higher productivity levels (e.g., Balasbramanyam, 1973). However, higher productivity does not always lead to accumulation of local technological capability and dynamism for generation of technical change (Ansal, 1988).

Similarly, number of studies show that foreign ownership substantially limit technological capability accumulation in local firms because the parent company, in its efforts to minimize R&D costs, prefers to use its own resources for R&D activities and hence, makes very limited investment in the subsidy firms (Pearson, 1977; Fairchild, 1979, Caves, 1982). However, some MNCs, started to carry out certain R&D activities in some developing countries where there are abundant and low wage university graduates (Rugman, 1981). But the nature of these R&D activities was not studied although it may create serious repercussions in developing countries' strategic sectors like telecommunications.

Telecommunications Sector

As modern business and modern government become more dependent upon communications technology, telecommunications (TC) became not only a strategically important sector but also a catalyst for economic growth. The cost and range of TC infrastructure and services available to business is an important factor in determining a country's economic competitiveness in international markets. Hence, the policy adopted for TC sector has a significant impact on a country's economy. Adopting the latest technological changes in the sector is, as much important as trying to generate country-level technological independence.

The world TC industry has been dominated by 8-9 multinational corporations (MNC) whose sales revenues reach to GNP of some countries. The level of R&D investments of these MNCs and the required level of accumulated technological capabilities that mainly rely on educated and highly qualified labour for R&D activities, made the entry to the sector for developing countries almost impossible. Therefore, developing countries like Turkey, had obtained the TC technologies that have been developed by MNCs, through partnership and licensee agreements.

The global technical change trend in the sector has been the replacement of electro-mechanical exchanges by electronic, from manual to computer and from analogue to digital. Along with this technical change, the cost structure of the TC equipment manufacturing had been significantly changed. As the TC technology switched from analogue to digital, the share of basic components in the total production cost has increased from 30 % to 80 % while the share of labour in the total production cost has been from 20 % to 5% (Göransson, 1984:7).

The new labour process of electronics, on the other hand, requires more engineering work then electro-mechanical systems in which engineers constitute only about 5 % of the total workforce while in digital systems engineers form the 30 % of the total number of employees. This requirement is particularly intensified in software development that is known to have a labour- intensive labour process in the sector. Therefore, the advantage of the abundant and cheap skilled and educated labour (engineers) in a developing country may well be utilized by the parent telecommunications MNC within its global firm strategy.

The Turkish Telecommunications Industry

Publicly owned Turkish telecommunications services, PTT (Posta-Telegraph-Telephone) played a central role in the emergence of TC equipment manufacturing and hence the development of TC infrastructure in Turkey. In the 1980-90 period PTT made an investment of 7 billion US $ on exchange and network systems. Consequently, the share of digital systems reached to 41 % of the total TC network in Turkey in 1990, when the average share was only 39.3 % for OECD countries. The total production in the Turkish TC industry increased by 1240 % from the total value of 58 million US $ in 1980 to 777.5 million US $ in 1992.

There are three firms that meet the 75 % of this total production in the industry and hence the most important for PTT's investments. The first two (codified as Firm "A" and "B") were established in the mid-1960s to supply TC equipment for PTT and hence have been the major actors in the Turkish TC industry in both designing and installing of exchange and transmission systems. The third firm entered into the sector in the late 1980s as a subsidy of a MNC and there has not involved in any significant R&D activity. Therefore, Firms A and B that were both privatized in 1993, are chosen to be our case studies to examine the impact of privatization on the nature and direction of R&D activities.

The Case Study Firms

Firm "A"

It was established in 1967 as a joint venture company between Turkish PTT and a MNC that held 31 % of the shares, with the aim of supplying Turkey with locally produced TC equipment. It manufactures and delivers public switching, business communications, data networks, transmission and power systems, multimedia and wireless solutions and telephone sets to meet the communications needs of telephone operating companies and private institutions both in Turkey and abroad.

The firm has played an important role in the establishment of the TK infrastructure in Turkey by providing approximately 10 million lines of switching equipment , transmission and datacom systems. Following the significant investments made in the mid-1980s, as shown on Table 1, the sales and gross value added of the firm increased to the record high of 330.9 million US $ and 216 million US $, respectively, in 1993. In that year, however, the firm's foreign partner became the major shareholder by holding 53 % of the shares. Following the privatization in 1993, the amount of investments, R&D expenditure, total number of employees and -surprisingly- labour productivity (which is calculated as gross value added per employee) have also declined. The sudden fall in these values can be attributed to the crisis in Turkish economy in 1994 as well as to the restructuring process within the firm, the 1993 levels, however, could not be reached in the later years. Therefore, it is quite difficult to claim that the overall impact of privatization on the firm's performance has been positive.

Table 1 - Firm "A"s Sales Revenues, Investments, R&D Expenditures, Total Number of Employees, Gross Value Added and Labour Productivity - (1980-1997).

Years	Sales	Investm. (million US $)	R&D	No. of Employees	Gross Value Added (million US $)	Lab. Productivity
1980	34.7	0.7	0.7	1823	-	-
1982	30.1	1.8	1.3	1916	-	-
1984	34.7	1.9	1.5	2183	21.3	9.7
1986	150.1	5.0	2.4	3268	52.8	16.2
1988	128.3	2.1	4.5	1932	44.9	23.3
1990	140.4	3.9	8.4	1735	65.5	37.7
1991	223.1	3.3	13.1	1738	141.0	81.1
1992	273.7	11.3	14.1	1955	160.4	82.0

1993	330.9	14.7	14.7	1954	216.2	110.6
1994	158.3	11.8	11.2	1486	15.4	10.4
1995	161.5	9.9	11.7	1522	82.0	53.8
1996	236.2	6.6	13.6	1601	114.7	71.6
1997	268.8	5.7	14.0	1656	127.7	77.2

Source: Firm Records

When we examine the technological activities of the firm, we see that following the partnership agreement in 1967, local production started in 1969 and then a R&D unit was established in 1973 with the aim of increasing the local content of the firm's products. The unit carried out technical change activities independently from the parent company. The main technological activities of the R&D unit are summarized on Table 2, for the periods before and after the privatization. As can be seen from the table, Firm A had continuously enriched its existing products, moved from analog to digital systems and succeeded to become the leading manufacturer of the digital switching systems.

Table 2- R&D Activities in Firm A (1973-1997).

1973-1993 Period
1973-74 Local design change on electromecanical -Bar Switches
1977 Starting first software development activities
1978 First steps in software development; Microcomputer Controlled Automatic Route Testing System:ARTER and Video Switchboard System:Visa 1978
1979 Development of Automatic Rural switch:N5-3B
1982 First electronic PABX, locally designed Spacenet family:EX-100 and EX-200
1983 The printed circuit board manufacturing workshop, introduction of digital technology: DMS-100 switching
1984 Push-button telephone sets introduced, first digital switch-DMS-100 put into service, new products in Spacenet: EX30and 50
1985 First tandem switch DMS-200 put into service, first locally designed electronic rural exchange Elif I put into service, establishment of software development group for DMS systems
1986 Computer backed design System (CBDS) put into service in R&D unit, High-capacity Spacenet family members:EX 2000 and New rural exchange Elif II introduced, joint R&D activity on DMS exchange systems started
1988 First locally designed fully digital rural switch: DICLE introduced, Support activities for Gateway DMS-300, power unit for small offices:SOP
1989 Fully digital Diginet DX4 switches, Deployment of first Turkey specific DMS load with locally developed features, Participation in the Common Channel Signalling No.7 development on DMS switches, TC network design for Russian federation
1990 Development of hardware and software for the Announcement in Ringback Tone feature on DMS, Participation in the DMS-300 development, CIS telecommunication network signalling development
1991 Diginet DX2 switches developed, design of DMS systems for China and Moracco, Design of the direct fiberoptic transmission from the exchange
1992 Interactive Compound Auxiliary Platform for Services (ICAPS) for new generation Diginet family, A new hardware-independent, time sharing, multitasking software design for rural switches, First international application of DRX-4(DICLE) in Macedonia, An original application on DRX-4: Built-in Fiber Interface, Design of power unit for urban switches and radio-link systems: PS-2000, Remote Management System (RMS) for power systems

1993 First Application Specific Integrated Circuit (ASIC), New member of Diginet family:DX3, Special telephone set design for DX-1,2,3; Object-oriented software design and flexible application capabilities in rural products family, Universal Tone Receiver card hardware &software design for DMS, Design of first standard power unit in cabinets:KEBAN, Flexible Multiplexer for transmission :FLUX
1994- 1997 Period (after privatization)
1994 Ownership of international software development on the DMS 100 i switching systems 1995 Software supplied to the parent company amounted to 11 million US $ 1996 Software supplied to the parent company amounted to 10 million US $, Preparation of software loads to DMS-100i exchange to China, Central and Latin America, CIS and Turkey 1997 Software supplied to the parent company amounted to 10 million US $, Global responsibility for the preparation of software loads to DMS-100i exchange to China, Central and Latin America, CIS and Turkey

Source: Company Annual Reports

The R&D unit made very important contributions to this process by designing rural exchange families, fiber optic transmission and power supply system as well as digital DMS switching systems. With the R&D unit's accumulated technological capability during the 1970s and 1980s, the firm had acquired the ownership of international software development on the DMS 100 i switching systems in 1994. After privatization, however, the firm's R&D activities seem to have focused merely on software development. R&D services and software supplied to the parent company increased from 6 million US $ in 1993, to 11 US $ in 1995 and then 10 US $ in 1996 and 1997.

The number of engineers and their distribution between hardware and software development in the R&D department before 1989 could not be obtained from the firm's personnel office. In the interviews with the engineers who had worked in the firm since the 1970s, it was estimated that the share of engineers worked in the hardware development division was about 75 % of the total number of R&D engineers until mid-1980s. Then this share had dropped to approximately 40 % of the total R&D engineers by the end of the 1980s. Table 3 shows that the number of engineers employed in R&D department increased to 380 of which around 80 % work in the software development in 1997. It was expressed that the parent company carries out the R&D activities on hardware mainly in its headquarters and then the technological developments for some products are transferred and manufactured in Firm A in accordance with the parent MNC's global firm strategy.

Table 3- Number of Engineers in R&D Department of Firm A and Their Distribution Between Software and Hardware Development - (1989-1997)

Years	No. of Engineers in R&D	Engineers in Software-%	Engineers in Hardware- %
1989	170	- (60)?	- (40)?
1990	193	80	20
1991	200	81	19
1992	267	82	18
1993	262	83	17
1994	293	85	15
1995	340	82	18
1996	365	82	18
1997	380	80	20

Source: Firm Records

Firm " B "

The firm was founded in 1965 as the Research Laboratory of the Turkish PTT, continued its activities as PTT TC Equipment Laboratory and Factory and then converted into a joint stock company in 1983. A licensee agreement was signed with a major MNC in the world TC industry that purchased 39 % of the firm's equities and hence became the firm's partner. Firm A continued its independent R&D work, however, and signed licensee agreements with different companies to produce wide range of products in order to meet Turkish PTT's TC equipment needs. Then, in 1993 the foreign partner became the major shareholder of Firm B, holding 65 % of the shares.

Table 4 shows that after 1984, the firm's performance in terms of sales revenue, R&D investment, gross value added and labour productivity (which is equal to gross value added per employee) has steadily increased and reached to their highest values in the early 1990s. The 1994 economic crisis affected the firm's performance very badly that has not yet recovered and reached to values of the early 1990's. Therefore, it is again difficult to claim that the impact of privatization has been positive on the firm. Because in the 1994-97 period, sales dropped by 60%, workforce and R&D expenditures cut by 265 %, gross value added decreased by 52 % and hence, the firm got shrunken. The labour productivity however, increased by about 68 % that is mentioned to be the main and the most important impact of privatization by some authorities.

Table 4- Firm "B"s Sales Revenues, Investments, R&D Expenditures, Total Number of Employees, Gross Value Added and Labour Productivity - (1984-1997).

Years	Sales	Investm. (million US $)	R&D	No. of Employees	Gross Value Added (million US $)	Lab. Productivity
1984	29.1	1.2	0.3	2000	11.0	5.5
1985	53.1	-	1.2	1504	30.7	20.4
1986	113.1	18.4	2.4	1941	61.9	31.9
1987	207.5	-	3.2	2248	102.4	45.6
1988	147.5	10.5	3.1	2106	-	-
1989	77.4	3.6	3.3	1479	62.6	42.3
1990	150.1	7.4	5.3	1718	72.6	42.2
1991	222.4	4.3	7.5	1926	111.5	57.9

1992	221.1	5.2	8.5	1692	116.8	69.0
1993	275.4	7.0	10.5	1595	104.5	65.5
1994	102.8	2.9	5.6	806	3.5	4.4
1995	88.7	-	6.8	-	39.8	-
1996	157.2	2.6	6.9	576	45.0	78.1
1997	167.3	8.6	6.0	596	60.8	102.1

Source: Firm Records

Examining the technical change activities of Firm B (summerized in Table 5) shows that the firm had carried out extensive R&D work, independent from its foreign partner, transferred technology through licensee agreements signed with different TC companies and hence expanded its production lines until the foreign partner became the major shareholder of the firm. After 1993, the firm's all R&D work joined to the MNC's global R&D strategy and the firm got involved mainly in software development and conducted only subcontracted work on some joint hardware development projects.

The number of engineers employed in the R&D department of Firm B was 155 in 1985 and increased to 182 in 1990. The distribution of engineers between software and hardware divisions was 26 % and 74 %, respectively, for both years as shown on Table 6. In 1994, the number of engineers working in R&D dropped drastically to 73, mostly due to the economic crisis in Turkey and most of the R&D work directed to software development for which 86 % of the engineers worked. Then in later years, the share of engineers employed in the software division continued to be high but decreased to 70 % in 1998. Therefore, the parent MNC seems to have assigned the software development work which is engineering labour - intensive, to the Turkish subsidy where engineers have lower wages than the MNC's headquarters.

Table 5- Technical Change Activities in Firm B (1967-1997).

1967-1985 Period
- Analog Multiplex Systems - Medium and high capacity transmission - Design of adjustable telegraph systems - Design of Digital Multiplex Systems - First PCMs with 30 channels - Data modems - Design of Radiolink Systems - Adaption of licensed telephone set production - Design of second generation PCMs - Design of Data modems
1985-1993 Period of Foreign Partnership
- Design of 30 and 120 line capacity digital R/L systems - Design of new generation PCMs (03-04) - License obtained for urban digital exchange system 12 (from the partner) - License obtained for analog and digital R/L systems (480-1920 telephone lines) - (from the partner) - License obtained for coin telephone sets (from the partner) - License obtained for fiber optic line equipment (from Ericsson) - License obtained for rural R/L systems (from Siemens) - License obtained for power units (from Alcatel) - Design of integrated circuit (ASIC) - License obtained for card phone sets (from Alcatel) - Design of low capacity urban switch: LEVENT

1994 - 1997 Period (after privatization)
- Joint software development for System 12 with the parent company
- Design of the GSM-sub-multiplexer for mobile telephone system
- Design of new generation 2&8 Mbit/s fiberoptic terminal equipment
- Joint design of next generation GSM system-G2
- Design of new generation 2&8 Mbit/s digital radolink systems
- Design of EC-3 and EC-7 software package
- R&D work on Broadband switch
- Design activities for the new cardphone model
- R&D work on the new generation G2 project
- Joint R&D on Broadband ISDN & TMN technologies
- Improvement on locally designed Levent switch system
- Design of 2nd generation 2 and 8 Mbit/s microwave digital radiolink systems
- Completion of radiolink system for 2&8 Mbit/s
- Update work on PCM & FOLTE equipment technology
- 2&8 Mbit/s 140 Mbit/s range fiberoptic line equipment completed
- Design of digital multiplex and fiberoptic line equipment for ranges from 2 Mbit/s to 140 Mbits/s
- GSM transmission network design for world market in cooperation with the parent company
- Field trials & tests of 622 mbit/s SDH systems
- R&D on the G2 BSC and G2 Transcoder products
- Joint projects of 1511 P2 and TMN
- Joint hardware & software development activities on cardphones

Source: Company Annual Reports

Table 6- Number of Engineers in R&D Department of Firm B and Their Distribution between Software and Hardware Development - (1985-1998)

Years	No. of Engineers in R&D	Engineers in Software(%)	Hardware (%)
1985	155	26	74
1990	182	26	74
1994	73	86	14
1995	101	79	21
1996	88	80	20
1997	97	74	26
1998	105	70	30

Source: Firm Records

Conclusion

The debates surrounding privatization that focus on efficiency as the primary effect of privatization result in overlooking its other very important repercussions for a country. Technical change activities that are directed to achieve and maintain a country's technological independence can be more critical than achieving higher efficiency in a strategically important sectors.

When our case study firms were established in the late 1960s as state controlled enterprises, the main idea was that domestically meeting all the communication needs of Turkey, is

important for the country's security and national interests. Hence, the sector was structured in a way that the country's technological independence can be achieved and maintained. Both firms accumulated technological capability in their efforts to develop new products, improve the existing ones, transfer technology from different sources in most convenient terms and to conduct joint R&D activities with other local and foreign enterprises.

Through the accumulated technological capability in Firm A and B, Turkey could succeed to meet 90 to 95 % of her TC equipment needs locally, when the Turkish PTT made big investments in the mid-1980s to switch analog to digital TC technology. After privatization, however, not only they started to transfer technology only from one source, namely the parent company, they also started to conduct only subcontracted R&D work in accordance with the parent company's global firm strategy and concentrated mainly on software development.

Hence, at present, all the national control on the Turkish TC industry which could well be utilized as the entry point to the information technology, is lost. There can be no initiative hold in the sector to determine the nature and direction of R&D activities in accordance with the country's urgent and crucial requirements. Therefore, privatizing public enterprises and loosing all the control of their management to foreign companies, should be carefully reconsidered since it may well be creating very undesirable results in a strategically important sector.

References

Ansal, H. (1988) Technical Change in the Turkish Truck Manufacturing Industry, Ph.D. Dissertation, SPRU of Sussex University, UK.

Atkinson, A.B. and Stiglitz, J.E.(1969) " A new View of Technological Change", The Economic Journal, Vol.79, No.4, pp. 573-578.

Balasbramanyam, V.N.(1973) International Transfer of Technology to India, New York, Praeper.

Caves, R.(1982) Multinational Enterprises and Economic Analysis, Cambridge University Press.

Dosi, G.(1988) "Sources, Procedures and Microeconomic Effects of Innovation", Journal of Economic Literature, Vol.26, No.3, pp.1120-1171.

Fairchild, L.G.(1979) "Performance and Technology of US and National Firms in Mexico", in Stree, J.H. and James, D.D.(Eds), Technological Progress in Latin America: The Prospects for Overcoming Dependency, Westview Press, Colorado.

Göransson, B.(1984) "Enchancing National Technological Capability: The Case of Telecommunications in Brazil", Discussion Paper, Lund University Reserch Policy

Institute, No.158.

Jenkins, R.(1987) "Transnational Cooperations and Uneven Development: A Survey" in Newfarmer, R. (Ed), Profits, Progress, Poverty: Studies of International Industries in Latin America, Notredame University Press.

Nelson, R.R.,(1987) "Innovation and Economic Developments: Theoretical Retrospect and Prospect" in Katz, J. (Ed), Technology Generation in Latin American Manufacturing Industries, London, Macmillan, pp.78-93.

Pack, H. and Westpal, L.E. "Industrial Strategy and Technological Change: Theory versus Reality", Journal of Development Economics, Vol.22, No.1, pp.87-128.

Paula, G. M. and Camargos, S.P. (1998), "Privatization and R&D Activities: The Case of Brazilian Steel Industry", Management of Technology, Sustainable Development and Eco-Efficiency, 7 th International Conference on Management of Technology, 16-20 February 1998, Florida, USA, pp. 970-979.

Pearson, R (1977) "The Mexican Cement Industry; Technology, Market Structure and Growth", IDB/ECLA Research Programme, Working Paper, No.11.

Rugman, A.M.(1981) Inside the Multinationals: The Economics of Internal Market, London, Croom Helm.