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Abstract

Significant reforms have taken place in the Israeli Telecommunications Industry in the last two decades. Nevertheless, there is little or no competition in the largest segment of the market: local and intercity (domestic) wireline service. The paper first identifies key issues that need be tackled in order to achieve a competitive domestic telephone market in Israel and then examines how a recent Israeli Ministry of Communications (MOC) committee addressed these key issues.

Keywords: Telecommunications, Deregulation, Interconnection

1 Introduction

Until recently, local telecommunications was a highly regulated sector in nearly every country in the world. Recent technological breakthroughs have changed the long-held belief that the provision of telecommunications services is a natural monopoly. As a result nearly every developed country has pursued a deregulatory policy in the 1990s in order to introduce competition into the telecommunications industry. In the U.S., the Telecommunications Act of 1996 was passed to promote competition by encouraging the entry of local exchange carriers (LECs), interexchange carriers (IXCs), and Cable television firms into each others markets. Similarly, the European Council Resolution of (1993) set January 1, 1998 as the date for full liberalization of voice telephony.[1] Four relatively small countries (Australia, Chile, Guatemala, and New Zealand) have been at the cutting edge of telecommunications deregulation.[2]

Despite significant reforms in the Israeli telecommunications industry (see section (2)), there is little or no competition in the largest segment of the market: local and intercity wireline service. Bezeq remains a regulated monopoly provider of this service. This paper identifies the key issues that need be tackled in order to achieve a competitive domestic telephone market in Israel and then examines how a recent Israeli Ministry of Communications (MOC) committee addressed these key issues.

2 A Description of the Initial Reforms in the Telecommunications Sector in Israel

Until recently, all telecommunications services in Israel were provided exclusively by the Ministry of Communications. Significant reforms have taken place in the Israeli Telecommunications Industry in the last two decades. In this section I briefly review the reforms.

Formal reform began with the Telecommunications Act of 1982, which established Bezeq, the government owned corporation. Bezeq replaced the Ministry of Communications as the provider of telecommunications services in 1984.

[1]The European Council subsequently adopted an resolution requiring "equal access" by 2000.

[2]Several recent papers, including Harris and Kraft (1997) on the US experience, Waverman and Sirel (1997) on Europe, and Spiller and Cardilli (1997) on the small countries that have moved the fastest towards a deregulated environment, assess the policies of various countries that are in various stages of deregulating the telecommunications industry.

In March 1990, the government partially privatized the firm. The initial stock offering was held in September 1990. By December 1992, 24 percent of the company was held privately. Currently the Israeli government owns approximately 64 percent of the company; Cable and Wireless and Merrill Lynch each hold 10 percent of the company; 16 percent of the company is held by the general public.

In addition to the partial privatization of Bezeq, structural reforms have occurred in the telecommunications industry:

- Local and Intercity Wireline Service -

  Bezeq still provides exclusive voice service for all local and intercity calls in Israel. Despite the fact that Bezeq has remained a monopoly on this service, there have been significant improvements in the provision of local and intercity wireline telephone communications over the last fifteen years.[3]

  Price cap regulation was introduced in 1988; since 1993, price cap regulation has significantly reduced the real price of domestic phone service. Figure 1 shows that the "domestic phone basket," which includes calls, monthly service, and installation, has fallen in real terms by approximately 25 percent from 1993-1998. A delineation of the data (figure 1) shows that over the same period the price of domestic calls has fallen significantly, while the price of monthly service has risen; this has reduced the cross subsidy from "traffic" to "access".[4]

  Yearly traffic increased by approximately 80% during the 1988-1997 period. Part of this increase is due to the reduction in tariffs and part to the increase in population and (per capita) income. During the same period, the number of fixed lines increased by 120%.

  Table (1) shows current rates for domestic calls in Israel. The rates are based on counting units or pulses. The current price of the counting unit is 7 cents.[5] It is

[3]See Gandal (1994) for details.

[4]In Israel, all phone calls are metered, including local calls. The monthly service fee just provides the line and access to the network.

[5]All $ valuations in this paper are converted from the New Israeli Shekel (NIS) at a rate of 1 $ = 3.80 NIS. In the light of the recent devaluation of the NIS, the current $ costs are approximately 10 percent lower than reported.

important to note that all calls, even those that last a few seconds, pay a full counting unit.

Time of Day	Local	Within Region	Intercity
8:00 - 18:00	300	96	48
18:00 - 22:00	480	288	144
22:00 - 8:00	1800	900	900

Table 1: Seconds Per Counting Unit

- International Telephone Service -

  Until July 1997, all international services were provided exclusively by Bezeq. Beginning in July 1997, two additional firms (Barak and Kavei Zahav) began providing international telephone service. Bezeq International, which is a 100 owned subsidiary of Bezeq is the third international provider. In 2002, this market will be open to all firms wishing to provide international telephone service.

  Following the introduction of competition into the provision of international telephone service, rates fell dramatically. Figure 1 shows the real price of international calls fell by 87 percent from 1993-1998. Supplementary data show that the steep fall in international prices that occurred during the 1993-1998 period comes on top of a 50 percent real price decline during the 1981-1992 period. (See figure 2).

  The prices in Table (2) for July 1997 are those that were available during peak hours on the eve of the introduction of competition. The prices in February 1998 are for the carrier providing the least expensive service. These prices are all available 24 hours a day. Note that in all cases, these prices exclude the 17 percent value added tax.

  Before the introduction of competition, rates for calls from Israel to the U.S. ranged from \$0.53 per minute (off-peak rate) to \$1.00 per minute (the peak rate). Currently all three firms offer rates in the range of \$0.16 to \$0.18 per minute. These rates are in force 24 hours a day.[6]

[6]Again, all of these rates are without the 17 percent value added tax.

An interesting note is that Bezeq International's share of international service fell from 100 percent to less than 60 percent during the first three months of competition. This may be an "short term" effect due to the desire of the entrants to capture market share. While prices may rise somewhat over time, it is likely that the firms will compete fiercely for the important markets–like the U.S.

The international market is the most competitive sector in the telecommunications industry. This is because of equal access (all three firms have three digit access codes) and low switching costs.

Country	July 1997 (Peak Rate)	February 1998 (24 hours per day)
United States	1.00	.16
United Kingdom	.89	.13
France	.89	.23

Table 2: International Tariffs from Israel ($ per minute).

- Wireless (Cellular) Telephony -

  In 1986, Bezeq (in partnership with Motorola) began offering cellular phone service. The company (called Pelephone) is a subsidiary in which Bezeq has a 50 percent stake.

  In 1994, an additional cellular license was awarded to Cellcom. Given the relatively inexpensive cellular prices that Cellcom committed to in the auction, the number of cellular lines increased by approximately 235 percent in 1995 (see figure 3).

  By the end of 1997, there were approximately 1.8 million cellular subscribers split equally between the two providers. There will be 2.2 cellular lines by the end of 1998.[7]

  Since Israel has approximately 2.7 million wireline phones (approximately 45 lines per 100 residents), its 1998 ratio of wireless to wireline subscribers (approximately 80

[7]Recently, the Telecommunications Ministry awarded a license to a third provider, which will begin providing service in the fall of 1998.

percent) is among the highest in the Western World.[8] This is due, in part, to the relatively inexpensive airtime charges for cellular service.

An additional reason for the high penetration rate is that in Israel, charges for all cellular services are "Calling Party Pays (CPP)." (See section (3) for further discussion.) In the U.S. for example, cellular subscribers are charged airtime for both outgoing and incoming calls.

- Video-to-the home (VTTH) services -

  A 1986 decree and subsequent amendments to the Telecommunications Act of 1982 led to the establishment of a cable television industry in Israel. Three operators currently have monopoly rights to provide service in various areas of the country. These monopoly rights will expire in the 2002-2006 period. See figure 4a for the map and figure 4b for the areas controlled by each firm.

  Figure 4b shows the initial mergers that occurred before provision of cable service began in 1991. In 1998, there were two additional mergers (between Golden Channels and ICS & between Tevel and Gvanim), reducing the number of cable firms from five to three.

  Currently, there are slightly more than one million subscribers. See figure 5. Golden Channels-ICS and Tevel-Gvanim each have approximately 400,000 subscribers, while Matav has approximately 260,000 subscribers. Despite the relatively high prices (approximately $35 per month), the penetration rate (that is, the subscribers/homes passed) is quite high and cable reaches 90 percent of all households.

  Negotiations are under way between the cable companies and the Ministry of Communications. One scenario is that the cable companies will relinquish their monopoly rights to provide VTTH services, in order to be permitted to enter into the provision of telephone services.[9] It is possible that the cable firms (perhaps as a combined entity) will be the first competitor(s) in the domestic telephone service market.

[8] Industry forecasts indicate that the number of wireless and wireline phone subscribers will be equal by the end of 1999.

[9] In such a case, the Telecommunications Ministry will begin awarding licenses for the of Direct Broadcast Satellite (DBS).

The Telecommunications Ministry estimates that the current size of the telecommunications market (described above) is approximately $ 3.2 Billion per year with the following breakdown:

- Domestic (local and intercity) telephone service 42 percent,
- Cellular service 27 percent,
- International telephone service 13 percent, &
- Cable television service 13 percent.

The remaining 5 percent includes telecommunications equipment and private business exchanges. Internet service, which is not regulated, is not included in this calculation. Currently there are approximately 200,000 internet users (excluding university users) who pay on average $25-$40 a month for unlimited service. There are approximately 30 internet service providers, but recently there has been a trend towards large firms entering into the provision of internet service. The major providers (Netvision, Internet Zahav, and IBM) control most of the market.

3 Key Issues in the Transition to a Competitive Domestic Telecommunications Sector

Since many Western countries are further along in deregulation/introduction of competition in telecommunications than Israel, there is a great deal that can be learned from the deregulation policies adopted by others; nevertheless, there are some institutional details that are unique to Israel and make the deregulatory process different in Israel. In this section, I discuss the key issues that will have to be addressed in Israel in order to move to a competitive telecommunications industry:

3.1 Strategies to Encourage Entry into the Provision of Local Telephone Service

In the U.S., following the Telecommunications Act of 1996, the FCC decided to (partially) unbundle network elements. This will allow local loops to be leased from Local Exchange

Carriers (LECs). Following the FCC decision to unbundle the network, LEC and Interexchange (IXC) or long-distance carriers "waged" lengthy and costly "battles" in front of nearly every State Public Utility Commission about what should be the price of the local loops.

The LECs endorsed the Efficient Pricing Components Rule (ECPR), which insures that prices paid to incumbent firms that lease their local facilities will include opportunity costs (current profits). The IXCs endorsed a plan in which facilities could be leased at prices quite close to the total element long run incremental cost (TELRIC) of the essential facility.

A related issue is "universal" service, one of the most important issues in every country. The main problem is that it will likely be unprofitable to offer basic service in rural/high cost areas. If there is competition on all services, there will be no cross subsidies to support carriers providing basic service in high cost areas.

One solution is to have all carriers contribute to a fund and use the fund to subsidize the service in the area. But this requires calculating the costs and updating the calculations. Another is to auction the right to provide of universal service.[10]

Currently Bezeq is the only firm that is permitted to provide local telephone service and it is required to provide service at (common) regulated prices in all areas in the country. Israel has only begun to address these critical issues.

3.2 Access/Interconnection Pricing

The determination of access/interconnection charges is perhaps the most important issue in enabling competition in industries such as telecommunications and electricity where (i) there are essential facilities and (ii) these facilities are monopolized due to first mover advantages, economies of scale, or regulation. A small but growing literature, including Economides and White (1995), Baumol Ordover, Willig (1995), Armstrong and Vickers (1996), Laffont and Tirole (1996), and Laffont, Rey and Tirole (1998), has examined the affect of access pricing on competition. The general conclusion is that if access/interconnect prices are set by the firm(s), competition will be reduced. Laffont, Rey and Tirole (1998) show that even in a duopoly setting, the ability of the firms to set access pricing can facilitate collusion.

Interconnection rates that reflect costs are critical to ensure that the proper signals will be sent to potential entrants into the Israeli telecommunications market. Interconnection rates

[10]In 1996, the California Public Utilities Commission (CPUC) convened a conference to examine the possibility of auctioning the rights to become a "carrier of last resort" (COLR) in rural/high cost areas.

are already an important issue for providers of cellular and international service. Currently the interconnection rates are high according to international standards. International carriers pay a flat rate of 3.3 cents per minute to Bezeq for all international calls that originate or terminate in Israel. Cellular providers pay interconnection charges of 2.9 cents a minute if they "hand off" more than 75 percent (on average) of their calls to Bezeq in the local area in which the "receiving" party is located. Similarly, if the cellular providers hand off less than 75 percent of their calls to Bezeq in the local area in which the receiving party is located, they pay a higher interconnection fee–4.0 cents per minute. The logic behind this policy is that when calls are handed off in the local area of the receiving party, the transport costs to Bezeq are lower. The interconnection charges in Israel implicitly include "access deficit charges."

Interconnection fees are considerably lower in the U.S. and the U.K., the two large countries that are on the cutting edge of telecommunications deregulation. In the U.K., incumbents bear all costs of universal service obligations, that is, there are no access deficit charges. Interconnect charges for a single tandem phone call were 0.94 U.S. cents per minute in the U.K. in 1996. In 1996, U.S. "gross" interconnect charges (including access deficit charges) for a single tandem call termination averaged 2.56 cents per minute. The "net" interconnect charge in the U.S. is less than 1.5 cents per minute. It is estimated that the cost of providing interconnect services is falling at approximately 8-9 percent per year.[11]

Four major problems with interconnection rates in Israel are

1. Prices are high relative to the U.S. and the U.K.

2. Prices are not uniform across carriers.

3. Interconnect prices are not *directly* based on costs, since pricing is based on the *average* number of calls that are handed of in the local calling area.

4. There is no explicit delineation between access deficit charges and net interconnect charges.

[11]Source: Ovum Ltd.

3.2.1 The Internet and Interconnect Pricing

Since all calls in Israel are metered, users of the internet pay Bezeq for each additional minute of use, as well as the cost they pay to their internet service provider. Currently, internet calls are priced as a local phone call, despite the fact that in many cases, the cost (to Bezeq) of an internet call is equivalent to that of an "interconnect" call. A policy in which "internet" calls are priced the same as interconnect calls would likely speed the diffusion of the internet in Israel. (This is because all local calls in Israel are metered).

3.3 The Cellular Boom, Inefficient Bypass of the Wireline Network, & Interconnect Prices

As was mentioned earlier, by the end of 1998, Israel will have 2.2 Million Cellular Lines and the ratio of cellular/fixed lines will exceed 80 percent. There are three main reasons for the tremendous growth in this market.

The first reason for the boom in the cellular market is simply that cellular telephone service in Israel is among the least expensive in the world. Peak usage "airtime" rates for Cellcom are approximately 12 cents per minute. Pelephone peak rates are approximately 19 cents a minute. These rates are low relative to international standards.

The low rates are due, in part, to the 1994 auction for the second cellular license (which Cellcom won). The Ministry of Telecommunications (MOC) used a "procurement" auction in which the competitors had to commit to maximum airtime, monthly service, and installation prices for five years. The structure of the auction led to very low "price" bids.[12] The winner, Cellcom, charged no installation fee and no monthly fee for the first two years, and "airtime" rates were very low. Price ceilings from the auction are still in effect for Cellcom. They will expire at the end of 1999. By then, a third cellular carrier will be providing service.[13]

The second reason for the tremendous growth in cellular service was the adoption of a "calling party pays" (CPP) policy. This policy (together with the low monthly fees) encouraged consumers to order lines and keep their "cellular" phones turned on. The low "airtime" prices encouraged use of the cellular network.

The third reason for the tremendous increase in the number of cellular lines is the pricing policies of the carriers for calls completed on their own network versus calls completed on

[12]See the appendix for details.

[13]The third carrier will not be subject to price ceilings.

another network. In order to understand this, it is important to examine the details of pricing in the market:

- Land to Mobile (LTM) and Mobile to Land (MTL). These calls pay "airtime" on the mobile network (either 12 cents per minute or 19 cents per minute during peak times, depending on the mobile network) plus the "high" interconnect fee (4.0 cents per minute).
- Mobile to Mobile (MTM) If these calls are on the same network, consumers only pay a single "airtime" charge (either 12 cents per minute or 19 cents per minute during peak times, depending on the mobile network); if the calls are from one mobile network to the other, callers pay the sum of "airtime" charges of both networks (31 cents per minute).

The low monthly service rates and the pricing "anomaly" that mobile to mobile calls on the same cellular network pay the same airtime rate that LTM calls pay created incentives for firms to subscribe to all three networks and employ routers. Routers are devices that automatically identify the network of the receiving party and send calls placed from inside the firm out on the same network as the number that is being dialed.[14] Given the current (high) interconnect rates, this results in significant savings for firms.

This results in inefficient bypass of the wireline network because the cost (not the price) of a call from land to mobile is lower than the cost of a mobile to mobile call.[15]

Reduction of interconnect rates to levels that exist in the U.S. and Western Europe will reduce the difference between the price of LTM calls, so that the difference between LTM calls and MTM calls (on the same network) will be trivial. This will reduce the inefficient bypass (of the wireline network) that is taking place.

4 The 1998 Committee Report of Tariff Rebalancing

The committee was charged with rebalancing domestic wireline tariffs in order to enable competition in this market. The report was presented to the Ministry of Communications in

[14] In Israel, each cellular network has its own area codes, and these areas codes are different than those used by the wireline network. Hence the area code of the receiving party identifies its network.

[15] Traffic sensitive costs and terminal costs are typically much more expensive for mobile networks than they are for fixed wireline networks.

September 1998. In this section, I first discuss the methodology employed by the committee and then examine how the committee's recommendations addressed the key issues raised in section (3).

The first step was to calculate total "recognized" network costs, i.e., the costs that comprise the "rate base." Since the committee did not have detailed data on capital acquisitions, it chose to update the rate base by using the rate base that was deemed acceptable by the 1993 tariff rebalancing committee. This base was adjusted to account for changes in the structure of the firm. (Bezeq no longer provides cellular or international service. These are provided via subsidiaries.) In addition to the structural adjustment, the weighted average cost of capital was adjusted upwards from 8.5 to 10.5 percent to reflect the increase in risk associated with the introduction of competition.

4.1 Long Run Incremental Costs

The committee adopted the principle that prices (tariffs) for telecommunications tariffs should be based on the forward looking long run incremental cost (LRIC) for the service.[16] Tariffs can not be set equal to long run incremental costs because there are common and joint costs in the network.

The next task of the committee was to calculate the LRIC for each service. The committee defined LRIC to be the capital cost of equipment associated with each service. Hence it was necessary to, for example, distribute the cost of a central office switch among local, long distance, and interconnect calls. This "accounting decomposition" was provided by Bezeq. Once the accounting decomposition was accomplished, the committee needed to calculate the capital cost of each piece of equipment.

Since there is no second hand market for used telecommunications equipment, the committee calculated capital costs in the following manner. Let

- A_t be the current (year t) capital cost of a particular piece of equipment. This includes depreciation as well as interest costs.
- C_0 is the cost of purchasing a new piece of equipment at the beginning of the current year.

[16] Forward looking means that these costs should be calculated using current prices for equipment needed to rebuild the network today. This is important because, similar to computers, the prices of telecommunication equipment have been falling quite rapidly. See section 4.1.1 for details.

- T is the economic life of the equipment (in years).
- r is the cost of capital, i.e., the weighted average cost of debt and equity.
- ϵ is the yearly rate of decline in equipment prices. We calculate ϵ so that the output produced by the equipment does not change, that is, the price is adjusted for any productivity gains.

The goal is to measure A_t, the cost of capital. We assume that all parameters (C_t, T, r, ϵ) are known. Except for ϵ, the parameters necessary to calculate A_t are fairly straightforward.[17] We also assume that the piece of equipment provides the same stream of services for its whole economic life, that the output produced by the equipment is constant, and that the rate of decline of equipment prices (ϵ) is constant.

The cost of capital in period t, A_t, is implicitly defined by

$$\sum_{t=1}^{T} A_t(1+r)^{-t} = C_0, \tag{1}$$

that is, the present discounted value of the lifetime capital costs attributed to a particular piece of equipment (the LHS of 1) equals the current cost of purchasing the equipment new.

Since (by assumption) equipment costs decline at a rate of ϵ per year, the committee required capital costs to fall at this rate also. The attractiveness of this method is that the capital cost per year for new entrants purchasing a new piece of equipment is equivalent to the capital cost for incumbents who are using equipment that is already in place. Under the assumption that capital costs for each piece of equipment decline at a rate of ϵ per year,

$$A_t = (1-\epsilon)A_{t-1} = (1-\epsilon)^{t-1}A_1. \tag{2}$$

Substituting (2) into (1) (and several steps of algebra) yields

$$A_1 = \frac{r+\epsilon}{1-\frac{(1+r)^{-T}}{(1-\epsilon)^{-T}}}C_0. \tag{3}$$

Hence, the cost of capital in the first year is ρC_0, where $\rho \equiv \frac{r+\epsilon}{1-\frac{(1+r)^{-T}}{(1-\epsilon)^{-T}}}$; ρ is referred to as the "cost of capital factor." This factor increases in r and ϵ and decreases in T.

[17] We discuss how ϵ is calculated in section (4.1.1).

4.1.1 Changes in Telecommunications Equipment Prices

The source of the data is the U.S. Bureau of Labor Statistics.[18] The producer price index measures changes in the average prices received by domestic (U.S.) producers of goods and services.

U.S. Bureau of Labor Statistics data show that real prices of switching equipment fell at an annual rate of slightly more than two percent during the 1988-1998 period.[19] The switching equipment category includes central office switches, local office switches, and toll/interexchange office switches.

Real prices of (carrier) line transmission equipment rose at a rate of slightly less than one percent during the 1994-1998 period.[20] Since the CPI rose at an annual rate of 2.4 percent during the same period, real prices of line transmission equipment fell by 1.5 percent per year during the 1994-1998 period.

Prices of user terminals and interface equipment fell in nominal prices at an annual rate of 4.1 percent during the 1988-1998 period. Hence, real prices of user terminals and interface equipment fell at a 7.5 annual rate over the 1988-1998 period. The annual rate of decline was 6.2 percent nominally or 8.6 percent in real terms during the 1994-1998 period.[21]

These data assume that the productivity of the equipment stayed the same over time. Clearly this is not true. The relevant measure is the price per unit of output. Northern Business Information (NBI, 1991) reports that prices (per line) for central office switches made by Northern Telecom fell from approximately $450 in 1982 to $110 in 1991. (pages 18-20). That translates into a yearly decline of approximately 14.5 percent per year. Additionally, NBI (1993) reports that the average price of digital switches (per line) continued to fall from 1991 to 1993. They note (page 71) that Ameritech received a price of $170 per line in 1991, while PacTel received a price of $110 per line in 1993. In calculating the rate of decline ϵ for switching equipment, we are interested in the switch price per line than the switch price itself. The committee estimated that $\epsilon = .12$ for switching equipment and $\epsilon = .08$ for other

[18] It can be found on the web at the BLS data home page: http://stats.bls.gov/datahome.htm

[19] The CPI rose at a 3.3 percent annual rate during the 1988-1998 period, and switching equipment rose at an annual rate of 1.1 percent during that period.

[20] Data on this category are only available from July 1994.

[21] Note that these are prices in $ U.S. Due to the appreciation of the Israeli currency, during the 1988-1997 period, the annual (real) rate of change (decline) in prices faced by Israeli firms (who purchased telecommunication equipment) was greater than these data indicate.

telecommunications equipment.

4.2 Allocation of Common & Joint Costs

Once LRIC had been calculated for each piece of equipment in the network, the committee was able to calculate, using the"accounting decomposition" provided by Bezeq, the LRIC of each service. Using the committee's estimates, LRIC costs make up only 40% of Bezeq's total network costs; the joint and common costs are quite significant. The committee adopted two principles in allocating the common and joint of the costs.

1. There should be no cross subsidy within a service. This means that at the very minimum, each part of the service must cover its direct LRIC.

2. There should be no cross subsidy between services. This means that tariffs must be set so that the total cost of the service (i.e., telephony) must cover all of its direct costs, common costs and joint costs.

4.3 Tariffs

Telephony (which includes access, calls within Bezeq's network and interconnect calls) is the largest service provided by Bezeq. Currently there is a cross subsidy from "calls" to "access" within telephony. The monthly fee paid by Bezeq subscribers is less than its direct cost (i.e., LRIC.) At the same time, the price of telephone calls (local and intercity) significantly exceeds the LRIC of these calls. Further, telephony itself subsidizes other services (such as FRAME RELAY).

Principle (1) required an increase in the monthly access and connection fees. Given political constraints, the committee recommended raising the monthly access and connection charges so that they would exactly cover LRIC. This required an increase in the access and connection fees of approximately 12 percent.

Using principle (2), traffic (end-user & interconnect) tariffs had to be priced in order to cover the LRIC of traffic plus all the common and joint costs of telephony, but not to cross subsidize other services.

The common and joint telephony costs were divided among the traffic components using weights of 1.0 (full allocation of joint and common costs) for calls that originate and are

completed on Bezeq's network and .5 (partial allocation) for interconnect calls. This calculation yielded an "overhead" on end-user traffic of 220% (or 3.2 times the direct costs), and an overhead on interconnect traffic of 110% (or 2.1 times the direct cost). Since, on average, the current overhead on end-user traffic is 4.7 times the direct cost, the calculations indicate that the price of traffic should fall by 32 percent.

Since the cost of interconnection depends on whether the call uses just Bezeq's local network or Bezeq's intercity network, the committee recommended that there be an equivalent matrix for interconnect calls, identical to that for end-user traffic. (Bezeq has indicated that it wants to streamline the $3x3$ matrix to a $2x2$ matrix (two areas: local and intercity and two time periods: peak and off peak). Regardless of the size of the matrix, the committee recommended that the price of interconnect calls in cents per minutes (P_I) calls be set so that

$$P_I = \frac{2}{3}P_T - 1/2, \tag{4}$$

where P_T is the per minute price (in cents) of a similar end-user call. Equation (4) was derived in the following fashion.

Using Bezeq data, the direct cost of an interconnect call was approximately one quarter of a cent less than the corresponding end-user call, i.e., $c_I \approx c_T - 1/4$, where c_T is the direct cost per minute (in cents) of an end-user call, and c_T is the direct per minute cost of an equivalent interconnect call. Since $c_T = P_T/3.2$ (recall that the price of end-user calls will be approximately 3.2 times the direct cost), $c_I \approx P_T/3.2 - 1/4$. Further recall that the price of an interconnect calls will be 2.1 times its direct cost, i.e., $P_I = 2.1c_I$. Substituting this expression (approximately) yields the expression in (4). If for example, an end-user intercity call is priced at 3 cents a minute, an "intercity interconnect call" would be priced at 1.5 cents per minute. Using this methodology, the price of interconnect calls will fall by approximately 63 percent from the present rate.[22]

4.4 Alternative Calling Plans

Despite the elimination of the cross subsidy from "calls" to access, the new tariffs for calls (local, intercity, etc.) are still significantly (220%) higher than the long run incremental cost.

[22]The committee also recommended that the current price cap regime be kept in place and that the X-efficiency factor (real drop in prices) should be 7% per year.

In such a case, a new entrant could profitably undercut these rates, even if the entrant was less efficient than Bezeq. In order to level the playing field, the committee gave Bezeq the right to offer consumers three alternative plans in addition to the regulated one. Consumers will be able to choose among these tariffs. The committee made the following recommendations regarding alternative tariffs.

- The alternative tariff must cover the cost of the service.
- The alternative tariff is restricted to telephony, that is, it cannot include more than one service.
- The alternative tariff must be available to all consumers, regardless of the use of the network (i.e., no quantity discounts).
- The alternative tariff must be approved by the Ministry of Communications.

5 How the Committee Recommendations Addressed the Key Issues

Recall that the committee made the following three main recommendations regarding tariffs:

1. Access (monthly service) & connection rates should rise by 12%.
2. End-user traffic rates should fall by 32%.
3. Interconnect rates should be (i) uniform across carriers, (ii) a function of distance (similar to other domestic calls), and (iii) be lowered by 63% on average.

These three recommendations made by the committee will eliminate the cross subsidy from access to traffic. Recommendation (3) essentially solves the first three problems with current interconnect pricing in Israel that were raised in section 3.2. Recommendation (3) also will reduce the incentive to inefficiently bypass the wireline network (section 3.3). While the report did not *directly* address the problem of interconnect pricing (section 3.2.1), it indirectly reduced the magnitude of the problem by reducing the cost of local telephone calls.

The committee made no recommendation regarding the distinction between gross and net interconnect costs. This was due to the fact that the committee did not address the universal service issue.

A separate government committee (working in parallel) recommended that Israel adopt facilities based competition. In order to enter the domestic wireline market, firms will have to provide services in 12 of the 41 statistical areas that make up Israel.[23] This will eliminate the need for developing a mechanism for unbundling network elements. This plan does not, however, solve the universal service problem, since it does not encourage entry in high cost rural areas.

6 Conclusion

Two critical issues remain unresolved:

- Universal service: It is imperative to develop a universal service plan. The problem is solvable, since universal service funding will likely be relatively inexpensive. This is because Israel has a high population density.[24] The high population density is in part a result of the "border" housing policy in the years preceding the state and the early years of statehood that discouraged low density areas. As a result, many rural areas are quite densely populated.

- The regulation of alternative tariffs that will be provided by Bezeq: Since Bezeq's cost function is not known and since the cost depends on usage (which will differ among consumers), the principles adopted by the committee do not provide a "black and white" rule which will enable the Ministry of Communications to accept or reject tariffs. It will be important to develop clear rules that permit Bezeq flexibility, while preventing predatory pricing.

If these two issues are resolved satisfactorily, the implementation of the committee's recommendations should enable efficient entry into the provision of domestic wireline service.

[23]These recommendations were made by a separate government inter-ministerial committee. See the 1998 Roseanne report, which is available at the Ministry of Communications web site: http://www.moc.gov.il, for more details on facilities based competition. Details on the statistical areas can be found in the reports of the Central Bureau of Statistics (http://www.cbs.gov.il/engindex.htm).

[24]For example, Israel's population density is approximately 10 times that of the U.S.

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Appendix: The MOC Auction of the Second Cellular License.

The bids were graded using the following score function:

$$S = 100 - \sum_{i=1}^{5} w_i B_i/50.$$

The basket in year i, B_i, was set equal to $I_i/3 + 12M_i + 2500A_i$, where I_i was the installation fee in year i, M_i was the monthly service fee in year i and A_i was the (peak) price per minute of airtime in year i. The weights, w_i were set equal to .3 in year 1, .25 in year 2, .15 in year 3, .1 in year 4 and .2 in year 5. This score function used by the MOC was known in advance by the bidders.

The strategy of the firms was to maximize profits over I_i, M_i, A_i such that $S = \bar{S}$ where $\bar{S}$ was the score that they wanted to achieve. Alternatively, by duality, the constrained optimization problem can be expressed as to maximize S over I_i, M_i, A_i such that $\pi = \bar{\pi}$ where $\bar{\pi}$ is minimum the level of profits that the firm must earn.

The bidders had to commit to these prices for five years. The bidder that offered the highest score received the license. In fact, the score function above constituted only 50 percent of the total points. The other 50 points were based on technology considerations and all competitors met these technological criteria. Hence, the awarding of the license came down to the highest score.

Figure 1. Real Telephone Tariff Index (1993-1998)

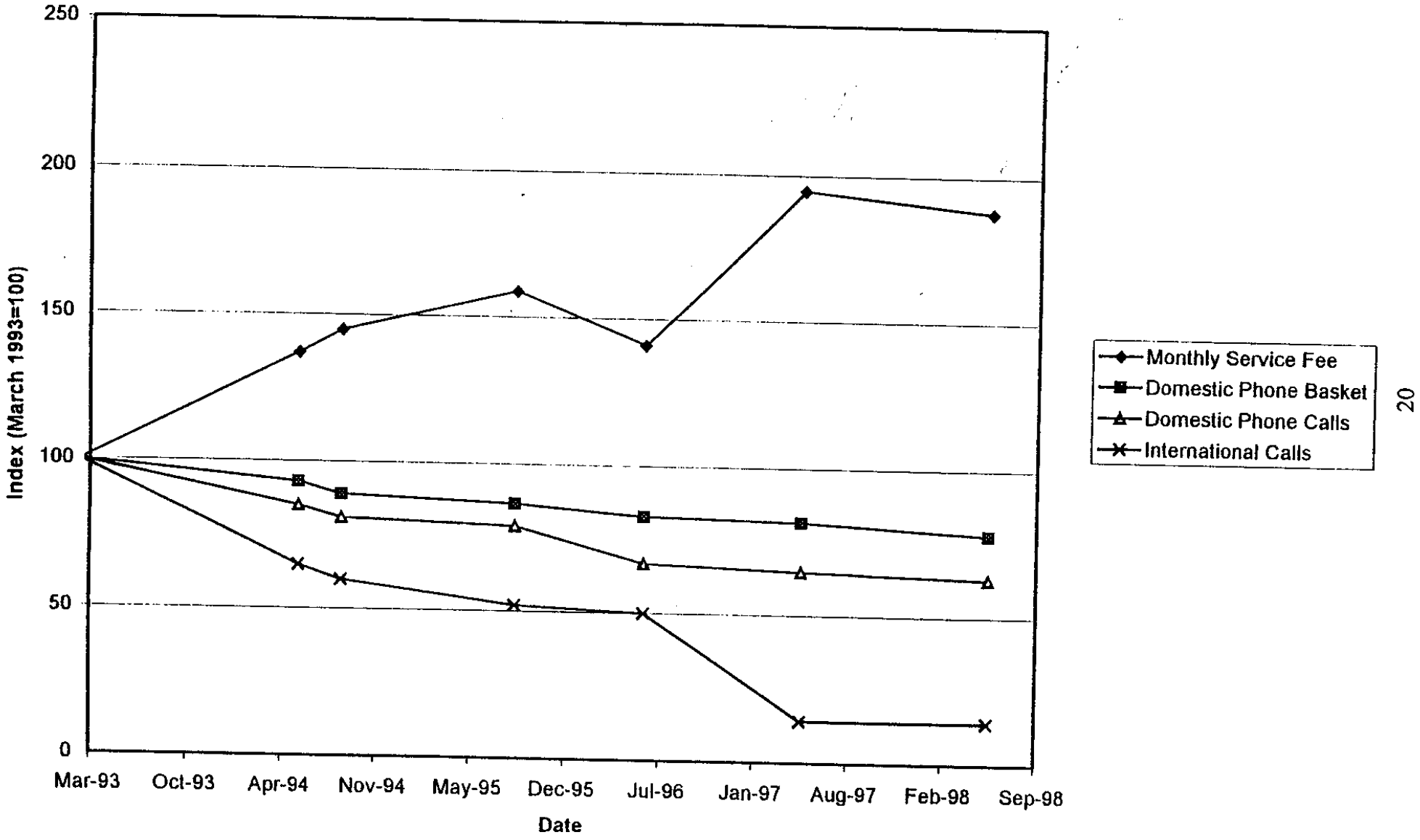


Figure 2: Price Indices: 1981-1992 (1981=100)

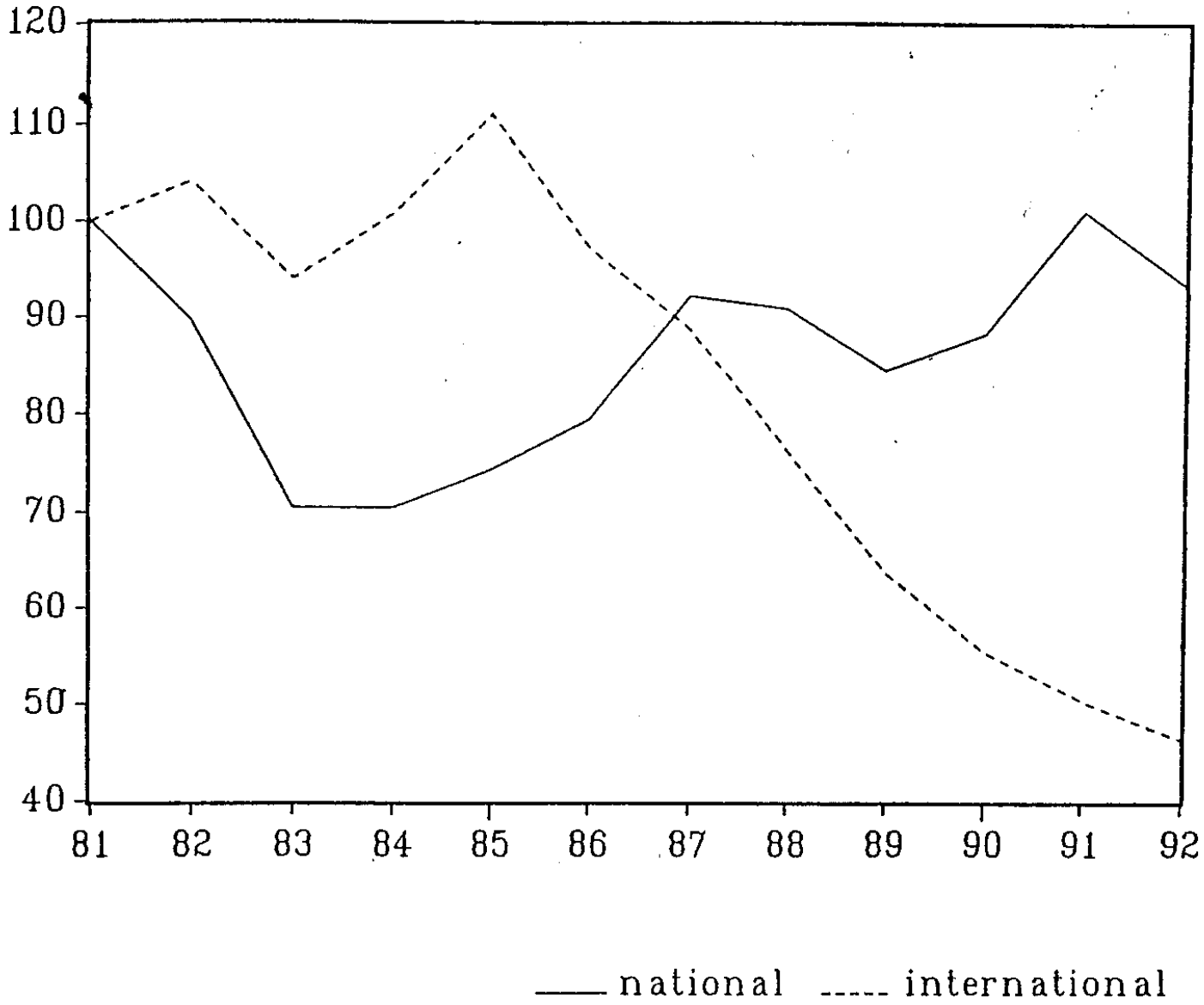


Figure 3. Fixed and Cellular Phone Lines 1993-1998

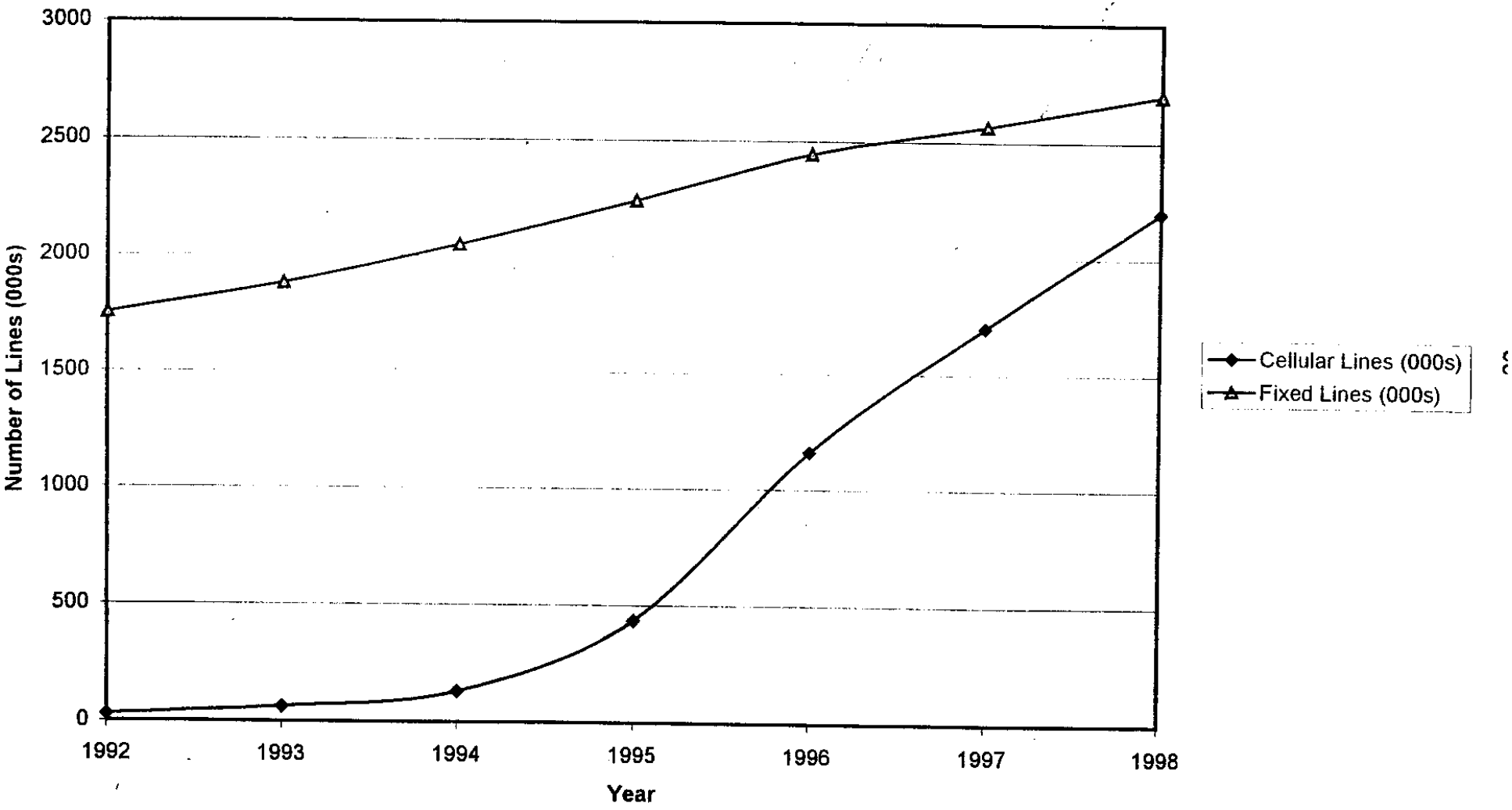
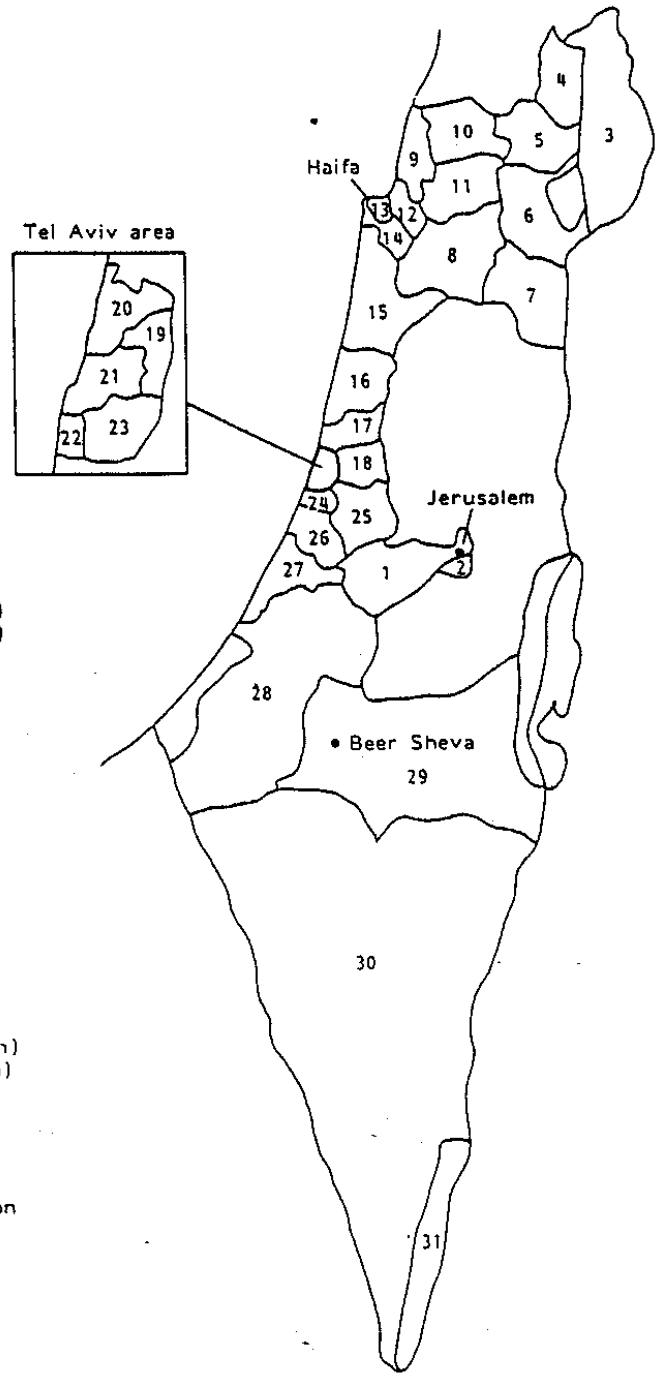
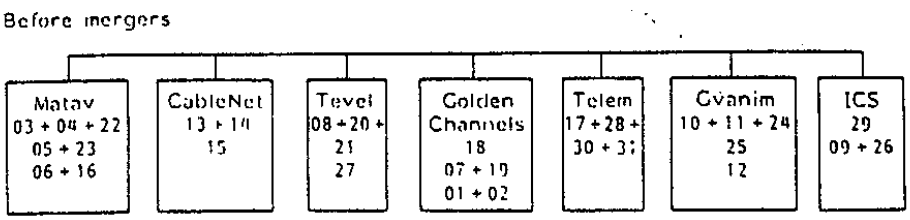
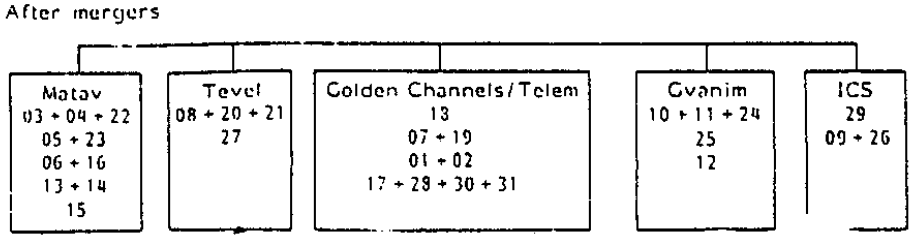


Figure 4 (a) The Original 31 cable franchise areas in Israel
Figure 4 (b) The Israeli Cable Firms Before and after the first wave of mergers



The original 31 cable franchise areas in Israel.





The Israeli CATV firms, before and after mergers.

A '+' means that the areas were licensed jointly.

Figure 5: Homes Passed & Subscribers: 1992-1997