When Good Intentions Are Not Enough:

Sequential Entry and Competition in the Turkish Mobile Industry

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Abstract

A decade into the liberalization of the Turkish mobile industry, the sector remains one of the most concentrated in Europe. This paper analyzes the links between the regulatory environment and competitive outcomes in the Turkish context. The paper argues that seven years of duopoly incumbency resulted in a significant first-mover advantage. It then focuses on the role of the regulatory tools that could potentially restrain the incumbent operators' first-mover advantage and stimulate competition: national roaming, interconnection regulation, and number portability.

Keywords: Mobile; Sequential Entry; Competition; National Roaming.

1 Introduction

Depending on how one counts, eight to twelve years have passed since Turkish authorities decided to develop an industry that would provide mobile telephony services at competitive prices. Today the Turkish mobile industry is one of the most concentrated in Europe; three operators, Turkcell, Telsim, and Avea, have market shares of 64, 20, and 16 percent, respectively. Although mobile penetration had increased from 22.3 percent in 2000 (last year of the duopoly period) to 39.4 percent in 2003, the penetration rate stood as the second lowest among the OECD countries. The latest price comparisons for the mobile market indicate that Turkey had one of the highest mobile telecommunication prices among the OECD countries in 2004.

The focus of this paper is the role of the regulatory environment in this outcome. In particular, the paper emphasizes the negative impact on competition of delaying new entry until after seven years of incumbency. By the time the government decided to auction new licenses, the two incumbent mobile network operators (IMNOs), Turkcell and Telsim, having rolled out their nation-wide networks, had significant first-mover advantages proportional to their subscriber bases.

Given the delayed entry of the entrant mobile network operators (EMNOs), this paper argues that there were three crucial policy tools that the authorities could use to stimulate effective competition in the mobile market: national roaming, interconnection regulation, and number portability. The regulator had strong intentions to implement the first two. Roaming was not successfully implemented. The interconnection regime was conducive to new entry, but the new entrants did not make good use of it. Finally, even though five years have passed since new entry, number portability is still not implemented.

In Turkey's *fixed* telecommunications market, the authorities seemed reluctant for a long time to undertake measures that would challenge the dominance of the incumbent operator. In the Turkish mobile industry, by contrast, the regulatory attitude was much more inclined to promote competition. What makes the Turkish story interesting is that the poor market outcomes obtained despite this more pro-competitive attitude. This is not a simple case of lousy intentions or downright bad policy. The Turkish mobile industry brings out the challenges of regulating an industry of this complexity, especially after having long delayed entry. This paper provides an overall picture of the Turkish mobile industry, and analyzes the potential links between the above mentioned regulatory tools and competitive outcomes in the Turkish context.

There are several lessons that can be drawn from the Turkish experience. The most important is

that the Turkish experience confirms the existence of significant first mover advantages in the mobile telecommunications industry. These advantages are amplified by the existence of tariff mediated network externalities and switching costs. Moreover, the degree of first-mover advantage increases with the length of the incumbency period. The policy conclusion that can be derived from this observation is that promoting simultaneous rather than sequential entry is more likely to generate a competitive environment. Once first-mover advantage results in dominance, that dominance is difficult to break. A related conclusion has to do with the importance of foresight: roaming policy would have had much higher chances of success if roaming obligations were not imposed as an afterthought, but were included in the original concession agreements of the IMNOs. Another lesson that can be extracted from the Turkish experience is that correct regulations may become ineffective if the legal environment lacks cohesion and competence and allows for opportunistic behavior. Roaming policy was rendered ineffective by legal challenges by IMNOs and what is generally believed to be mishandling by civil courts. The case of interconnection policy shows that correct regulations may fail to be effective because intended beneficiaries may fail to make good use of it.

The organization of the paper is as follows. Section 2 presents a description of the regulatory environment in the telecommunications industry. Section 3 provides a brief history of the development of the Turkish mobile market. Section 4 examines the impact of regulatory policies on the evolution of competition. Section 5 discusses the main lessons that can be extracted from the Turkish experience, provides recommendations and concludes.

2 Background: The Regulatory Environment

In line with most international experience, telecommunications services in Turkey used to be provided by a state monopoly (Posts, Telegraph and Telephone, PTT). Liberalization of telecommunications equipment occurred early on in the 1980s, along with the privatization of equipment manufacturers that were subsidiaries of PTT. In 1994, as part of an overall orientation towards privatizing state owned assets, telecommunications services were separated from post and telegraph, and Turk Telekom A.S. (TTAS) was established as a state economic enterprise and a joint stock company.[1]

[1] For details on the regulatory framework for telecommunications industry see OECD (2002), Atiyas (2005), and Burnham (2006).

[insert Figure 1 here]

The first important step in liberalization was the authorization of two private companies to provide mobile services over the GSM 900 standard in 1994. These companies, Turkcell and Telsim, had revenue agreements with TTAS until 1998, at which time they were issued licenses by the Ministry of Transport. Contrary to the practice of many European countries, TTAS was not initiated to take part in the mobile business, which evolved as a duopoly until 2001.

Various attempts were made to privatize TTAS in the 1990s, but these failed due to legal and constitutional challenges. The landmark law regarding liberalization and regulatory reform in the telecommunications industry was amending Law No. 4502, adopted in January 2000. The Law prescribed that the monopoly rights of TTAS would end on December 31, 2003. It also established the Telecommunications Authority (TA) as an independent regulatory body, and effectively transferred the regulatory functions of the Ministry of Transport to that agency.

Turkey's process of negotiations with the European Union for membership has been launched in October 2005. Hence, as part of the accession process, Turkey will eventually adopt the regulatory framework for electronic communications that is in place in the European Union. The regulatory framework that has been emerging in Turkey in the last few years is largely inspired by that in the European Union.[2] A case in point is the interconnection regime which played an important role in the evolution of the mobile industry. The Ordinance on Interconnection and Access (May 2003) stipulates voluntary commercial agreements for access and interconnection, with the TA intervening for dispute resolution in case parties fail to reach an agreement. In such cases, the TA may impose the terms of an agreement. According to the Ordinance the TA has authority to impose access and interconnection obligations on all operators, if it deems that refusal to provide access or interconnection or imposition of unreasonable terms would hinder the emergence of a competitive market. A distinguishing feature of the Turkish regime is that it stipulates mandatory domestic roaming obligations, a topic that will be discussed in detail below.

Turkey has a Law on the Protection of Competition which is enforced by the Competition Authority (CA). The CA has taken a number of significant decisions in the telecommunications industry involving cases of abuse of dominant position by incumbents in both the fixed and wireless segments. There is some ambiguity in the relevant laws regarding the division of authority between the TA and CA, and the two agencies have displayed some disagreement about their respective

[2] Some divergences exist. See Atiyas (2005) for details.

boundaries of authority. The evolving tendency is that the CA does not investigate allegations of competition law violations when actions in question are in areas regulated by the TA.

The attitudes of the TA and especially the Ministry towards competition in the wireline and wireless segments were very different. The Ministry had only a half-hearted commitment to the development of competition in the wireline industry. The prospective privatization of Turk Telekom prompted the authorities to slow down the introduction of competition in expectation of higher privatization revenues. By contrast, both the Ministry and the TA were much more aggressive towards the mobile industry. This is partly explained by the fact that Turk Telekom became a new entrant in the mobile business, and the Ministry's protective attitude towards Turk Telekom led it to take a more pro-entry posture in that segment. This was evident both in roaming and interconnection policy, as discussed in Section 4.

3 The Development of the Turkish Mobile Market

3.1 Phase I – The Duopoly Period (1994 – 2001)

Two IMNOs, Turkcell and Telsim, started to provide cellular mobile telephony services in 1994, through revenue sharing agreements with Turk Telekom. Turkcell was joint venture between Sonem Holding (currently Telia Sonera), a Finnish telecommunications company, and Çukurova group, then the third largest conglomerate in Turkey. Telsim initially was a partnership between Rumeli Holding, Alcatel and Siemens, but Rumeli Holding, a Turkish group owned by the Uzan family, active in a variety of sectors including energy and banking, very quickly became the sole owner. The revenue agreements stipulated that Turk Telekom would obtain 67% of the revenues, and the rest would be retained by the operators.[3] All infrastructure investments were to be undertaken by the operators themselves, but the ownership of the facilities would be retained by Turk Telekom.

An important turning point in the development of the industry was in 1998, when the revenue sharing agreements were replaced by 25-year concession agreements signed between the operators and Ministry of Transport. As a result of these agreements, the operators were granted licenses, for which each paid 500 million US dollars, and obtained the ownership of infrastructure as well. As shown in Table 1, the subscriber base of mobile telephony increased substantially after 1998, jumping from about 3.5 million subscribers in 1998 to 16 million subscribers in 2000. The change in the contractual arrangement from a revenue sharing agreement to a license produced two important

[3] See Yilmaz (2000), p. 47.

consequences. First, it introduced price competition: Under the revenue sharing agreement retail mobile call tariffs were determined by Turk Telekom, whereas under the license arrangement they began to be set by the mobile operators. According to ITU data, the ensuing price competition between the two operators, resulted in a rapid reduction of the price of a 3-minute call from over 1 US dollar to around 60 cents within a year in 1998. In addition to tariff reductions, both operators also started granting handset discounts (daily *Hurriyet*, June 14, 1998). These changes must have led to a rapid increase in demand. In addition to injecting competition, the change in the contractual framework also affected investment incentives.

Compared to a revenue sharing agreement, a license is a higher powered incentive contract. Under a revenue sharing agreement revenue passed over to Turk Telekom acted as a tax on earnings, reducing incentives to invest. By contrast, a license arrangement makes the operator the residual claimant of earnings, providing stronger incentives for investments and network rollout. Indeed, Turkcell investments increased from 136 million USD in 1997 to over 1 billion USD in 1999.[4]

Throughout the duopoly period, Turkcell had larger market share than Telsim. This is partly due to the fact that Telsim entered the market a few months later than Turkcell in 1994. More importantly, Telsim's activities were suspended between November 1995 and July 1996 because it was found to violate the revenue agreement. These effectively meant that Turkcell gained substantial first-mover advantage over Telsim. The suspension of Telsim's license also dealt a heavy blow on Telsim's reputation, and Telsim was never able to challenge Turkcell's dominance in the market. In terms of number of subscribers, Turkcell's share was about 69% in 1999 and 2000.[5] In fact, Turkcell's dominance, commanding a market share (in terms of number of subscribers) of 65-75%, continued even after the entrance of new operators in 2001 (see below). In terms of share in revenue, the market share of Turkcell was even higher. Between 1998-2000, an average Turkcell subscriber's monthly usage was about 140 minutes against 41 minutes for an average Telsim subscriber; in terms of revenues, the market share of Turkcell was above 80% in that period.[6]

Turkcell's growth strategy during that period entailed exclusive agreements with handset importers/distributors and retail dealers. Through these exclusive contracts, Turkcell was able to prevent distributors of major brand (e.g. Ericcson and Panasonic) handsets from marketing Telsim SIM cards and subscriptions, and effectively bundled these handsets with Turkcell subscriptions.

[4] See Competition Authority, Decision No: 01-35/347-95, p. 12 Table 6.
[5] See Competition Authority, Decision No: 01-35/347-95, Table 1.
[6] See Competition Authority, Decision No: 01-35/347-95, p. 9 Tables 2 and 3.

Telsim filed a complaint to the Competition Authority in September 1999, arguing that Turkcell's exclusive agreements with handset distributors and dealers distorted competition and acted as barriers that impeded Telsim's entry. The Competition Authority concluded that Turkcell's practices amounted to infringement of the Law on Protection of Competition.

3.2 Phase II – New entry and the quadropoly period (2001 – 2004)

Towards the end of the 1990s the Government decided to award 3 new GSM licenses. Two of these licenses were to be sold through auctions to private parties. The third would be sold to Turk Telekom. Turk Telekom, in turn would establish a mobile telecommunications subsidiary.

As the auction design indicates, the government was either unaware of the trade-off between promoting competition and raising revenues from the auctions, or had a stronger preference over revenues: A sequential auction was designed for the sale of the first two licenses, and the winning bid of the first auction would act as a minimum price in the second auction. The first tender was held in April 2000 and the license was won by Is-Tim, a consortium of Is Bank, a Turkish commercial bank, and the mobile phone arm of Telecom Italia, at an unexpectedly high price of 2.5 billion US dollars. Given the high starting price, no bidder participated in the second auction and the second license was not sold. The second highest bid in the first auction was 1.35 billion USD.

The Turkish GSM auction made it into the economics literature. Binmore and Klemperer (2001) presented it as an example of bad auction design because it allowed gaming. They, along with many observers in Turkey, argued that the winner of the first auction prevented entry into the second auction by bidding a price higher than what the license would be worth if the second license was also sold resulting in an additional player in the market, and therefore, higher competition. Other people argued that Is-Tim did not intend to act strategically and simply overestimated the value of the license. As a result, it is not even clear whether the government achieved its revenue objective.

The third license was sold to Turk Telekom at the same price paid by Is-Tim. Is-Tim started operations in March 2001 under the brand name Aria. Turk Telekom's subsidiary, Aycell, started

operations in December 2001.

	Phase I (Duopoly)							Phase II			
	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Subscription											
total number x 1,000	175	437	806	1,610	3,506	8,122	16,133	19,573	23,323	27,888	34,708
% change (prv. year)		150	84	100	118	132	99	21	19	20	24
per 100 inhabitants	0.3	0.7	1.3	2.6	5.5	12.6	24.7	28.6	33.5	39.4	48.0
Revenues											
total in million USD	61	143	302	622	417	2,304	3,485	2,850	2,816	3,656	4,765
per subscriber in USD	347	327	375	386	119	284	216	114	121	131	137

Table 1: Phase I and II– Basic Statistics for the Turkish Mobile Industry

Source: ITU

Table 1 shows the development of the market after new entry. Penetration rates have continued to increase, reaching 48% in 2004. Revenues, however, have shown a slower growth and revenues per subscriber have declined significantly. There are several reasons for this. First, Aria and Aycell entered the mobile market during a major macroeconomic crisis. As a result of financial crises in November 2000 and February 2001, gross domestic product declined by more than 9% in 2001. The impact of the crisis on the mobile industry was severe. Table 1 shows that total revenues in the mobile industry declined from 3.5 billion USD in 2000 to 2.8 billion 2001-2002. The second reason was heavy taxation. In addition to an 18% value added tax, the mobile industry suffers from a special consumption tax of 25%. This tax was initially intended as a temporary measure to meet the fiscal cost of a major earthquake that occurred in 1999, but has since then become permanent.

The significant decrease in per subscriber revenues from USD 216 in 2000 to USD 114 in 2001 can be attributed to the effect of entry.[7] However, this could also be partly explained by the increased proportion of pre-paid customers over time. Pre-paid subscriptions generally generate less revenue than post-paid subscribers, and proportion of pre-paid subscribers had increased from 44% in 2000 to 62.4% in 2001.[8]

[7] According to the OECD (2005) data, there was a downward trend in per subscriber revenues even before entry, from 1997 to 2001. This data also suggests a lower decrease -about 28% in per subscriber revenues right after entry (from 2000 to 2001).

[8] See OECD (2005).

Mobile Operators	Market Shares (%)											
	Phase I							Phase II				
	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Turkcell	78.0	68.0	80.0	76.9	68.5	69.2	69.0	67.0	67.3	67.9	67.0	63.0
Telsim	22.0	32.0	20.0	23.1	31.5	30.8	31.0	29.2	25.4	19.6	19.0	20.5
Aria	–	–	–	–	–	–	–	2.7	5.1	–	–	–
Aycell	–	–	–	–	–	–	–	1.1	2.1	–	–	–
Avea	–	–	–	–	–	–	–	–	–	12.5	14.0	16.5

Table 2: Mobile Operators' Market Shares

Source: 1994-2000: Turkiye Vakiflar Bankasi (2001)

2001: Turkcell Annual Report 2001 and www.interpro.com

2002-2003: www.hangioperator.com

2004: Is Investment (2005)

2005: www.internethaber.com

Table 2 provides data on market shares of the operators. The table shows that new entry did little to shake the dominance of Turkcell, whose market share remained at around 67% during 2001-2004. Telsim's market share declined from about 30% in 2001 to 20% in 2003-2005. The new entrants' total market share gradually increased from below 4% in 2001 to 16% in 2005.

3.3 The current state of the industry: 2+ 2 = 3

The government intended to support new entry by imposing roaming obligations on the IMNOs. Specifically, Law no. 4502 mandated that "mobile telecommunication, data operators or operators of other services and infrastructure as determined by the Authority are also required to satisfy reasonable, economically proportionate and technically feasible roaming requests of other operators." In addition, article 35 of the concession agreement between Is-Tim and the TA states that an operator may sign roaming agreements with other operators and requires the regulator "to provide a necessary, sufficient and fair competitive environment since Is-Tim entered the market."[9] It was

[9] Quoted in Dutz et al. (2003).

generally acknowledged in the industry that the Ministry of Transport had made a verbal promise to Is-Tim during the sale of the license that Is-Tim would have roaming rights.

For reasons that will be examined in detail below, to the apparent embarrassment of the Turkish authorities Is-Tim ended up not being able to obtain roaming services from either of the incumbent operators. In 2003 TIM threatened to withdraw from Turkey. In the end, Is-Tim and Aycell decided to merge to form TT&TIM, with TIM and Turk Telekom holding ownership of 40% each and Is-Bank holding the remaining 20%. Hence the number of operators in the industry was thereby reduced to 3.

The final important change in the industry occurred when Telsim was taken over by the Turkish Deposit Insurance Fund (TDIF). This happened because TDIF took over Imar Bank of the Uzan family that held majority share in Telsim. Telsim was subsequently bought by Vodafone.

4 Analysis

Following seven years of incumbency by Turkcell and Telsim, the effect of entry on enhancing competition was only mild. The new entrants, Aria and Aycell, together had a market share of 3.8% upon their year of entry, which only increased to 7.2% in the following year.[10] Eventually the entrants failed to survive as separate entities. As discussed below, the purchasing power parity (PPP) adjusted price comparisons suggest that Turkey was one of the most expensive countries among the OECD countries in 2004, almost a year after the end of Phase II.

Concentration indexes are often used as indicators of degree of competition. Although concentration indexes are higher in mobile telecom markets than markets with no significant entry barriers, they are meaningful for cross-country comparisons, as well as for within-country comparisons over time.

The concentration indexes, computed as Herfindahl-Hirschman Index (HHI), are suggestive of poor market performance for the post-entry Turkish mobile market.[11] By the end of the quadropoly period, in 2003, Turkey had the second highest market concentration index, 0.51, among the OECD countries that had four MNOs.[12] The concentration index in the Turkish mobile market in this

[10] Exact figures differ across sources. For example, according to Merrill Lynch (2004), the total market share of new entrants was 2% at the end of 2001, and 5% at the end of 2002 (see Table 107).

[11] One other criteria for the performance of mobile markets is the presence of virtual mobile operators (MVNO). Currently, there are no MVNOs in Turkey.

[12] HHIs are computed using OECD (2005) data on the market shares of MNOs (see p.46, Table 2.6).

year was even higher than all other OECD countries that had 3 operators.[13]

In fact, the concentration index in the Turkish mobile market with four MNOs, was comparable to those countries that had only two MNOs: Luxembourg, New Zealand, and Slovak Republic, with HHIs of 0.53, 0.50, and 0.51, respectively. Regardless of the number of active MNOs, the Turkish dominant operator, Turkcell, had the largest market share, 68.1%, compared to any dominant operator in the OECD countries (except in Mexico).[14]

New entry and competition was expected to increase the penetration rate significantly. Between the last year of Phase I (2001) and the last year of Phase II (2003), penetration rates increased from 22.3% to 39.4%. At first sight such an increase could be interpreted as a relatively significant positive effect of entry. However, one should note that the penetration rate after such an increase still stood as the second lowest among all OECD countries.

Reasons behind this disappointing outcome are suggested below.

Timing of entry has a significant impact on the competitive structure in the mobile telecoms market due to the first-mover advantage enjoyed by the IMNOs.[15] Gruber (1999) argues that the market shares of MNOs in Europe suggests the presence of a first-mover advantage. By the end of 1997, in countries like Denmark and Germany, where the GSM licenses were granted simultaneously, the operators typically had similar market shares, whereas in countries like Ireland, Italy and Spain, where there was a time lag between the first and the second entry, market shares showed large disparities in favor of the first entrant.

This paper claims that the degree first-mover advantage is likely to increase with the length of the incumbency period, and in the absence of proper regulatory policies, entrants are likely to fail to compete effectively with well-established incumbents. This is because a longer incumbency often implies larger asymmetries between the IMNOs and EMNOs in terms of i) geographical coverage, and ii) subscriber base upon entry, and both asymmetries feed the first-mover advantage of the IMNOs. The latter feeds the first-mover advantage, in particular in the absence of a sound interconnection regulation, since it allows for "tariff mediated" externalities through the large price dispersions in on-net and off-net calls. Last, but not least, the presence of switching costs tend to amplify the degree of first-mover advantage, which calls for a further caution for regulatory policies.

[13] Except for Iceland, which effectively had two MNOs, since the third MNO had only a 0.3% market share.

[14] The average market share of the largest MNOs in the OECD countries is 48.87%.

[15] Gruber (1999) states two main reasons as to why a first-mover advantage may arise in the telecoms markets. The incumbent operators usually get the best customer base, that is, the customers with the highest willingness to pay, and they also recover the capital costs of setting up their network more quickly than their followers. The former source of first-mover advantage suggests the existence of switching costs in the market.

The impact of first-mover advantage generated by sequential entry (albeit with a relatively short time lag) was clearly evident in the first phase. As discussed above, the fact that Telsim entered later than Turkcell and that its activities were subsequently suspended for about seven months helped Turkcell to establish and consolidate its dominance. The time lag between the entry of IMNOs and EMNOs, and hence its competitive impact, was much more dramatic. Because Turkcell already had a first-mover advantage over Telsim, and Telsim already had much lower market share, the delay mainly benefited Turkcell and Telsim did not have much of a first-mover advantage over the EMNOs. In what follows, the paper focuses on this second phase, and discusses the factors that affect consumers' subscription choice, which in turn affects the degree of competition. For each factor the paper also discusses the related regulatory policy that can help in moderating the first-mover advantage.

4.1 Geographical coverage and national roaming

Geographical coverage is one of the main determinants of quality of service in the mobile telecom markets. Consumers value larger geographical coverage, and all else being equal, prefer the MNO with the largest coverage. It is often not possible for firms to build a national coverage prior to the launch of their network services, and consumers' choice do not depend per se on the ownership of the infrastructure that conveys the service. Therefore, national roaming is a viable alternative for extending geographical coverage, and can be particularly vital during the initial phases of new entry, when EMNOs need to gain the critical mass to survive their business.

Although networks with symmetric-size coverages may voluntarily engage in roaming,[16] the IMNOs which already provide a national coverage may be reluctant to provide roaming services to EMNOs, which typically have small initial coverage. There are very few papers that formally analyse incentives for roaming. Valletti (2003) provides a model in which firms simultaneously set their coverage, then negotiate for roaming, and then compete with prices. He shows that in such a setting, firms do not have incentive to roam (unless they collude on prices), as they enjoy a softer competition with different network coverages, which constitute a quality variable. If firms can collude in prices, however, they can avoid expensive duplication of networks, and count on the roaming agreements to provide services in the non-covered areas. While his model gives some good insights for simultaneous network roll out, one needs a different setting to analyze sequential entry,

[16] Indeed, in Turkey, the two IMNOs, Turkcell and Telsim, relied on voluntary roaming agreements over the course of their network expansion.

where IMNOs have already built their network and reputation, locked-in some customers, and face smaller EMNOs for competition. In such a case, IMNOs are likely to deny roaming, in particular, if EMNOs will find it difficult to reach the critical subscriber base in the absence of roaming.

Foros et al. (2002) consider two symmetric sized MNOs, and show how incentives of firms with respect to quality of roaming may differ depending on whether the firms collude in the investment stage or not. They show that if firms set their investments cooperatively, the equilibrium quality of roaming coincides with the social optimum (which is not the case when firms invest non-cooperatively). They also extend their model to analyze roaming incentives in the presence of a mobile virtual network operator (MVNO).[17] They show that in the presence of a MVNO, there is a little scope for regulating quality of roaming both under cooperative and non-cooperative investments.

Although the nature of roaming agreements between MNOs is different than the access agreements that take place between MVNOs and MNOs,[18] conditions under which voluntary access may emerge might be common in both cases.

Bourreau et al. (2006) state the following reasons for MNOs granting an access to MVNOs on voluntary basis: using spare wholesale capacity, generating additional wholesale revenues, and addressing market niches that the existing MNOs do not reach very effectively. Authors develop a model in which vertically integrated firms (MNOs) interact on an upstream market to provide wholesale services to downstream competitors (MVNOs). They show that MNOs are willing to contract with MVNOs not only because it generates additional wholesale revenues, but also because it contributes to moderating competition on the retail market. They also show that MNOs might have strong incentives to coordinate on a quasi-collusive equilibrium, in which the wholesale prices are high.

According to Dewenter and Haucap (2006) incentives of MNOs to open their networks mainly depend on the mode of competition and the degree of product differentiation. Drawing on a static competition model, authors argue that MNOs will be likely to provide network access voluntarily if the services offered by MVNOs are sufficiently differentiated, so that benefits through access revenues outweigh the competition effects. They also show that incentives to grant an access to

[17] The authors' definition of roaming is a broad one and includes granting access to the MVNO. More importantly, they assume away any side payments between the operators that engage in roaming.

[18] Technically roaming is a capacity sharing agreement that requires a two-way access between the operators. Differently, the nature of the access problem between the MVNOs and MNOs is one-way, and for that matter resembles more the one-way access problem in the fixed line telecom markets (e.g., through local loop unbundling).

MVNOs are greater under Cournot competition than under Bertrand competition, since industry profits are less sensitive to the degree of differentiation under the former.

Then, the question is whether regulators should oblige the IMNOs to roam with smaller EMNOs. As stated in the Intug position paper on National Roaming (2003), imposition of national roaming may play an important role in ensuring effective market entry for operators, and can also improve MNOs' services in rural and remote areas. Requiring second generation operators to provide roaming services to second generation operators ("2G/2G roaming") has not been a widely used policy. In Europe, under the 1998 framework (that is, before countries started to adopt the 2003 EU regulatory framework for electronic communications) the only countries that imposed mandatory roaming obligations were Denmark, Greece, Italy, and Norway.[19] Of these, Greece still has mandatory statutory roaming obligations on all operators. Under the 2003 framework, roaming obligations can only be imposed as part of remedies on operators that have significant market power (SMP) in the market "for access and call origination on mobile telephone networks", that is, market 15 as identified in the European Commission Recommendation on Relevant Markets. as of fall 2006, the only countries that have identified 2G/2G roaming obligations as one of the remedies that can be imposed on MNOs in market 15 are Denmark, Norway, Spain and Sweden. However, as a result of market analyses, Denmark and Sweden have decided that there is effective competition in their relevant market, which means that no obligations can be imposed on any of the operators. Hence in Western Europe, 2G/2G roaming obligations can be imposed only in Greece, Norway and Spain. However, regulators have been more willing to require 2G operators to provide roaming services to operators that have licenses for third generation mobile services ("2G/3G roaming"). In fact, all countries in Western Europe (except Germany and Netherlands) do have such obligations.[20]

Once the IMNOs roll out their networks, imposing roaming obligations on IMNOs upon entry can be procompetitive, that is roaming may enhance competition ex post.[21] This is true in particular, if the same competitive outcome can not be reached in the absence of mandatory roaming, in a reasonable time frame. However, mandatory roaming is also likely to reduce EMNOs' incentives to

[19] The information on roaming policies presented in this paragraph are taken from Cullen International, Western Europe Cross Country Analysis; available at www.cullen-international.com.

[20] By an interesting contrast, none of the new members of the European Union countries have any 2G/3G roaming obligations.

[21] One should note that mandatory roaming may reduce IMNOs' ex ante incentives to invest in infrastructure. However, this paper does not focus on ex ante incentives here, as in Turkey, by the time the EMNOs were granted the licenses, both IMNOs had almost full national coverage networks.

build their infrastructure, which is the reason why roaming obligations are often complemented with a sunset clause. In Turkey, the entrants' license conditions explicitly required them to carry out sufficient investments in infrastructure so as to reach a coverage ratio[22] of 50% in 3 years and 90% in 5 years. Hence, the roaming obligations imposed on the IMNOs were considered as a temporary remedy to facilitate entry and expansion of the EMNOs' subscriber base. Since the incumbency period was quite long, and the IMNOs had almost a full national coverage at the timing of the entry, imposition of national roaming had a great potential to stimulate competition.

As recounted in Annex 1,[23] the distinct feature of the Turkish experience is that the authorities did impose national roaming obligations but failed to enforce it. The concession agreements that were granted to the IMNOs in 1998 did not mention any roaming obligations. However, Law No. 4502 and ensuing secondary legislation authorized the TA to impose roaming obligations on mobile operators, exercise dispute resolution, and, ultimately, to set the terms and conditions of an agreement in case parties failed to reach an agreement by themselves (which the TA did). However, IMNOs challenged the decisions of the TA both at the civil and administrative courts and were able to obtain injunctions against the terms and conditions determined by the TA. IMNOs also applied for international arbitration. Ironically, both the IMNO and the EMNO filed a lawsuit against the TA at the International Court of Arbitration of the International Chamber of Commerce, the former for the imposition of roaming, and the latter for not having it. In the end, the roaming issue was resolved in 2004 when the two EMNOs merged and dropped roaming requests. In the meantime, the International Court of Arbitration rejected Turkcell and Telsim's claims.

Note that to be effective, roaming policy had to be implemented without delay, especially given the sunset clauses in the entrants' licenses. The delays generated through the legal challenges basically reduced or even eliminated any additional effect roaming policy could have had on the development competition. Since the details of the TA's proposed terms and conditions are not public, it is not possible to evaluate whether the TA could have been more effective in dispute resolution (whether, for example, these conditions imposed excessive costs on the IMNOs). There is general agreement, however, that IMNOs would have been less successful in delaying implementation if the legal environment was more cohesive, and had more expertise in dealing with issues related to telecommunications regulation and competition. In particular, it is generally accepted that in Turkey a civil court should not have adjudicated administrative decisions. One important remedy

[22] This is defined as the ratio of population that would have access to mobile services.

[23] Annexes to this paper are available upon request from the authors.

in that respect is to make the Council of State, the high administrative court, the body for appeals against TA decisions, rather than lower level administrative courts (which is currently the case) and to endow them with sufficient expertise. Still, some residual legal uncertainty is often sufficient to provide opportunities for legal challenges, which are in turn sufficient to generate delay. As argued in Annex 1 in some more detail, the best way to eliminate legal uncertainty with respect to roaming was to have included roaming obligations explicitly in the IMNOs licenses when they were issued in back in 1998. Such foresight would have eliminated all grounds for frivolous legal challenges and also absolved the authorities from having to impose what could be construed as costs on IMNOs that were not part of the original bargain.

4.2 Tariff-mediated externalities: regulation of interconnection and price competition

The cost of a mobile call is generally thought to entail three components: call origination, call transmission and call termination. In countries where the "calling party pays" principle holds, the MNO that originates a call that terminates in a rival's network (off-net call) pays a termination charge to that network. The physical cost of originating and terminating a call is considered to be not too different. However, the actual cost of an off-net call to the originating MNO depends on the terminating charge that the originating MNO pays to the terminating MNO. Hence, the call termination charge is an important determinant of the cost, end therefore the retail tariff of off-net calls.

When MNOs are allowed to set retail tariffs that discriminate between calls on-net calls (i.e. calls terminating on their own networks) and off-net calls, they may set high termination charges thereby increasing the cost of off-net calls relative to on-net calls. This, in turn induces MNOs to set their the retail off-net tariffs higher than retail on-net tariffs. This creates a "tariff mediated externality" in the sense that consumers are better off if the people they want to call are in the same network. Everything else equal, this makes MNOs with larger subscriber base more attractive. This not only makes switching from IMNOs to EMNOs less desirable, but also attracts non-attached customers towards IMNOs. Therefore, by setting call termination charges at a high level, IMNOs can make it difficult for new entrants to expand their subscriber base and acquire market share.

This has indeed been the case in the Turkish mobile market; an important commonality in different package options that are provided by the Turkish IMNOs has been the disparity in the per

minute prices of on-net and off-net calls (see for example, Annex Table A.3.1 for Turkcell tariffs).[24] The asymmetry in the MNOs subscriber bases, therefore, has been generating a tariff-mediated externality in favor of the IMNOs that have larger subscriber bases. Competitive response from the EMNOs to the tariff-mediated externalities has been to charge a uniform price for on-net and off-net calls. However, such a response has a potential to eliminate the subscriber base disadvantage of the EMNOs only to the extent that they can offer comparable off-net prices to the IMNOs' on-net prices. The EMNOs' ability to offer such prices, in turn, depend on the termination call charge they have to pay to the designated MNO. As argued below, this ability was seriously hampered by high termination charges.

In most countries termination tariffs that incumbent fixed operators can charge on calls terminating in their networks are regulated, often set equal to some estimate of costs. There seems to be an overall agreement that under these circumstances mobile operators have incentives to set suboptimal termination charges on fixed-to-mobile (FTM) calls.[25] There seems to be less agreement on the economics of termination of mobile-to-mobile (MTM) calls and the appropriate regulatory remedies, if any. Concerns about excessive termination charges have led regulators in many countries also to intervene in the determination of MTM termination charges (or, at least, not to treat them differently from FTM termination charges).[26]

Implications of MNOs' ability to discriminate between on-net and off-net calls has created some debate in the academic literature. Laffont, Rey and Tirole (1988) suggested when MNOs compete for subscribers through two-part tariffs and can discriminate between on-net and off-net calls, they would agree to set reciprocal access charges equal to costs. In Gans and King (2001), MNOs set

[24] Currently (May 2006), Turkcell provides a plan in which per minute off-net calls (to other MNOs) are priced more than double of the in-net prices. Similarly, Telsim provides a plan in which per minute off-net calls are priced almost triple of the on-net calls. However, the rates they provide for fixed-line calls are the same as on-net calls. This can be explained by the fact that in Turkey, fixed and mobile networks are usually as perceived as complements, and that the substantial part of the competition in telecoms takes place between MNOs. By charging the on-net price to fixed line calls, IMNOs appeal to the customers. Turkcell also provides a package called "Uniform price," with which it offers a single price regardless of the call termination. As one can expect, per minute prices are higher than on-net calls in other packages and, the monthly fixed fee is four times higher than its standard package.

[25] See, for example, Rey and Jullien (2004): "It is generally accepted that mobile operators have a joint interest in increasing fixed to mobile (F2M) termination rates, so as to extract revenue from the fixed line operator(s)." In reality, rerouting of calls through GSM gateways constrains the degree to which charges for FTM calls can deviate from those of on-net MTM calls. This, in turn, constrains MNOs' ability to raise FTM termination above costs. The authors thank an anonynmous referee for bringing up the possibility of rerouting arbitrage.

[26] As of August 2006, most countries in Western Europe had imposed some sort of controls on mobile termination rates such as transparency, non-discrimination and cost orientation. Some (including Austria, Belgium, Denmark, France, Greece, Italy, Lithuania, Netherlands, Norway, Portugal, Spain, Sweden, UK) had imposed explicit "glide paths" to reduce MTRs over specified period of time (Cullen International, Western Europe Cross Country Analysis, available at www.cullen-international.com). In all Western European countries but Finland MTM and FTM termination charges are equal.

reciprocal access charges below cost to dampen competition for subscribers. Hence, in their model, MTM termination charges are actually "too low."[27] However, this prediction is not supported by cross-country evidence: Most such evidence suggests that MTM termination charges are high relative to costs. It was in fact this evidence that prompted regulators to regulate MTM charges in the first place.

The Turkish case suggests that the interesting dimension of tariff-mediated network externalities may be the role they may play in hindering entry. The issue of entry was examined in section 6 of Laffont, Rey and Tirole (1988). They examine a market where the incumbent has full coverage and a new entrant chooses its coverage and incurs an investment cost. They show that if the entrants' planned coverage is small enough, then an incumbent can blockade entry. Calzada and Valletti (2005) show that under the threat of entry, assuming that the terms of interconnection cannot discriminate between incumbents and entrants, IMNOs setting reciprocal MTM termination charges may be induced to distort termination charges upwards. Under the threat of entry, incumbents face a trade-off. On the one hand, ex-post competition pushes them to set termination charges at or below cost. However, ex-ante, that increases the attractiveness of new entry. For some values of entry costs, IMNOs may prefer to deter entry by setting MTM charges above cost. Gabrielsen and Vagstad (2005) also present a model where high termination charges may act as a barrier to entry. In their model, incumbents may set terminating charges above cost even in the absence of entry threats. When entry is possible, high termination charges can be used to deter or limit entry. Two assumptions drive their results: exogenous switching costs and the existence of calling clubs, that is, groups of people that have a bias towards calling each other, creating unbalances in calling patterns. It will be argued below that the behavior of the incumbents in the Turkish mobile market is broadly consistent with the predictions of these models.

The interconnection regime Since the ultimate cause of tariff mediated externalities are above-cost MTM termination charges, the analysis now shifts to the interconnection regime in Turkey and the determination of MTM charges. When Turkcell and Telsim obtained their GSM licenses in 1998, they signed interconnection agreements with Turk Telekom and among themselves. In these agreements, termination charges for MTM (and MTF) calls were set at 1.4 cents/min.[28] The

[27] Calzada and Valletti (2005) show that this result is sensitive to modelling assumptions: When operators compete in utilities rather than prices, then termination rates are set equal to costs.

[28] In the case of MTF calls, this was true for "within area" calls whereas termination charge for "outside area" calls was set at 2.5 cents/min. The terms “within area” and “outside area” refer to the level at which calls are handed over

termination charge remained at that level until March 2001, when, just before Aria and Aycell entered the market, Turkcell and Telsim renewed their interconnection agreement and increased the terminating charges to 20 cents/min. The new entrants signed interconnection agreements among themselves and with the incumbents at 20 cent/min as well. This level was in line with developments in Europe. According to the European Commission (2003, Figure 21), the weighted average of mobile call termination charges for SMP operators was 20.5 Eurocents in 2001 and 18.8 in 2002.[29]

In view of the fact that high termination rates may create disadvantages for new entrants in the mobile market, one could have expected that Aria and Aycell seek lower charges and ask for the TA's intervention if necessary. Even though at the time the TA had not yet issued a regulation on interconnection, Law No. 4502 did endow it with the power to intervene and if necessary impose the terms of an agreement if parties in an interconnection negotiation did not reach an agreement. Aria or Aycell did not file a formal application. One possible explanation is that the new entrants thought high termination rates could generate high revenues from calls originating from rival networks.[30] In hindsight, it seems that Aria overlooked the potential deterrent effect of tariff mediated network externalities on its ability to acquire new subscriptions.

Another issue raised by the Turkish case is the welfare implications of asymmetries in the termination charges of different mobile operators. In a model of competition between a "strong" and a "weak" operator,[31] and where operators discriminate between on-net and off-net calls, Peitz (2005) shows that allowing a termination mark-up to the weak operator, while the termination charge of the strong operator is regulated at cost, improves consumer welfare and the weak operator's profits. However, the reduction in the strong operator's profits is even larger so that total welfare declines.

The tendency of the TA has also been to introduce asymmetries in the mobile termination charges. In May 2003 the TA issued an Ordinance on Access and Interconnection. The Ordinance reiterated the TA's role of dispute resolution in case parties failed to reach interconnection agreements and it also required that existing interconnection agreements be renewed. In June 2003 the

to the fixed network. This two-way classification is different from the classification employed in most of Europe (as well as European Commission documents), namely local, single transit and double transit. Roughly, "within area" interconnection lies between local and single transit. Similarly, "outside area" refers to an interconnection level that lies between single and double transit. Termination charges for FTM calls were calculated through a complicated formula that eventually caused a legal battle between TTAS and the mobile operators.

[29] The table reports fixed-to-mobile termination charges but also notes that except for a few cases rates do not differ according to the nature of the network that the call originates from.

[30] This was suggested by a former official of Aria in personal communication.

[31] A strong operator is distinguished from a weak operator by the fact that at symmetric prices, subscribers obtain higher utility from consuming the services of the strong operator.

TA issued a "Communiqué on Principles Regarding the Determination of Operators with Significant Market Power" (SMP). Soon after, TA designated Turkcell as having SMP in the market for mobile telecommunications services and both Turkcell and Telsim in the "mobile call termination market."

This time the mobile operators could not reach an agreement. The TA intervened and in October 2003 set the termination rates at 233 750 TL (about 14 eurocents/min, see Table 3) for calls from Turkcell and Telsim to Aycell and Avea and at 178 750 TL (about 11 Eurocents/min) for calls from the new entrants to incumbents. Hence termination charges for SMP and non-SMP operators were not symmetric. In the European Union, in July 2003, the weighted average of mobile termination charges was 13.7 eurocents/min for SMP operators, and about 16.4 eurocents/min for non-SMP operators (European Commission 2004, Figure 32). Hence the charges determined by the TA were somewhat lower than those in Europe.

		Eurocent per minute charges for call termination		
		Actual	SIRT (see Annex 1 Table)	EU averages (July 2003)
Fixed-to-Mobile(†)		13.5*	8.3 (SMP opr.)	13.7 (SMP opr.) 16.4 (non-SMP opr.)
Mobile-to-Fixed(†)	within area	4.5	2.2	0.97 (single tandem)
	outside area	3.2	3.2	1.67 (double tandem)
Mobile-to-Mobile(‡)	IMNOs	10.9	8.3 (SMP opr.)	13.7
	EMNOs	14.3	–	16.4

Table 3: Call termination charges (2003 – 2004)

Source: Compiled from Kibar (2005) and European Commission (2004)

(∗) Except for Aria. The charge was 18 Eurocents for Aria.

(†) Interconnection agreements between TT and MNOs, September 2003

(‡) TA Decision, October 2003, rates to be CPI adjusted every 3 months

The interconnection arrangement between Turk Telekom and the mobile operators also changed in 2003. In the renewed agreement, Turk Telekom's termination charge was set at 3.2 and 4.5 cents and that of the fixed-to-mobile calls at 13.5 Eurocents (see Table 3). Relative to the European practice, this meant that the new arrangement put the mobile operators at a serious disadvantage: The MTF termination charge was much higher than the European average of about 0.9 and 1.5

eurocents for single and double tandem interconnection charges, respectively. By contrast, the FTM charge is somewhat below average. Why did the mobile operators accept this arrangement? Kibar (2005) referes to an earlier Council of State decision mandating that FTM and MTF charges be symmetric, and suggests that the mobile operators were worried that any disruption in the negotiation might lead to intervention by the administrative courts and result in symmetric charges.

In October 2004, the TA announced a Standard Interconnection Reference Tariff (SIRT). Tariffs identified in the SIRT for 2004 are listed in column 3 of Table 3 (see Annex 2 for details). These charges reflect an important difference in the TA's approach to interconnection in the fixed and mobile markets. The table shows that call origination and call termination charges specified for Turk Telekom in Turkey are clearly higher those in the European Union. By contrast, the call termination on SMP mobile operators are significantly lower than those in the European Union. For example, the 7.5% envisaged for after October 2005 would be among the lowest rates in Europe (actually the third lowest, according to European Commission, 2006, Figure 32).

It is evident from this discussion that the regulator's attitude towards developing competition in the fixed and mobile markets was not the same. With respect to interconnection between TTAS and GSM operators with SMP, the TA seems to have taken an approach that is more protective of the interests of fixed incumbent operator, at least if one takes the European Union as a benchmark. With respect to incumbents versus new entrants in the mobile industry, TA is tougher towards the IMNOs relative to the practice in Europe. However, until 2003 EMNOs did not seek intervention of the TA and accepted the high MTM charges offered by the IMNOs. This created a wedge between the costs of on-net and off-net calls and generated tariff mediated mediated network externalities. As discussed next, this limited EMNOs' ability to compete with IMNOs.

Price competition The analysis now focuses on the pricing behavior of the IMNOs and the EMNOs. There were two trends that need to be underlined (a more detailed discussion and data can be found in Annex 3). The first was that the evolution of price competition was significantly influenced by the interconnection regime. Second, while new entry did have a competitive effect on prices, it seems the impact was more limited than what was initially envisaged.

Right after the increase in the interconnection charges from 1.4 to 20 US cents/min, and right before Aria's entry, Turkcell launched a new calling package called Biz Bize Cell, where the monthly fixed fee was reduced from about 2.5 to 1 Euro, and per-minute charges for on-net calls were reduced from about 22 to 11 eurocents, while per-minute charges for off-net calls were increased from about

29 to 34 Eurocents (see Annex 3, Table A.3.1). On-net charges remained at about 11-13 eurocents until early 2002, after which they increased to 14-17 eurocents.

At the time of entry, Aria's on-net charges were substantially higher than those of Turkcell (about 32 eurocents in March, steadily declining to 20-21 eurocents by the end of 2001, largely due to the depreciation of the Turkish Lira). While on-net and off-net prices were equal, on net calls were offered a discount after a total of 55 minutes per month. In December 2002 Aria launched a new campaign reducing the charges for both types of calls to an extreme low of 7-8 eurocents per min. For off-net calls this meant that Aria was making a loss, since the tariff was below the termination charge Aria had to pay to its rivals. This lasted only a few months, after which charges for off-net calls were raised to over 35 eurocents. After the merger, Avea had two basic packages: a package that did not discriminate between on-net and off-net calls and another that did. Overall, (as reflected in Figure 2 below), Avea tariffs were about 25-35% lower than those of Turkcell (see Annex 3 for details).[32]

Some evidence for the path of call charges are displayed in Figure 2 and 3.[33] Making sense out of operators' published tariffs is difficult because of the range of different packages they offer and existence of nonlinearities due to fixed fees, discounts etc. The analysis attempts to focus on cheapest packages offered by the operators, and those designed for consumers rather than businesses. Figure 2 compares per-minute prices of the dominant incumbent, Turkcell, and the new entrant Aria (and Avea, once Aria and Aycell merged). Figure 2 shows that Turkcell's tariffs for on-net calls declined compared to the pre-entry period and, overall, those for off-net calls increased. Aria provided non-discriminatory charges until early 2003. The figure also shows that Aria/Avea off-net tariffs and on-net tariffs were the respective of Turkcell tariffs, but, Aria *off-net* tariffs were significantly *higher* than Turkcell *on-net* tariffs. Because of Aria's much smaller subscriber base, consumers are likely to compare Aria off-net tariffs with Turkcell on-net tariffs.

[Insert Figure 2 here]

[32] Telsim's response to new entry was similar to that of Turkcell. In fact, the first package that Telsim launched in the face of new entry (Cep-Transfer) was exactly the same (in TL) of that of Turkcell's new package. Telsim tariffs remained very close to those of Turkcell throughout 2001. The tariffs in the later years were overall similar to that of Turkcell, except that Telsim generally offered a richer menu of non-linear tariffs with different mixes of fixed fees and per-minute charges. Also Telsim introduced a non-discriminatory package earlier than Turkcell.

[33] In the second half of November 2000 Turkey experienced a financial turmoil, which was followed by the collapse of the exchange rate in February 23, 2001. The value of Euro almost doubled from November 2000 to April 2001. Therefore, the sharp drop in Euro prices from November 2000 to April 2001 in Figure 3 (from Euro 35.36 to Euro 16.08) was in large part due to the depreciation of TL. The price decrease was only 17% in TL terms (from TL 20.8 million to TL 17.3 million).

The information revealed by Figure 2 may be misleading if read in isolation because of nonlinearities. One usually tries to get around this by defining a basket of calls and calculate its cost, assuming that the basket reflects the consumption pattern of an average consumer of the operator. This is done in Figure 3 where the basket is defined as 100 calls (per month), each 3 minutes long. It is further assumed that for each operator, the ratio of on-net calls is equal to its market share. The figure shows that initially calls from Aria were much more expensive than those from Turkcell, but eventually they became cheaper. Note that the comparison is sensitive to the size of the basket: With a smaller number of calls, effect of the Aria discount (for calls after the first 55 minutes) would have been diminished and the Aria package may become more expensive.

[Insert Figure 3 here]

As it can be seen from the discussion above, Aria's interconnection agreements and the high call termination charges that they entailed seriously constrained Aria's ability to compete with the incumbent through tariffs. Due to the tariff mediated externalities, the relevant price comparison from the consumers' perspective was the one between on-net prices of Turkcell (the large IMNO) and the off-net prices of Aria (the small EMNO). But the degree to which Aria could lower its off-net prices was limited by the high termination charges. In addition to the interconnection regime, it seems that Aria's inability to more rapidly expand its subscriber base can also be partly explained by its own strategic mistakes, both in pricing (which seems overly non-aggressive especially in the first year after entry) and in negotiating termination charges.

Finally, almost a year after the end of Phase II, Turkish mobile market stood as one of the most expensive among the OECD in terms of mobile telecommunication prices. The data used for this comparison is provided by OECD (2005). OECD defines three baskets, low usage, medium usage, and high usage, to compare mobile communication prices.[34] The comparisons use the least expensive offers made by the largest operator (in terms of market share) in each country, measured in USD, using PPP for 2004.

2003 was the last year of Phase II, during which four MNOs were active in the Turkish mobile market. In this year, Turkcell, which is the largest operator in Turkey had the highest PPP adjusted price for the low usage basket, USD 279.77, among all OECD countries (the OECD average was

[34] See p.173 of OECD (2005) for the detailed description of those baskets.

USD 203.88). For both medium and high usage baskets, Turkcell has the third highest PPP adjusted prices with USD 909.43 and USD 1766.93, respectively, among the OECD countries in August 2004 (the OECD averages for medium and high usage baskets were USD 556.40 and USD 964.10, respectively).

4.3 Switching costs and number portability

Presence and magnitude of switching costs affect decisions of both attached and non-attached customers. Attached customers (to the incumbent network) may be reluctant to switch to the entrant's network in the presence of high switching costs, even if the latter provides more attractive terms. However, switching costs also affect the choice of the non-attached new customers. Consider a non-attached customer who is about to subscribe either to network A or network B, and assume that currently network A offers more attractive terms overall. In the absence of switching costs, the customer would subscribe to network A, since she can easily switch to network B, if the relative terms change in favor of the latter in the *future*. Therefore, the customer bases her decision only on the *current* factors. However, in the presence of significant switching costs, consumers' *expectations* on the relevant factors (e.g., future installed base of the network, future tariffs) plays an important role. In that sense, a current and a significant asymmetry in the subscriber bases is likely to favor the larger MNO.

It already has been stated that switching may not be desirable from a large network to a smaller one when there are network effects (in particular, tariff mediated network effects). However, switching to a different mobile operator may not be desirable even in the *absence* of any network effects.[35] As listed by Shy (2002), there are at least there sources of switching costs in the mobile telecoms,[36] i) incompatible standards, ii) number (non) portability, and iii) penalties due to (early) termination of subscription.

The first type of switching cost, which arises when operators have different standards so that consumers need to purchase new equipment upon switching providers, did not exist at the period of new entry.[37] There are (and were) no substantial penalties for early termination of subscription

[35] Farrell and Klemperer (2004) argue that switching-costs markets can tip like network effect markets. If, for example, a larger firm has lower marginal cost, so that it may charge a lower price than its smaller rivals, this advantage (even initially small) can be magnified and the positive feedback dynamics can result in complete dominance by the large firm.

[36] See Shy (2002); the author provides a method with which unobserved switching costs can be calculated from observed prices and market sizes, and applies it to estimate the switching cost between two incumbent operators, Pelephone to Cellcom, in the Israili mobile telecom market.

[37] As mentioned earlier, during Phase I, Turkcell engaged in exclusive dealing agreements with equipment manu-

by either of the Turkish mobile operators, and hence, number non-portability seems to be the most important source of a switching cost in the Turkish mobile market.[38]

The TA included number portability into its work plan of 2004 and originally envisaged that it would be implemented by October 2005. This deadline has been shifted a few times and, as of November 2006, it has not yet been implemented.[39] The absence of number portability seems to be the most glaring regulatory failure.

5 Concluding Remarks

Turkey was a late starter in telecommunications liberalization. Competition in fixed line markets was put on hold for a long time. Even though Turkey has had a longer experience with some degree of competition in the mobile industry, it has been impossible to challenge the stronghold of the dominant operator.

The attitude of both the Ministry and the regulatory authority towards the mobile industry favored the new entrants, as reflected in both the roaming and interconnection policies. There were possibly two political-economy reasons for this. The first had to do with the fact that the fixed incumbent operator, Turk Telekom, was a new entrant in the mobile market. It is generally believed that Turk Telekom had significant influence on the Ministry. The second had to do with the fact that TIM represented till then the largest foreign direct investment in Turkey. Interestingly, the authorities also had proper legal bases for both the roaming and interconnection policies.

The most important policy lesson that can be drawn from the Turkish experience is that in an industry like mobile communications where network externalities and switching costs are important, delaying new entry creates first-mover advantages for incumbents which may be difficult to reverse. The Turkish authorities waited for too long before issuing new licenses. Promoting simultaneous rather hen sequential entry is more likely to generate a competitive environment. The big advantage of simultaneous over sequential entry is that competition is initiated on a level playing field, before tariff mediated network externalities and switching costs take hold.

Given that new entry was delayed, the authorities used both roaming and interconnection policies as remedies to enhance competition. Imposition of roaming obligations on the incumbents

facturers, which did create switching cost, as consumers who were to switch from Turkcell to Telsim had to buy a new equipment.

[38] See Buehlera et al. (2006) for the competitive effects of number portability in the European mobile markets.

[39] Recently the President of the TA has announced that work on number portability was nearing completion and the policy would be implemented by the end of 2006 (The daily *Hurriyet*, August 22, 2006).

proved ineffective and the IMNOs were able to use the legal system to prevent rapid implementation. The roaming experience underlines two important lessons: The more obvious is the importance of foresight. Roaming policy would have been successful if it was imposed not as an afterthought but included in the original concession agreements of the IMNOs. That would have greatly reduced and even eliminated any future legal uncertainty by obviating the necessity to what amounts to renegotiating the original bargain. Hence, to the extent possible, remedies such as mandatory roaming should be included in the original licenses to minimize future legal uncertainty. The second is the importance of the level of expertise and cohesiveness of the overall legal environment. Having the correct regulations is not sufficient if the legal environment allows opportunistic behavior, loopholes and challenges. As discussed above, one way to improve the legal environment is to ensure that appeal bodies have sufficient expertise. In the Turkish case, this would mean that the Council of State should be the sole appeal body and should be endowed by sufficient expertise.

Regarding interconnection policy, this paper has argued that the TA's attitude was pro-competitive, at least as far as MTM termination charges were concerned and in comparison to contemporary policy in Europe. The reason interconnection policy proved ineffective in the initial years of new entry in compensating for tariff-mediated network externalities was that EMNOs accepted the interconnection offer proposed by the IMNOs rather than seek lower rates or apply for dispute resolution. It seems clear that this was a mistaken strategy and did not serve EMNOs own interests. The question then arises whether this mistake could have been prevented by regulatory intervention. For example, one alternative approach, at least for the initial years, could have been a more heavy-handed regulation where the regulator would intervene not only in case there is a dispute, but by setting charges directly. In hindsight, such an on-hands attitude could have worked better for the EMNOs. At the same time, such an approach would have been against the main international tendency, which was (and still is) in the direction of more light-handed regulation. Also, it is debatable whether a regulatory authority ought to seek to correct possible mistakes by private corporations. A better approach could be for the regulator to adopt a more active communications policy, that is, provide better guidance and reveal more clearly its views and expectations on how competition may develop in the industry and where main hindrances may lie.

It has been argued above that switching costs are an important characteristic of mobile markets. Given the fact that switching costs increase the value of first mover advantages, and given the long delay in allowing new entry, number portability should have been an integral part of measures to enhance competition. This remedy has not been adopted and needs to be adopted in the future.

Given the strategy of sequential entry, the Turkish authorities tried to use correct remedies to promote competition in the mobile telecommunications industry, with the exception of failure to introduce number portability. In hindsight, however, sequential entry was the original sin and remedies proved insufficient to reverse the first mover advantages.

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NOTE: Annex will be available upon request.

Annex 1. The inability of Turkish Authorities to enforce national roaming policy

Upon acquiring its entry license, Is-Tim held negotiations for roaming with the IMNOs between November 2000 and March 2001 but no agreements were reached. Following an application by Is-Tim for dispute resolution, the TA told the parties in May 2001 to reach an agreement within 4 weeks or else the TA was going to determine the terms and conditions of an agreement. The parties failed again and in October 2001, and as required by Law No. 4502, the TA determined the terms and conditions of the roaming agreement and asked the parties to accept these terms or else reach an agreement on their own terms by November 2001. Is-Tim announced that it accepted the terms and conditions determined by the TA. Turkcell and Telsim filed applications with the court and obtained preliminary injunction decisions on the terms and conditions determined by the TA. Turkcell then applied for international arbitration at the International Chamber of Commerce's (ICC) International Court of Arbitration with the request that Turkcell had no obligation to sign a roaming agreement with the terms and conditions determined by the TA. Telsim also applied for international arbitration. In March 2002 the TA issued the Ordinance on Principles and Procedures for Making Roaming Agreements and asked again Turkcell to sign a roaming agreement with Is-Tim in 30 days. Turkcell again obtained injunctions and applied for international arbitration for a second time.

In March 2003 Is-Tim filed a lawsuit with the ICC against the TA asking for about 3 billion USD in damages because promised roaming services had not been made available. The CEO of TIM was quoted as saying that if the regulatory framework regarding roaming remains as it is, TIM might consider withdrawing from Turkey. The lawsuit was subsequently withdrawn when, following negotiations between the Italian Prime Minister Berlusconi and the Turkish Prime Minister Erdogan, in June 2003 it was announced that Is-Tim and Aycell would merge to form TT&TIM. TT&TIM was formally established in February 2004; in June 2004 the company created Avea, a new brand name under which services would be provided.In the meantime, the International Court of Arbitration rejected all of Turkcell's and Telsim's applications.

If roaming policy was going to be of any use at all it had to be implemented fast, especially since EMNOs' concession agreements required them to roll out their own networks (so as to reach a

coverage ratio of 50% in three years and 90% in 5 years). Delays in implementation meant that the IMNOs could further reinforce their first mover advantages by fiurther expanding their subscriber base, before new entry couldpose a threat. Hence, any delays that IMNOs could generate though legal challenges greatly reduced any additional effect roaming could have had in developing effective competition. Two factors help explain why IMNOs were successful in delaying enforcement. The first factor is lack of cohesion, consistency and expertise/experience in the legal system. In hindsight, it was the civil courts' injunctions against TA's decisions regarding the roaming dispute that played a critical role in delays. Application for international arbitration alone would not have resulted in delays, as they would not have prevented the TA from executing its decisions. It is generally agreed in Turkey that a civil court does not have the authority to adjudicate administrative acts and therefore should not have issued injunctions against TA's decisions on roaming disputes. Given time, this decision of the civil court *would* have been corrected through the appeals process but by that time the economic effect of roaming policy would have been reduced to nil. Consequently, the second, and more important, factor behind the inability to enforce roaming policy was a lack of foresight. Roaming obligations should have been included in the original concessions granted to Turkcell and Telsim in 1998.[40] Such a remedy would have greatly reduced subsequent legal uncertainty and would have prevented future opportunistic behavior by the IMNOs. Furthermore, IMNOs saw the imposition of roaming obligations only two years after obtaining concession contracts as an extra cost and not as part of the original bargain (if anything, they possibly saw it as a violation of the original bargain), and felt justified in delaying implementation through any means available.

The Competition Authority got involved in the roaming issue as well. Is-Tim filed a complaint with the Competition Authority in December 2001 claiming that Turkcell and Telsim had abused their dominant position by refusing to provide roaming services. While the main legal issue in the developments described above was whether the TA had the authority to impose roaming obligations (presumably which were not specified in the licenses Turkcell and Telsim had obtained in 1998), here the issue was whether refusal to provide roaming was a violation of Competition Law. The Competition Authority concluded the investigation a year and a half later, in June 2003 and found both Turkcell and Telsim in violation of the Competition Law, fined Turkcell USD 15.4 million and

[40] Another hypothesis could be that this was not a case of lack of foresight but of intentional opportunism, that is, that the government knowingly excluded roaming obligations from the initial concessions to make these contracts more attractive to the IMNOs, only to renege later. There is no evidence of such opportunism.

Telsim USD 6.1 million.

In its roaming decision, the Competition Board first investigated whether Turkcell and Telsim have joint dominance[41] over the GSM infrastructure market and concluded that they did. The Board then argued that Turkcell and Telsim had effectively refused providing roaming services and that this refusal amounted to an abuse of dominant position by denying access to an *essential facility*.

As a general rule, the essential facility argument is used for cases where the competing firm lacks a realistic ability to duplicate a facility that it needs to provide its services. In the roaming case Is-TIM eventually had to duplicate facilities in question by its license condition. Hence the Board argument had to be that full roll out of the facility would take time and that the passage of time would make it more difficult for Is-TIM to attract subscribers. The Board listed technical, legal and economic difficulties that would prohibit the installation of infrastructure in a short period of time (say, one year). The argument was that delays in attaining full coverage would seriously increase the cost of attracting subscribers, and the resulting delay in revenues would jeopardize the viability of the company and reduce its ability to compete with the incumbents.

Annex 2. Standard Interconnection Reference Tariffs (SIRT)

The SIRT was announced by the TA in October 2004. The SIRT included call origination and termination charges that would be applicable to Turk Telecom and call termination charges for mobile operators with SMP. The SIRT does not bind operators, that is, operators may set their charges freely in bilateral agreements. However, it is generally understood that if operators fail to conclude interconnection agreements and apply to the TA for dispute resolution, then the TA will likely impose the charges determined in the SIRT. As of July 2006, the tariffs determined in the SIRT have not yet been applicable in the mobile industry. As discussed in the text, the charges in SIRT reflect an important difference in the TA's approach to interconnection in the fixed and mobile markets. To summarize, call origination and call termination charges specified for Turk Telekom were clearly higher those in the European Union. By contrast, the call termination on SMP mobile operators were significantly lower than those in the European Union. At the same time, the SIRT envisaged that charges would decline over time, as reflected in the table below. The TA renewed the SIRT in 2006 and the new charges would be valid as of June 2, 2006. By that

[41] Joint dominance is defined as ability of operators to behave as a single operator by coordinating their actions.

time, all mobile operators were designated as possessing SMP in the market for call termination. The new SIRT specified different termination charges for the three operators: as shown in the table charges decline with operators' market share. Overall, it can also be underlined that these charges are among the lowest charges available in Europe in October 2005 (compare for example with European Commission, 2006, Figure 32).

	Eurocent per minute charges for		
	call origination and call termination on TT		call termination on GSM
Effective during	within area	outside area	(for SMP operators)
10/01/04 – 12/31/04 (†)	2.2	3.2	8.3
01/01/05 – 09/30/05 (†)	1.8	2.7	7.9
10/01/05 (†)	1.1	2.0	7.5
06/02/2006(‡)	1.02	1.89	7.14 for Turkcell 7.76 for Vodafone 8.93 for Avea

Annex 2 Table: Standard Interconnection Reference Tariffs set by the TA (net of taxes)

(†) converted to Euro with the Turkish Central Bank rate of October 1, 2004)

(‡) converted to Euro with the Turkish Central Bank rate of June 2, 2006

Source: Telecommunications Authority

Annex 3. Pricing Behavior of IMNOs and EMNOs

Right after the change in the interconnection agreement between Turkcell and Telsim, which increased the termination charges from 1.4 to 20 US cents/min, Turkcell launched a new calling package significantly reducing the price of on-net calls and increasing the price of off-net calls (see Annex Table A.3.1). Through this new package, called Biz Bize Cell the monthly fixed fee was reduced from about 2.5 to 1 euro (from 2.5 to less than 1 million TL) and the per minute charge for on-net calls from about 22 to 11 eurocents (0,2 to 0,1 million TL). By contrast, charges for off-net

calls were increased from 29 to 34 eurocents (from 0.25 to about 0.3 million TL).[42]

	Standard Cell Package				**Biz Bize Cell Package**			
	eurocent	eurocent per minute			eurocent	eurocent per minute		
Dates(*)	fixed fee	on-net	on-net (disc.)	off-net	fixed fee	on-net	on-net (disc.)	off-net
Mar. 1, 2000	455.7	23.6	19.9	29.5				
Aug. 23, 2000	435.0	28.2	23.9	35.9				
Jan. 3, 2001	402.9	28.2	24.0	35.9				
Mar. 3, 2001	297.6	23.4	19.9	29.7				
Mar. 23, 2001	291.9	22.9	19.9	29.2	109.0	11.4	11.4	33.9
May 15, 2001	252.7	25.8	22.0	32.8	94.4	9.8	9.8	29.3
Jun. 13, 2001	251.9	25.7	21.9	27.5	94.1	13.3	13.3	39.2
Aug. 28, 2001	198.0	22.4	21.2	28.7	74.0	11.6	11.6	34.7
Nov. 17, 2001	190.9	24.4	23.2	31.3	71.3	13.0	13.0	38.0
Feb. 12, 2002	210.9	27.0	25.6	34.6	78.8	17.3	17.3	48.5
Jun. 12, 2002	181.6	30.4	28.1	36.7	67.8	16.2	16.2	45.7
Mar. 1, 2003	147.4	25.9	23.8	31.3	55.0	13.7	13.7	39.0
Apr. 15, 2004	170.5	29.1	26.9	33.8	59.4	15.4	15.4	42.1
Nov. – Dec. 2004	145.9	25.5	23.5	29.7	50.8	13.7	13.7	37.1
Nov. 2005	46.7	21.2	21.2	31.1	59.7	16.8	16.8	37.4

Annex Table A.3.1: Turkcell Tariffs, post-paid packages (including VAT)

Calls to PSTN are charged as same rate as on-net calls.

(*) For 2000 – 2003, dates refer to days when tariffs are launched or changed.

For 2004 – 2005, dates refer to months when tariffs are observed.

Between 2001-2005 monthly fixed charges remained constant in TL terms (and decreased by about one half in Euros). On-net charges remained at about 11-13 eurocents until early 2002, after which they increased to between 14-17 eurocents afterwards. Off-net prices similarly increased to

[42] Note that the TL depreciated sharply during that period. Hence in principle comparisons should be based on Euros is more informative than those in TLs. Nevertheless, one should expect less than full pass through from exchange rate movements to TL values.

over 45 eurocents in 2002, and to an average of about 40 eurocents. Note that these rates are well above the rates which prevailed before new entry, reflecting the impact of increased competition.

	Eurocent per minute		
	On-net	On-net discount	Off-net
Aria Promotional Package			
March 21, 2001	32.0	14.4	32.0
July 1, 201	26.0	11.7	26.0
October 1, 2001	19.6	8.8	19.6
December 6, 2001	21.7	9.8	21.7
Aria Indirimli 55 Package			
July 1, 2001	38.7	17.4	38.7
October 1, 2001	32.6	14.7	32.6
December 6, 2001	39.8	17.9	39.8
February 26, 2002	49.1	22.1	49.1
July 1, 2002	40.8	18.4	40.8
November 1, 2002	38.8	17.5	38.8
December 5, 2002	7.9	7.9	7.9
March 5, 2003	6.7	6.7	35.8
April 15, 2004	7.4	7.4	39.7
Avea Packages			
November - December 2004	6.4	6.4	27.5
November - December 2004	17.8	17.8	17.8
November 2005	7.5	7.5	37.4
November 2005	22.1	22.1	22.1

Annex Table A.3.2: Aria - Avea Packages

One important change in the off-net calls after 2004 is that calls to the fixed operator are charged the same rate as on-net calls. Interestingly, all Turkcell tariffs discriminated significantly between on-net and off-net calls; Turkcell did not introduce a non-discriminatory package until 2004. As one can expect, in the non-discriminatory package that is currently offered by Turkcell, per minute prices are higher than on-net calls in other packages and, the monthly fixed fee is four times higher

than its standard package. Therefore, the package is likely to appeal only to limited number of subscribers, if any.

Table A.3.2 provides some data on Aria's tariff policy. Aria entered the market through what was called a "promotional package": The package had no monthly subscription charge. On-net charges were set at 0.28 million TL; this corresponded to about 32 eurocents in March 2001 declined steadily to about 20-21 eurocents by the end of 2001. These rates were substantially higher than the on-net calls of Turkcell. The package contained a quantity discount: calls made after a total of 55 minutes per month were charged at approximately 45% of regular calls. In December 2002 Aria launched a new campaign this time reducing both on-net and off-net charges to an extreme low of 0.12 million TL (about 7-8 eurocents per min). For off-net calls to other mobile operators, this was below the termination rate Aria had to pay to its rivals hence Aria was making a loss on these calls. This lasted only for a few months and by March 2003 the charge on off-net calls were increased to over 35 eurocents. After the merger Avea had two basic packages: in one package on net calls were charged a low rate of 7-9 eurocents and off-net calls at around 28-40 eurocents depending on the exchange rate. In the other, there was a non-discriminatory charge of 18-20 eurocents both for on-net and off-net calls. This package seems to target those subscribers who may place a large number of off-net calls; higher on-net prices are used to cross-subsidize lower tariffs on off-net calls. Evidence seems to suggest that high termination charges has restricted Aria and Avea's ability to compete aggressively by lowering tariffs. In response, the operator has developed a menu of tariffs designed for subscribers with different profiles for off-net calls.