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A Dyadic Approach

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Abstract:

The success of acquisitions rests on detecting and realizing unique synergies between buyer and target through their dyadic relationships. We study the role of unique dyad-specific synergies in the selection of takeover targets in the global mobile telecommunications industry. Firms use their foresight to select specific targets: First, they lower integration costs by selecting geographically close targets. This effect is stronger when buyer and target are in the same country, but only if the market is not so concentrated that it provokes regulatory interventions. Second, they select targets that can be acquired at a modest bid premium because they have asymmetric bargaining power. Finally, they select targets which can generate significant synergies due to technological synergies. Our work expands the existing target selection literature by studying dyad-specific factors within a single industry. This helps us in identifying unique synergies as drivers of acquisition performance.

JEL Codes: G34, L22, L41, L96

1 Introduction

Strategy researchers have long been interested in different aspects of acquisitions, most notably the pre-acquisition phase, the bidding process and post-acquisition integration processes (Haleblian et al. 2009).[1] All three clearly matter for the success of an acquisition: i) picking the right target and performing the necessary due diligence will determine the maximum amount of value that can be generated through an acquisition, ii) the bidding process will put an upper bound on the part of the value created that can be appropriated by the buyer's shareholders, and iii) management of the post-acquisition integration process determines how much of the potential value is actually realized following the acquisition.

The strategy process literature has mostly focused on the integration part of the acquisition process by studying stock market reactions to announced acquisitions. They identified a number of drivers and obstacles of successful acquisition, most notably issues of value creation, managerial self-interest, environmental factors and firm characteristics (Haleblian et al. 2009). Interestingly, research on the pre-acquisition phase is quite scarce, even though identifying potential synergies and ultimately selecting the right target ultimately determines the value that can be created from the takeover of a specific target.

In addition to other elements such as portfolio considerations, identification of managerial and financial capacities to conduct takeovers, or the alternative between internal and external growth, target selection is an important decision in the pre-acquisition phase. Generally, two dimensions affect target selection. First, there may be factors specific to the target firm or target market. For example, a firm may be badly managed or put up for sale for extraneous reasons like the lack of a successor to the founder-manager, both of which will make it a takeover target

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[1] As our empirical context are acquisitions and not mergers between equal partners, we use the term acquisition throughout this paper, but we relate to the overall literature on mergers and acquisitions (M&A).

for a wide set of potential acquirers. Similarly, firms in attractive markets or market segments will attract the attention of multiple bidders whose operating profits would increase if they purchased a target in a more profitable market segment. These factors will increase the likelihood that a firm will become a target, but not necessarily the likelihood that it will be matched to a firm that profits more from this specific target firm than others. Indeed, if anything, the fact that a target is attractive to many bidders might increase competition for it, driving up the bid premium and ultimately lowering the potential for the buyer's shareholders to profit from the takeover.

Hence, the second set of factors refers to the likely supranormal profits to be generated from the combination of a specific buyer-target dyad. The crucial difference to target- or target market-based factors is that dyadic factors are unlikely to be competed away in the bidding process. That is, dyadic factors will only be realized for a specific pairing and therefore rest on unique synergies that other potential buyers will not see and are therefore not willing to pay for. These unique synergies either may have their basis in the maximum potential value created, in the bargaining power during the bidding process, or in a smooth anticipated post-takeover process. They can form the basis of competitive advantage for these firm combinations, i.e. an increase in post-acquisition performance.

We study target choice in takeover activity in a single industry. We sidestep some of the common methodological and conceptual issues in acquisition research on the pre-acquisition phase and focus on dyad-specific factors while controlling for firm- (buyer and target) and market-specific factors that may influence the general likelihood of a takeover. Specifically, we study the global mobile telecommunications industry from 2000 to 2014 to test our hypotheses on dyadic geographical and technological factors as well as a bilateral measure of relative bargaining power. We find that geographical closeness – which should lower integration costs – increases the likelihood of a takeover. This effect is even stronger when buyer and target are

in the same country, but only if the market is not so concentrated that it provokes regulatory interventions. Moreover, firms using the same technology are more likely to initiate a takeover, likely because of more opportunities for economies of scale. Finally, dyads in which the buyer has a significantly larger number of subscribers than the target are also more likely to form a takeover pair, which could be driven by more bargaining power of the buyer.

We contribute to the sparse literature on target choice by specifically capturing the role of dyadic factors, extending the traditional view of what makes it likely that a firm is taken over (which ultimately captures how the market views a particular target firm) or that a firm is active as a buyer (which reflects the firm's financial strength and internal growth opportunities). Specifically, we look at the likelihood that a particular dyad creates unique synergies that ultimately determine the success of specific acquisitions.

2 Prior Work

The literature on acquisitions is vast and covers different aspects, as pointed out above. We focus on two strands of the vast literature on acquisitions: the target selection literature, which we contribute most directly to, and work on drivers of acquisition performance, which implicitly assumes that targets are chosen to maximize potential synergies with the buyer, and that there is heterogeneity in these attainable synergies.

2.1 Acquisition Performance and Synergies

The core logic of acquisitions is that buyer and seller combine to realize synergies that partly benefit the target's shareholders (through the bid premium paid) and the buyer's shareholders (through improved post- acquisition performance). Hence, work studying the determinants of superior post- acquisition performance can give us some insights into possible sources of synergies unique to a particular buyer-seller dyad (Yu et al. 2016; Barney 1988), as unspecific synergies would likely be eroded through a competitive bidding process by multiple willing

buyers (Harrison et al. 1991). Synergies or strategic fit between buyer and target can stem from similarities and differences between two firms. The rationale behind synergies from similarities includes economies of scale or reduced search costs due to geographical proximity (Chakrabarti & Mitchell 2013; Ramos & Shaver 2013) or product line similarity (Mitchell & Shaver 2003). The logic behind synergies via differences between two firms is that there may be complementarities, i.e. differences that mutually reinforce the firms' individual capabilities, resources or activities (Ruckman 2005; Zaheer et al. 2013).

Product market similarities generally have a positive impact on acquisition performance (Mitchell & Shaver 2003; Schildt & Laamanen 2006), and further research has extended this to similarities in production technologies and science-based research (Salter & Weinhold 1979) with some positive empirical support (Lubatkin 1983; Singh & Montgomery 1987). However, empirical support is not uniform – for instance, Lubatkin (1987) and Kim and Finkelstein (2009) do not find confirmation for the market- or product relatedness hypothesis. Empirical evidence on the performance impact of the similarity of resource allocation (e.g. marketing or R&D intensity) is also indeterminate. Ramaswamy (1997) finds that large differences between buyers and targets to lead to negative performance impacts, while Harrison et al. (1991) and Ruckman (2005) find that dissimilarities of resource-allocations improve post- acquisition performance, partly because the resulting synergies are less anticipated by markets and therefore not included in the bid premium.

Target choice ideally already anticipates factors impeding or facilitating synergy realization in post-acquisition integration and future operations of the involved companies. Hence, difficulties in post-acquisition integration due to cultural differences will affect post-acquisition performance (Cartwright & Schoenberg 2006) and, inasmuch as they can be anticipated, influence target assessment and ultimately selection (Jemison & Sitkin 1986). Especially cultural and managerial fit between buyer and target has been studied in some detail (Björkman

et al. 2007; Chatterjee et al. 1992; Datta 1991; Larsson & Finkelstein 1999; Stahl & Voigt 2008; Teerikangas & Very 2006).

Research on post- acquisition performance can therefore inform research on target choice in several ways. Target selection decisions should incorporate potential strategic synergies and anticipate factors creating friction in post-acquisition integration. Moreover, to determine the share of value created through an acquisition that can be appropriated by the buyer, the extent of synergies unique to a particular buyer-target combination is crucial. This calls for a dyadic view on acquisitions and the attractiveness of particular buyer-target pairings.

2.2   Target Choice

Empirical work on target choice is sparse compared to work on the performance implications of acquisitions (Teerikangas 2012). Partly, this can be explained by concerns of data availability as data on both potential (but not chosen) and actual targets has to be gathered, which is challenging because the choice set of a potential buyer is hard to identify.

Prior work has dealt with target choice in three separate streams: A first stream of studies focuses mainly on target characteristics, asking which characteristics make firms more likely targets (Caiazza et al. 2012; Hannan & Rhoades 1987; Hernando et al. 2009; Moore 1997). Another line of research reflects the dyadic nature of acquisitions more closely by studying target characteristics that increase the likelihood of being acquired by different types of buyers, e.g. factors driving the likelihood of being bought by domestic or international or small or large acquirers (Hannan & Pilloff 2009; Wheelock & Wilson 2000) or dependent on the buyer's product scope (Mitchell & Shaver 2003). Other studies simultaneously analyze bidder and target characteristics at the firm level, using a dyadic data structure, so the unit of analysis is a unique pair of potential bidder and target (Baum et al. 2000; Chakrabarti & Mitchell 2013; Ruckman 2005; Schildt & Laamanen 2006; Yu et al. 2016).

Much of the target choice literature has focused on the "efficiency hypothesis" as a source of complementarity at the firm performance level. The underlying assumption is that via acquisitions, badly managed assets are transferred to better management. Bidders will thus aim for ill-performing targets where they can profitably leverage their existing resources and capabilities. Empirical studies on the role of target firms' earning situation, profitability or cost efficiency found mixed results, some reporting no support (Hadlock et al. 1999; Hannan & Rhoades 1987), others confirming the hypothesis (Akhighbe et al. 2004; Amel & Rhoades 1989; Caiazza et al. 2012; Hannan & Pilloff 2009; Moore 1997; Wheelock & Wilson 2000). Another important factor in the dyad-based literature is the degree of complementarities at the product or market level on target choice. In banking, the likelihood of a target being acquired increases in the amount of local loans as a proxy for unique assets that complement those of a geographically more dispersed bidder (Akhighbe et al. 2004; Hannan & Pilloff 2009). Similarly, in the US pharmaceutical industry, bidders look for targets that are complementary rather than similar to their R&D and product portfolios (Yu et al. 2016), analogous to the tendency of low-R&D drug companies to acquire high-R&D firms (Ruckman 2005) and of firms in dissimilar technological domains to merge (Schildt & Laamanen 2006).

Conversely, other studies found that buyers are more likely to buy targets in close geographical proximity (Baum et al. 2000; Chakrabarti & Mitchell 2013; Ramos & Shaver 2013). The intuition is that knowledge transfer and thus post-acquisition frictions are lower for close dyads.

Overall, prior work suggests that unique synergies lie at the core of post-acquisition performance and therefore target choice. We build on these insights in our hypothesis development after introducing the specific empirical context we study.

3 Acquisitions in the global mobile network operator industry

While much of the technological base of wireless communication had been laid out earlier in the 20th century, it was not before the 1990s that mobile telephony really took off. The introduction of GSM (Global System for Mobile Communications) and other second generation (2G) network technologies made radio technologies more scalable and allowed the emergence of mobile telephony for everybody (Dunnewijk & Hultén 2007). Mobile telephony became a mass phenomenon in the overall population and growth rates and penetration numbers quickly exceeding the industry's most optimistic forecasts (Gruber & Verboven 2001). In emerging markets, i.e. in countries with an infrastructure lagging behind western standards and often a dispersed population in rural areas, mobile technology often was a welcome opportunity to leapfrog landline voice and data transmission technologies (Howard 2007).

The deregulation of telecommunications markets beginning in the 1980s and 90s allowed private companies to enter markets, so that typically several private companies complemented the offers of former state-owned monopolistic incumbents (Dunnewijk & Hultén 2007). The mobile segment had lower entry barriers than the wireline market, as companies did not need to invest in the expensive bottleneck of a wire-bound last mile (Kim et al. 2009) but only needed to acquire a license and set up a backhaul network as well as terminating mobile base stations. Some of these private companies are part of larger multi-national corporations owning operators in different countries. These multinationals expanded either via greenfield investments or acquisitions. As greenfield investments are limited to points in time where license auctions take place, acquisition often is the only entry mode into a new country, which makes the global mobile operator industry an interesting case for studying M&A target choice.[2]

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[2] Customers can also buy mobile services from virtual mobile network operators, who do not own the network but buy network capacity from other MNOs. Our empirical setting is however limited to infrastructure-based MNOs.

Considering the success and high growth rates the introduction of 2G technology had brought about, the advent of third generation network technologies such as UMTS was anticipated enthusiastically (Dunnewijk & Hultén 2007). However, smart auction designs of the states led to high prices paid for the 3G licenses and thus a financial squeeze of the operators who had to finance the expenses of setting up these new networks, which partly involved upgrading 2G network elements and partly building new network elements. Moreover, after the dotcom bubble burst, capital markets questioned the profitability of the investments and 3G business cases were evaluated more carefully (Dunnewijk & Hultén 2007). Further, operators had to develop business and pricing models for new data services. Markets for voice services became saturated in many developed countries as penetration rates reached or even exceeded 100% in the mid-2000s. Simultaneously, technology and coverage improved so that mobile voice services became a commodity, leading to aggressive price competition and lower margins.

Thus, continued growth of a group of mobile operators therefore increasingly had to rely on a series of acquisitions as internal growth began to stagnate in most industrialized countries from the mid-2000s onwards. Moreover, domestic acquisitions were often under regulatory scrutiny.

4 Hypotheses: Target choice criteria in infrastructure-based service industries

We now derive testable hypotheses specific to the global mobile telecommunications market. While they are specific to some key drivers of buyer-target match, we expect them to apply to other infrastructure-based industries as well. We briefly outline some key structural characteristics of our empirical setting at this point, also to guide our hypothesis development: We study domestic and international international horizontal acquisitions in the global mobile network operator industry. The companies we study offer services based on a local technical infrastructure. Geographic markets are therefore separate; services can neither be offered

remotely nor shipped to a different place nor are there significant product complementarities from operating in more than one geographic market. Another industry feature is that the companies we study hardly engage in basic research (Fransman 2002), which has been studied as an important source of strategic fit in other settings (Yu et al. 2016). Further, due to regulatory issues, there are normally no tradeoffs between market entry via acquisition or a greenfield entry examined in other industries (Harzing 2002).

Buyers select targets based on the expected unique synergies from a particular combination of bidder and target that can be realized. We are interested in three drivers of target choice: First, geographical closeness as a measure of anticipated integration costs of an acquired firm (Cartwright & Schoenberg 2006; Jemison & Sitkin 1986). Second, technological commonality to proxy for the likely synergies arising from technical economies of scale (Lubatkin 1983). Third, the relative size of buyer and target to capture asymmetries in the bargaining position during the bidding process. Given that we cover both domestic as well as cross-border acquisitions, we are also interested in the effect of market concentration as a measure of the likelihood of regulatory intervention following an acquisition. As Hannan and Pilloff (2009, p. 1171) argue, objectives to increase market power should be most relevant to domestic deals.

4.1   Geographical Proximity (Integration Costs)

Geography is a crucial factor for the type of acquisitions we study. Geographic distance between bidder and target is expected to create friction in achieving synergies from acquisitions via various mechanisms: Geographical distance itself is a factor that makes communication and mutual understanding more difficult, even if communication technologies are available (Hinds & Bailey 2003; Olsen & Olsen 2000). Further, geographical and cultural distance are often correlated. Interestingly, empirical studies on cultural distance and performance in mergers give conflicting results. Reus and Lamont (2009) argue for an indirect effect of cultural distance on acquisition performance via the integration process, and that cultural distance often leads to

negative performance outcomes. Conversely, if learning is fostered and the firm has superior integration capabilities, cultural distance becomes an opportunity to reach above average gains. Barkema and Schijven (2008) found in a sample of Dutch firms that post-acquisition performance improved if bidders had previously acquired other targets in geographic proximity. Hence, an ideal target should be located not too far away from previous "outposts" although it does not necessarily have to be closely located to a bidders' own headquarter or country of origin. We thus advance Hypothesis 1:

H1: Bidders are more likely to select targets located in regions with prior presence.

4.2 Within-Country Takeovers (Market Power)

The industrial organization and competition policy literature has long recognized the role of market power motives for takeovers (Bresnahan 1989). Put simply, a takeover of a competitor in the same country increases the buyer's market power and the level of concentration in the country, leading to higher expected profit margins. This motive appears only for within-country takeovers as the market structure (not just the owners) in the domestic market is changed. At the same time, two firms in the same country are likely to face the lowest integration costs as they have been serving the same market and the same population even prior to the takeover. Consequently, compared to cross-border takeovers, the likelihood of buyers targeting a domestic rival for a takeover is higher, that is, we expect an additive positive effect on the likelihood of a takeover over and above the geographical proximity postulated in H1. At the same time, the market power motive also raises issues from a competition policy point of view. Specifically, as markets become more concentrated, the likelihood of a takeover being completed successfully will decrease because competition authorities are likely to intervene, or the anticipation of regulatory intervention will put potential buyers off attempting a takeover. We summarize this in our Hypothesis 2 on domestic takeovers:

H2a: Bidders are more likely to select targets operating in the same country targets located in regions with prior presence.

H2b: Bidders are less likely to successfully take over a target in the same country the more concentrated the market is.

4.3   Technological Commonality (Scale Economies)

As James (1998, p. 565) points out *"technology issues may have far reaching consequences for future strategy and may directly affect the competitive position of the acquired business and its new parent"*. Synergies arise from a certain "fit" between two companies based on the technology they use (Makri et al. 2010). In global telecommunications, production technologies correspond to the network infrastructure for voice and data services. In general, it is not obvious whether similarities or complementarities generate most value from the bidder's perspective. A target with a different technological infrastructure to the bidder's may present a learning opportunity about different or novel technologies. However, this complementarity argument is only relevant if the differing technology is more advanced or for other reasons of expected relevance to the acquirer. Conversely, there are multiple reasons why similarity in technical infrastructure would allow synergies between two firms. Using the same technology in different markets allows redeploying knowledge and competencies and generating economies of scale in the procurement of new infrastructure or spare parts. Similar technologies also help assess the value of a target's infrastructure and optimization potential if that particular infrastructure is already known to the bidding company. Thus there are arguments for synergies stemming from complementarities as well as from similarities. For our specific industry setting, we consider similar production infrastructures to be preferable since different network technologies largely reflect different country standards rather than expected technological superiority. For instance, a European network provider operating networks on the basis of the GSM standard would probably not benefit from technological knowledge about the CDMA standard prevalent in

other regions. As long as the different technologies are just alternative standards, the benefits of similarity should prevail over possible advantages caused by dissimilarity in technological infrastructure. We formulate Hypothesis 3 as follows:

H3: Bidders are more likely to select targets using the same technology.

4.4   Buyer-Target Size Differences (Bargaining Power)

Any takeover is at its heart a process of bargaining over the purchase price. While the unique synergies the buyer expects determine the range in which the bargaining solution will lie in, where in this interval the purchase price lies depends on the relative bargaining power of the two parties. In the global mobile telephony market, the installed base of users plays an important role in determining the bargaining power of target and buyer. First, it is a relevant proxy for the size of the operations in a specific country, which captures the bargaining power of firms involved in takeovers (Capron & Shen 2007). Second, it proxies for the expected future cash flows since subscribers tend to stick to their current operator and thus the potential value generated by the target as a standalone operator, and it is a measure of the financial power of the prospective buyer (Hubbard & Palia 1999). Finally, a small target network has much to gain from achieving compatibility with a larger buyer network and not vice versa (Regibeau & Rockett 1996), so that a large difference in network sizes favors the buyer vis-à-vis the target. This implies that a deal becomes more likely between the two since the target is keen to sell and the buyer's bargaining power is comparably large – the target becomes easy prey for the buyer. Hence, we formulate our final hypothesis, H4, as follows:

H4: The larger the size difference between buyer and target subscriber networks, the more likely is a takeover.

We now empirically study the target-choice criteria of multinational corporate groups.

5 Data and Methodology

5.1 Data sources and structure

We purchased data from GSMA, the leading industry association of the mobile communications industry. GSMA tracks virtually all mobile phone operators worldwide on a quarterly basis. The data used in our final sample includes 882 operators from 237 countries. For our analysis we use ownership information for operators, data on the number of subscribers for each operator, the technology standards operators use on their networks, as well as the country-specific variables GDP per capita and population. Our dataset covers a timeframe of 15 years (2000-2014),[3] but due to entry and exit of operators, we do not observe all operators for all years. Even though GSMA collects data on a quarterly level, we collapse the data to a yearly level as we think that this is the more appropriate timeframe for making acquisition decisions.

Acquisitions within the mobile network operator industry can be categorized as within-country and between-country acquisitions. Within-country acquisitions combine the two network operators' networks and the business in one company. Conversely, due to the national nature of the mobile network operator business, operators maintain an individual legal entity after between-country acquisitions. We can track between-country acquisitions with the ownership data GSMA collects on so-called groups. Groups such as the Vodafone Group are companies owning stakes in multiple national operators. We define an acquisition as a group acquiring ownership of at least 50% of a mobile network operator. For within-country acquisitions, GSMA does not provide a database showing who is acquired by whom. Instead, the operator disappears from the dataset and the merge date is recorded behind the name of the discontinued operator. We identify the buyer by examining which of the operators in the same country sees

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[3] We also observe data from 2015, but this year is not part of the final sample. As we describe below, we assume the acquisition decision to have taken place in the year before the actual acquisition and therefore the only data we use from 2015 is the information on acquisitions.

a subscriber increase of the magnitude of the acquired operator after the acquisition. We only analyze acquisitions where an operator is acquired by a group (not another individual operator).[4]

GSMA collects a wide array of data on size and performance of mobile network operators. We use the number of subscribers as the broadest available metric and considered an important performance measure in the industry. We want to avoid losing potential target operators through missing variable values as the likely non-random distribution of those missing values would lead to biased estimates, overweighting operators with better data availability.

GSMA also provides data on the technologies used by mobile network operators. We do not consider first-generation analog technologies as these have already become obsolete by the beginning of our sample in 2000. Instead, we focus on the second and third generation of technologies, commonly referred to as 2G and 3G. There are four different 2G network technologies in the sample: GSM, CDMA, IDEN and TDMA. For 3G, we observe CDMA, WCDMA, LTE and WIMAX. Operators can use multiple of these technologies in parallel and most often continue operating their 2G networks after the start of 3G networks.

The dataset lists pairs of operators (i.e. potential targets) and multinational telecommunications groups (i.e. potential buyers) per year. Each observation contains information about the target, the potential acquirer, variables of fit between both, and if an acquisition took place.

5.2 Variables

All variables are defined briefly in Table 1 but are introduced in more detail below.

INSERT TABLE 1 HERE

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[4] This reduces the dimensionality of our data as it restricts the number of potential buyers to business groups.

5.2.1 Dependent variable

Acquisition of Target by Buyer (0/1), is the dependent variable. It is a binary variable indicating whether an acquisition has taken place in a given year for a particular buyer-target pair. In line with Hannan and Pilloff (2009) we define an acquisition as a change in ownership where the buyer acquires at least 50% of the target's shares.

As there is usually a time lag between the acquisition decision and the completed acquisition and we are interested in the factors driving the acquisition decision, we consider the year before the completion of the acquisition as the relevant year for the acquisition decision. We do this by moving the observed acquisition forward by one year.

5.2.2 Independent variables

H1 suggests that bidders will look for geographically close targets. We operationalize this in two ways. First, *Buyer active in country (0/1)* is 1 if the buyer already owns an operator in the target's country and 0 otherwise. Second, we code *Buyer active in region (0/1)* as 0 if buying a target would mean expanding a corporate group's footprint to a new region, and 1 otherwise. We distinguish 22 regions, with examples for regions being the Caribbean, Northern Europe, or South East Asia.

H2a states that the positive effect of geographical closeness becomes stronger if an operator is already active in the local market as this allows increasing market power and has more synergistic potential. We can test this by comparing the coefficient magnitudes of *Buyer active in country (0/1)* and *Buyer active in region (0/1)*. H2b introduces a moderator to the effect in H2a. We expect the probability of within-country acquisitions to decline the more concentrated the market is, as regulators become increasingly concerned about abuse of market power and no longer allow acquisitions. We measure the concentration of the target market with a *Herfindahl-Hirschman Index (HHI)*. The HHI is calculated by taking the sum of the squared

subscriber market shares in the target market. H2b is then tested through the interaction term *Buyer active in country (0/1) * HHI (0-1).*

H3 state that bidders prefer targets that use a similar production technology. The variable *Overlap with buyer technology (0/1)* indicates whether the potential target uses network technology already existent in the technology pool of the potential acquirer. A matching network technology allows reapplying existing competencies and achieving economies of scale in the procurement of new network elements and spare parts. We code *Overlap with buyer technology (0/1)* as 1 if there is an overlap between both technology portfolios and 0 otherwise.

H4 states that bidders will look for targets that are relatively smaller than their own size. We operationalize this via the variable *Subscriber difference buyer - target (mn)*, which is calculated by taking the number of all buyers of the potential buyer and subtracting the numbers of the target. We measure this difference in million subscribers.

5.2.3   Controls

While the variables testing the hypotheses are at the dyadic level, the control variables relate to the target market, the target, and the potential buyer.

We already introduced *HHI (0-1)* to measure the concentration of the target market above. In addition to the expected negative interaction effect with *Buyer active in country (0/1)* from testing H2b, we also expect a negative main effect (which is then the effect for between-country acquisitions) as more concentrated markets provide fewer opportunities for acquisitions.

The market penetration of the target market is another factor that could influence acquisition probabilities. We measure *Subscriber penetration (%)* as the share of subscribes in the target market divided by population of target market (%). We expect target markets to be more attractive if market penetration is relatively low, therefore promising more future growth

potential than more saturated markets. Note that this variable can take values larger than 100% as individuals can have multiple active subscriptions.

Regarding the target operator, *Target part of group (0/1)* indicates whether the potential target is already owned by another multi-national telecommunications group or not. This variable was found to play a significant role for acquisitions in the nursing sector (Baum et al. 2000). We expect targets already belonging to a group to be less likely to be acquired, as they can already reap the synergies of belonging to a group and synergies from acquisitions should therefore be lower compared to an independent target.

We also consider a buyer's prior *Acquisition experience (count)*. This variable counts all the acquisitions conducted prior to the focal year. The effect of this variable could go in two ways. On the one hand, prior experience could make future acquisitions more likely as the buyer gathered experience with the acquisition process, making also riskier takeovers viable. On the other hand, prior experience could also mean that there are fewer remaining targets available on the market, making new acquisitions less likely.

Finally, we control for *Buyer GDP growth (%)*, which measures average GDP growth in the countries the buyer group is already active. The year-on-year GDP growth in percentage points is weighted by the number of subscribers the buyer has in each country. The effect of this control could also go in both directions: negative GDP growth in the home markets could trigger the wish to expand to new markets, therefore leading to more acquisitions, but it could also result in less financial resources being available for expansion.

5.3   Descriptive statistics of the dataset

Table 2 and 3 provide summary statistics as well as correlations of the relevant variables.

INSERT TABLE 2 HERE

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282 acquisitions were observed in the dataset, with the number of acquisitions varying from 1 to 35 per year. Of all 282 acquisitions, 209 were between-country acquisitions and 73 were within-country acquisitions. Overall, 52 groups of operators have made at least one acquisition and are included in the analysis. We observe 882 operators as potential targets. Given entry and exit at the group as well as the operator level, the panel is unbalanced and we count a total number of 469,333 observations.

The baseline probability of being acquired is only 0.060%, which is not surprising given that we consider all possible combinations between potential buyers and targets. We come back to this baseline probability when interpreting our results. The summary statistics of all other variables are all in line with expectations and the pairwise correlations do not raise concerns regarding potential multicollinearity issues.

5.4   Model specification

We use a probit model to estimate the acquisition decision. A particular challenge in our analysis was to determine an appropriate choice set, i.e. decide which buyers and operators are "on the market" for potential acquisitions in a given year. We consider the groups of mobile network operators that have ever acquired another operator as potential buyers, i.e. we excluded groups that only grew organically or where acquisitions took place before the start of our observation period in the year 2000. We consider all active operators to be targets, i.e. we do not exclude an operator from our analysis once acquired, except for the year of the acquisition (note that we assumed that the acquisition decision took place the year before the actual acquisition). We do not remove operators from the target list once acquired since the same operator can be acquired multiple times (and some indeed were).

6 Results

The baseline results are reported in Table 4 and results regarding H2b in Table 5. In both tables, column (1) reports coefficients from a probit model with *Acquisition of Target by Buyer (0/1)* as the dependent variable and column (2) reports the corresponding average marginal effects. For binary independent variables, the marginal effect indicates a change in the dependent variable if the independent variable assumes a value of 1 rather than 0. When interpreting the marginal effects, it is useful to keep in mind the baseline probability for acquisitions of 0.060% (Table 2). The size of the marginal effects in column (2) relative to the baseline effect is reported in column (3). For binary variables, the effect is calculated directly as the marginal effect divided by the baseline probability as the marginal effect represents the effect of going from 0 to 1. For continuous variables, we multiply the marginal effect with the variable's standard deviation before dividing it by the baseline probability. In this case, the effect size represents the relative effect of increasing the variable by one standard deviation. An effect size of 100% is an effect that is as big as the baseline probability of being acquired.

INSERT TABLE 4 HERE

H1 states that acquisitions are more likely if the potential buyer is already active geographically close to the target. We test for this in two ways: by how much does acquisition probability increase if the buyer is already active in the country of the target and by how much does it increase if the buyer is already active in the same region (but not in the same country). The coefficients for *Buyer active in country (0/1)* as well as for *Buyer active in region (0/1)* are both positive and significant. The effects are also economically significant, as being active in the same country results in a nearly tenfold increase in acquisition probabilities and the effect for being active in the region is still 162% of the baseline probability.

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In H2a, we expected a higher probability of within-country acquisitions than for within-region acquisitions. The effect size of 948% for within-country acquisitions as compared to 162% for within-region acquisitions is clearly much bigger. To obtain formal support for H2a, we compute a linear combination in which we deduct the coefficient values of *Buyer active in region (0/1)* from *Buyer active in country (0/1)* and see that the difference is significant.[5]

Regarding H2b, we estimate the interaction effect *Buyer active in country (0/1) * HHI (0-1)*. Results are reported in Table 5.

INSERT TABLE 5 HERE

The easiest way to interpret the interaction effect in this nonlinear model is to look at the different marginal effects for within-country acquisitions (i.e., where the buyer is already active in the country of the target) and between-country acquisitions (i.e. where the buyer is not active in the country of the target). We see that a one standard deviation increase in the HHI (i.e. a change of 0.2), results in a strong decrease of within-country acquisition probability. The effect size is 763% compared to the baseline probability of being acquired. In contrast, the effect for between-country acquisitions is barely significant and the effect size is only 11% of the baseline probability. We therefore find strong support for H2b.

For the remaining results, we discuss results from Table 4, but results in Table 5 are very similar. In H3, we expected overlap between technologies used by the potential buyer and the target to increase acquisition probability. The coefficient *Overlap with buyer technology (0/1)* is positive and significant. The magnitude of the effect is weaker than the geographic effects, but still amounts to more than two-thirds of the baseline probability.

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[5] The difference is 0.515 with a standard error of 0.0544, implying a significance smaller than 0.001.

H4 relates to the size difference between the potential buyer and the target. We expected higher acquisition probabilities for larger differences and find a positive and significant effect that supports this. Interpreting the effect size is not as straightforward as for the prior tests, but we can see how much a one standard deviation change in *Subscriber difference buyer - target (mn)* increases the acquisition probability. A one standard deviation corresponds to a difference of 59.29 million subscribers (Table 2), leading to an effect size of 34% of the baseline probability.

We now report the results for the control variables. For the target market, we find a negative and significant coefficient for the *Herfindahl-Hirschman Index (0-1)*, i.e. buyers are less likely to acquire targets in more concentrated markets. A one standard deviation increase in market concentration decreases acquisition probability by 22% of the baseline. As we saw when discussing the results for H2b in Table 5, this effect is driven mainly by within-country acquisitions, pointing to the influence of regulatory interventions in concentrated markets.

Next, we assess the effect the level of saturation of the target market has on the acquisition probability. For increasing levels of *Subscriber penetration (%)*, we find a negative and significant decline in acquisition probability. An increase in the saturation of the target market by one standard deviation (48.95%) results in a reduction of the acquisition probability of 19% of the baseline. So targets operating in markets with more future growth potential are indeed more likely acquisition targets.

The buyer-side variable *Acquisition experience (count)* is negative and significant. A one standard deviation increase in experience (3.89 acquisitions), decreases acquisition probability by 32% of the baseline probability. The learning effect (Laamanen & Keil 2008) therefore seems to be dominated by the decrease in the availability of attractive targets and the increase in managerial complexity.

Finally, *Buyer GDP growth (%)* is positive and significant. Increasing GDP growth by one standard deviation (2.87%) increases acquisition odds by 23% of the baseline. This supports the intuition that operators from growing countries can invest more resources in acquisitions.

7   Discussion and Conclusion

Overall, our results support our hypotheses on target selection and takeover probability. We find that geography plays a major role in selecting targets, and although within-country takeovers seem especially attractive, possible antitrust intervention in concentrated markets counteracts this. The effect of technological commonality is smaller in magnitude, but still significant. If target and buyer share a common technology, a takeover becomes more likely. Finally, we find that size differences between a (larger) buyer and a (smaller) target increase the likelihood of a takeover. These results suggest that multiple aspects of a takeover process affect the selection of suitable targets – maximum expected synergies, the likely outcome of the bidding process, and the post-acquisition-integration process.

The pre-acquisition phase ostensibly is the one we are looking at as this is where targets are selected and most due diligence is performed. However, due diligence processes often focus on the identification of the maximum level of synergies to be achieved from a merger or takeover. Including the bidding process in our analysis shows that the likely outcome of takeover negotiations, proxied by the difference in size between buyer and target, is also a determinant for which deals will eventually take place. Finally, buyers also appear to take into account the likely difficulties faced in the post-acquisition phase already when selecting their targets.

Our study has a number of limitations. First, we used a broad definition of the potential choice set for prospective buyers: A business group could buy any operator not already part of the group. Clearly, this is the broadest possible definition of within-industry takeovers. However, we feel that it is preferable to err on the side of generosity rather than erroneously exclude

potential targets. Moreover, restricting the choice set (e.g. by only considering targets that were eventually taken over or by selecting on one of our independent variables), we would be distorting the effect of the respective variable on target selection. Moreover, while we do not observe the actual choice set, we have witnessed many takeovers of highly heterogeneous targets, suggesting that business groups do cast their net widely.

We have defined an acquisition as a multinational corporate group acquiring more than 50% in shares in the target. We assume that an acquisition pursues the goal of integrating two companies and reaping synergies. In some cases however, the multinational acquires a smaller stake, but still obtains managerial control over the firm and the possibility to integrate operations. This could happen when the remaining shareholders have purely financial interests and trust that the know-how of the business group and the potential economies of scale make it in their best interest to hand over control to a minority shareholder. In some situations, acquisitions may only happen for diversification, financial or personal motives and operational integration of the two companies is not the objective. While our 50% threshold is a somewhat crude operationalization, we still believe that it is well-suited to studying strategic target choice in the telecommunication industry.

Another limitation is that we rely on secondary data to inform us about the target selection process. That is, we do not observe the actual process of selecting, bidding and integrating a target, and we cannot observe failed takeover bids, takeover premia paid, or even the financial incentives for the buyers' managers. We cannot capture irrational, non-value generating decisions like managerial hubris. Our view of the takeover process is therefore informed by proxies for target selection based on expected technological synergies, bidding based on bargaining power, and the integration process based on realized synergies. We are encouraged by the fact that our three proxies have a statistically and especially economically significant

effect on takeover likelihood, but clearly future research would benefit from gathering more detailed data on one or multiple of the aspects we studied.

Our study makes several important contributions. First, we find that target choice is a deliberate process informed by buyers' expectations about the entire process until the target's integration. Our results suggest that firms use their foresight to select specific targets: First, they select targets which they feel can generate significant synergies due to technological commonalities. Second, they select targets they believe they can acquire at a modest bid premium because they have asymmetric bargaining power. Finally, they already anticipate the ease of integrating the target into the overall group by choosing geographically proximate targets, which lowers anticipated integration problems due to cultural differences.

Second, our study tracks the concentration process of a globally relevant industry over an important period in its evolution. The telecommunications industry has been studied extensively, especially the dynamics of within-country diffusion (Gruber and Verboven 1999, Grajek and Kretschmer 2009, Koski and Kretschmer 2005), but much less is known on the accompanying changes in global industry structure through mergers and acquisitions. What is especially interesting is that many of the global players in the industry (e.g. Deutsche Telekom, Telefonica, or Orange) were previously state-owned incumbents of fixed-line telephony and subsequently increased their global footprint through acquisitions and joint ventures. Hence, our study documents at least part of the evolution of a previously nationally restricted industry to a global one with increasing concentration in the hands of global players, even though market structures tend to be more regulated in individual countries.

Finally, our paper offers a number of specific insights into what makes targets more attractive for takeovers. In a technologically driven industry like the telecommunications industry, it is perhaps intuitive that technological overlap plays a role in target selection, but it is interesting in light of the fact that cellular markets are still national and that networks with different

technological standards are compatible. Our finding that geographical proximity matters in target selection is again in line with prior studies, but the magnitude of this effect suggests that target choice is indeed a regional affair. This has implications for the evolution of a business group's global footprint as expansion is likely to proceed area by area rather than in a scattered pattern which would be consistent with exploring and experimenting in new markets. Finally, the observation that large buyers seek out small targets, likely because the bargaining process is simpler (and leaves more rent with the buyer) suggests that negotiating power and willingness to sell dominate the potential increase in network effects if a larger operator is taken over.

To summarize, our study adds to the literature on target choice in a number of ways. By taking advantage of the single-industry setting and the inclusion of information covering several stages of the acquisition process, we generate comprehensive insights into target selection and the subsequent takeover process. Further research extending this work to other industries or even across industries taking into account geographical relatedness, technological relatedness and bargaining power considerations would help confirm (or refute) our findings beyond the specific context we study and outline possible boundary conditions.

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Tables

Table 1: Variable definitions

Variable	Definition
Dependent Variable	
Acquisition of Target by Buyer (0/1)	Dummy variable equal to one if the potential buyer acquires target in a given year
Dyadic Independent Variables	
Buyer active in country (0/1)	Dummy variable equal to one if the potential buyer does already own an operator in the country
Buyer active in region (0/1)	Dummy variable equal to one if the potential buyer does already own an operator in a region, but not in the country
Overlap with buyer technology (0/1)	Dummy variable equal to one if the potential buyer operates at least one of the network technologies used by the target
Subscriber difference buyer - target (mn)	Total number of subscribers of the potential buyer minus the total number of subscribers of the target (in million)
Target Market Independent Variables	
HHI (0-1)	Herfindahl-Hirschman Index (HHI); Sum of squared subscriber market shares in the target market
Subscriber penetration (%)	Share of subscribes in the target market divided by population of target market (%)
Target Independent Variables	
Target part of group (0/1)	Dummy variable equal to one if target belongs to an international group of operators
Buyer Independent Variables	
Acquisition experience (count)	Prior acquisitions by the potential buyer
Buyer GDP growth (%)	Year-on-year GDP growth in existing buyer markets (percentage, weighted by subscribers)

Table 2: Summary statistics

Variable	Mean	Std. Dev	Min	Max
Acquisition of Target by Buyer (0/1)	0.00060	0.02	0	1
Buyer active in country (0/1)	0.02	0.16	0	1
Buyer active in region (0/1)	0.15	0.36	0	1
Overlap with buyer technology (0/1)	0.86	0.35	0	1
Subscriber difference buyer - target (mn)	32.25	59.29	-794.25	367.37
HHI (0-1)	0.45	0.20	0.09	1
Subscriber penetration (%)	70.82	48.95	0.01	291.83
Target part of group (0/1)	0.51	0.50	0	1
Acquisition experience (count)	2.75	3.89	0	20
Buyer GDP growth (%)	2.28	2.87	-9.34	10.46

Note: 469,333 observations for all variables.

Table 3: Pairwise correlations

		1	2	3	4	5	6	7	8	9
Acquisition of Target by Buyer (0/1)	1	1.00								
Buyer active in country (0/1)	2	0.04	1.00							
Buyer active in region (0/1)	3	0.01	-0.06	1.00						
Overlap with buyer technology (0/1)	4	0.01	0.01	0.06	1.00					
Subscriber difference buyer - target (mn)	5	0.01	0.08	0.12	0.10	1.00				
HHI (0-1)	6	-0.01	-0.07	-0.01	0.02	-0.01	1.00			
Subscriber penetration (%)	7	0.00	0.03	0.06	0.17	0.18	-0.25	1.00		
Target part of group (0/1)	8	0.00	0.03	0.02	0.17	0.04	-0.13	0.22	1.00	
Acquisition experience (count)	9	0.00	0.09	0.11	0.14	0.57	-0.07	0.24	0.06	1.00
Buyer GDP growth (%)	10	0.01	0.01	-0.01	-0.02	0.02	0.03	-0.10	-0.02	-0.02

Table 4: Baseline results: determinants of acquisition target choice by buyers

INDEPENDENT VARIABLES	(1) Coefficients	(2) Marginal Effects	(3) Effect Sizes
Dyadic			
Buyer active in country (0/1)	0.919***	0.00569***	948%
	(0.0511)	(0.000741)	
Buyer active in region (0/1)	0.407***	0.000974***	162%
	(0.0437)	(0.000152)	
Overlap with buyer technology (0/1)	0.286***	0.000408***	68%
	(0.0723)	(0.0000741)	
Subscriber difference buyer - target (mn)	0.00175***	0.00000343***	34%
	(0.000452)	(0.000000906)	
Target Market			
HHI (0-1)	-0.331***	-0.000649***	-22%
	(0.0983)	(0.000195)	
Subscriber penetration (%)	-0.00122**	-0.00000239**	-19%
	(0.000459)	(0.000000911)	
Target			
Target part of group (0/1)	-0.141***	-0.000278***	-46%
	(0.0374)	(0.0000740)	
Buyer			
Acquisition experience (count)	-0.0251**	-0.0000492**	-32%
	(0.00885)	(0.0000175)	
Buyer GDP growth (%)	0.0250**	0.0000490**	23%
	(0.00860)	(0.0000171)	
Observations		469,333	
Pseudo R^2		0.095	

Notes: Column (1) reports coefficients as well as robust standard errors (in parentheses) of a Probit estimation. Column (2) reports the corresponding marginal effects. Marginal effects are calculated as average marginal effects, but because of being mutual exclusive, *Buyer active in country (0/1)* is calculated with *Buyer active in region (0/1)* = 0 and *Buyer active in region (0/1)* is calculated with *Buyer active in country (0/1)* = 0. Column (3) reports the effect size relative to the baseline probability of being acquired of 0.060%. For binary variables, the effect size represents the relative effect of going from 0 to 1, for continuous variables, it represents the effect of increasing the variable by one standard deviation. Asterisks denote significance levels (* 0.05 ** 0.01 *** 0.001). A constant and year fixed effects were included but results are not reported.

Table 5: Interaction results: determinants of acquisition target choice by buyers

DEPENDENT VARIABLE: Acquisition of Target by Buyer (0/1)			
INDEPENDENT VARIABLES	(1) Coefficients	(2) Marginal Effects	(3) Effect Sizes
Dyadic			
Buyer active in country (0/1)	1.419***	0.00443***	738%
	(0.153)	(0.000634)	
Buyer active in region (0/1)	0.405***	0.000968***	161%
	(0.0436)	(0.000152)	
Overlap with buyer technology (0/1)	0.297***	0.000418***	70%
	(0.0734)	(0.0000734)	
Subscriber difference buyer - target (mn)	0.00167***	0.00000327***	32%
	(0.000456)	(0.000000909)	
Target Market			
(1): HHI (0-1) * Buyer active in country (0/1)	-1.515***	-0.0229***	-763%
(2): HHI (0-1) @ Buyer active in country = 1	(0.458)	(00533)	
(1): HHI (0-1)	-0.220*	-0.000343*	-11%
(2): HHI (0-1) @ Buyer active in country = 0	(0.0938)	(0.000148)	
Subscriber penetration (%)	-0.00112*	-0.00000220*	-18%
	(0.000463)	(0.000000916)	
Target			
Target part of group (0/1)	-0.136***	-0.000267***	-45%
	(0.0375)	(0.0000740)	
Buyer			
Acquisition experience (count)	-0.0230**	-0.0000451**	-29%
	(0.00879)	(0.0000173)	
Buyer GDP growth (%)	0.0246**	0.0000482**	23%
	(0.00863)	(0.0000171)	
Observations		469,333	
Pseudo R^2		0.098	

Notes: Column (1) reports coefficients as well as robust standard errors (in parentheses) of a Probit estimation. Column (2) reports the corresponding marginal effects. Marginal effects are calculated as average marginal effects, but because of being mutual exclusive, *Buyer active in country (0/1)* is calculated with *Buyer active in region (0/1) = 0* and *Buyer active in region (0/1)* is calculated with *Buyer active in country (0/1) = 0*. Furthermore, *HHI (0-1)* is evaluated first at *Buyer active in country (0/1) = 1* and then at *Buyer active in country (0/1) = 0*. Column (3) reports the effect size relative to the baseline probability of being acquired of 0.060%. For binary variables, the effect size represents the relative effect of going from 0 to 1, for continuous variables, it represents the effect of increasing the variable by one standard deviation. Asterisks denote significance levels (* 0.05 ** 0.01 *** 0.001). A constant and year fixed effects were included but results are not reported.