

Time-to-completion for mergers and acquisitions in the food and agribusiness industry

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Abstract

Longer time-to-completion (TTC) increases transaction costs, delays deal benefits, and reduces the probability of meeting transaction objectives in mergers and acquisitions (M&A) transactions. This paper conceptualizes the determinants of TTC and estimates their effects in the food and agribusiness industry (FABI) due to the critical importance of TTC to M&A success and the dearth of existing studies on the industry. We confirm that longer TTC increases the likelihood of deal failure. We also find the following: company-specific factors such as acquirer solvency and leverage reduce TTC; deal complexity factors such as deals involving payment in cash or hard currency conclude faster; deals involving both acquirers and targets from the same country or industry take longer; using legal or financial advisers lengthens TTC; limited transparency or greater risk involved in a deal do not delay financing; deals consumed during a recession take longer; deal size and acquirer history of repeated M&A activities neither accelerate nor delay TTC. Considering the limited existing information on the contributions of various factors to timely deal completion or delays in FABI, our findings are useful in predicting M&A deal duration, costs, and potential for success. [EconLit Citations: G24, G34, L22, L66].

KEYWORDS

time-to-completion, mergers and acquisitions, transaction advisers, target, acquirer, negotiation, financing, regulatory approval

1 | INTRODUCTION

In general, the time-to-completion (TTC) is the period it takes to complete a merger and/or acquisition transaction. Most mergers and acquisition (M&A) deals (~70%) are completed within 180 days (Lavelle, 2019), but complex deals can take up to 20 years as per the Bloomberg M&A data. It is widely accepted that the longer it takes to complete an M&A transaction, the more likely it is for the deal to fall through (Li et al., 2017). Therefore, TTC is an important concept in determining M&A deal success, and the factors that affect it are of significant interest to M&A practitioners and scholars.

The importance of TTC in determining the probability of deal completion/success was formally recognized by Luypaert and de Maeseneire (2015). Since then, few studies have explored specific TTC determinants and their roles. Most of these merely focused on deal-specific factors (factors related to the nature of the M&A transaction), including deal size, payment mode, and whether or not participants are from the same industry or country). To date, however, few studies have comprehensively examined the roles of a broad range of factors that affect TTC (e.g., role of financial advisors, market conditions, and financial status of firms). Furthermore, no study has advanced a theoretical or conceptual framework for understanding the complexity of TTC or justified their analysis, despite the importance of the issue.

These are important gaps in the literature. Longer TTC can be costly if it delays the gains from synergy, which is a key motivation for M&A transactions in the first place (Luypaert & de Maeseneire, 2015). The faster a deal and its post-acquisition integration are completed, the sooner the realization of return on investment or ROI (Dauksis, 2018). Furthermore, longer TTC can increase overall M&A cost due to the time value of initial funds. Also, perceptions of M&A success fall over time (Angwin, 2004) while the likelihood of deal failure increases with TTC (Li et al., 2017).

In this paper, for analytical purposes, we more precisely define TTC as the period of time between M&A deal announcement (usually the bid date), and the receipt of approval to go ahead by the regulatory authority. Note, however, that in a few cases, the bid date may differ from the announcement date and that regulatory approval requests are sometimes denied. Figure 1 specifically depicts the official start and stop of the TTC. By the time a deal is announced, work has already gone into the M&A process. The preliminary (pre-announcement) phase of an M&A process starts with an assessment of gap finding in the acquirer's portfolio and ends when a feasible target is found. This period is not included in our notion of TTC. In the pre-TTC period, the acquirer would have conducted a portfolio gap assessment, sought and obtained approval from its shareholders and board that the gap warrants an investment, verified that the proposed investment will yield reasonable returns, selected an acquisition target, and carefully studied the selected target. It is difficult to predict or explain the time consumed in the pre-TTC period as

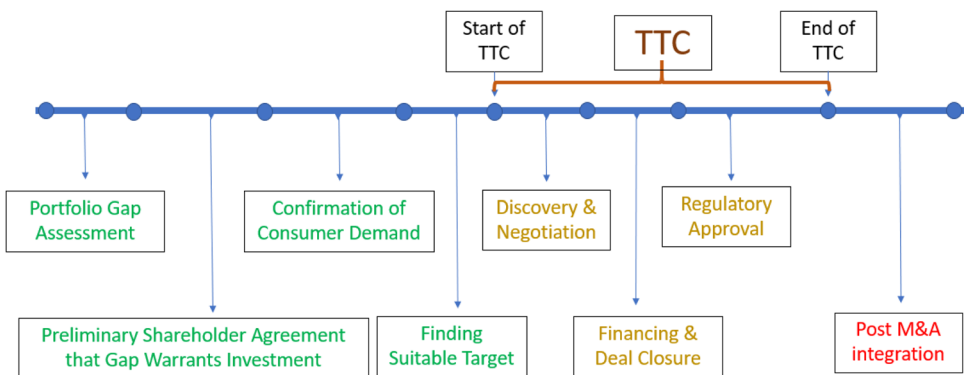


FIGURE 1 Defining time to completion (TTC)

this depends on the volume of needed preliminary research and gap analysis, and the nature of the industry, acquirer, and target.

It is important to understand the key component of TTC, the factors that determine them, and the effects of TTC determinants. As shown in Figure 1, the three phases of overall TTC include: time devoted to (a) negotiation, (b) financing the deal by an investment bank (IB), and (c) obtaining regulatory approval. Delays can occur in any of these phases. In Phase 1, we expect that as each party seeks to maximize the benefits to itself, it is concerned about the future profitability of the deal or resulting entity, the amount and mode of payment, tax benefits, and in the case of a merger, the postintegration synergies, and so forth. On the basis of the literature, we expect that delays in this phase are attributable to the characteristics of the deal, of both the buyer and seller, and of the market (Adelaja et al., 1999), including willingness to sell (de Bodt et al., 2014). As suggested by Maqbool and Zameer (2018), the financial statements of both companies and the nature of the deal, including deal complexity indicators, reflect future performance possibilities.

Deal complexity (e.g., more than one country or industry, hidden information, etc.) could complicate the due diligence process and lead either company to hire a legal or financial adviser to make the deal sounder and more sustainable. Note that the performance of a company indicates not only firm success, but firm objectives and strategy (Khudhair et al., 2019), and regulatory compliance (Chang & Taylor, 2016; Gan et al., 2015; Maqbool & Zameer, 2018). The extant literature identifies some of the factors that explain deal complexity, including bid value or deal size (Grinstein & Hribar, 2004); cross-border cultural differences (Popli & Kumar, 2016); degree of government control in the target sector (Reddy et al., 2016); limited knowledge of business practices (Luypaert & de Maeseneire, 2015; Dikova et al., 2010); cross-country/cross-sectoral nature of a deal (Bugeja et al., 2012; Coakley & Iliopoulou, 2006; Grinstein & Hribar, 2004); using stocks instead of cash as payment (Reddy et al., 2016); degree of deal hostility (Walter et al., 2008); weak shareholder support (Luypaert & de Maeseneire, 2015); market uncertainties (Graff et al., 2020). We expect that the more favorable these factors are, the shorter the TTC.

How transparent the participants in an M&A deal are, affects the TTC. The literature shows that “financial factors are significant determinants of the transparency of a company” (Ahmed, 2015; Arsov & Bucevska, 2017). The extant literature identifies three determinants of the transparency of a deal: (1) nature of ownership, (2) financial reports, and (3) board and management structure. These factors include financial leverage or the proportion of assets financed (Chow & Wong-Boren, 1987), ratios of market value to book value (Berglöf & Pajuste, 2005), acquirer's growth rate (Berglöf & Pajuste, 2005), concentrated ownership (Hanifa & Rashid, 2005), firm size (Hanifa & Rashid, 2005), liquidity (Trabelsi et al., 2008), expected performance (Trabelsi et al., 2008), R&D expenditure (Trabelsi et al., 2008), age of the company (Bokpin, 2013), profitability (Bokpin, 2013) and the audit quality (Bokpin, 2013). When a company's SPELL ratios (e.g., return on investment [ROI], return on equity [ROE], and return on assets [ROA]) are used to explain its performance, they also explain the transparency and complexity of the deal (Maqbool & Zameer, 2018). To be sure, SPELL is a standard acronym used to describe Solvency, Profitability, Efficiency, Liquidity, and Leverage. The literature, therefore, provides a sufficient basis for the development of a formal model or framework for understanding the time required to conclude negotiation and due diligence.

Phase 2, the time required by an investment banker (IB) to conclude financing, is affected by several factors, including risk (Cai et al., 2016) and transparency factors from Phase 1 (Marquardt & Zur, 2015). SPELL ratios reflect the acquirer's payment capacity. For example, for public companies which are usually more transparent, the IB is more confident, and TTC is likely to be shorter (Cai et al., 2016; Cain et al., 2011; Dhaliwal et al., 2016; Marquardt & Zur, 2015). Again, the literature provides some guidance on how to conceptualize the time required for financing.

Phase 3, the regulatory compliance phase, is equally complicated. Stringent regulatory and policy requirements can slow down the completion of M&A deals. Regulatory approval delays could emanate from three possible sources (Bushman et al., 2004). The first, antitrust policies, aim to protect an industry from excessive consolidation and the exercise of monopoly power. Oligopoly behavior can diminish consumer utility by increasing the price-fixing power of the firm (Röller et al., 2001). As M&As can make an industry less competitive

(Gomes-Casseres, 2018) by increasing the market share of the acquirer, regulators seek to protect public interests while supporting economic growth and industry investments, identified in the Harvard business review. The second is international cross-border regulations (Utesch-Xiong, 2021). Acquirers are likely to face added regulatory scrutiny in foreign markets due to bureaucracy, self-interest/dealing, and the desire to protect domestic firms (Bittlingmayer & Hazlett, 2000). The third is monetary policy constraints. The need for foreign exchange to complete an M&A transaction may complicate the transaction. Country financial authorities may not always be willing to part with foreign exchange to finance an international acquisition (Adra et al., 2020).

To prevent monopoly power, the literature suggests that regulators also consider the size of the deal and the absence of transparency, which suggests greater monopoly power (Thijssen, 2005). The more favorable the values of these factors, the shorter the approval time. For cross-border M&As, complexity can simply be explained by the cross-border nature of such deals vis-à-vis domestic deals. The currency in which the deal was transacted matters. Hence, the TTC of the regulatory approval phase may be explained through appropriate analysis.

In essence, the existing literature lays the foundation for a more deliberate, theoretically sound, and comprehensive investigation into TTC determinants. Because M&A involves two players (target & acquirer), optimal TTC determination necessarily involves optimization by each party at each TTC phase and overall. Thijssen (2005) describes this as dual-party profit maximization under a perfect information scenario. However, no study has yet advanced a coherent conceptual or theoretical explanation for the entire TTC period, especially the time taken for investment banking and regulatory approval decisions. Also, most studies zero in on one or two causes of delay, rather than explore, more comprehensively, the processes involved in TTC. In this paper, we address these gaps in the literature while advancing knowledge about how deals get delayed or accelerated.

We use the food and agribusiness industry (FABI) as our case study because of the critical importance of TTC to the success of M&A transactions and the absence of existing studies on TTC in the industry. While several studies have examined specific components of TTC in other industries, including pharmaceuticals, no study has explained TTC in the FABI. This study, therefore, places the literature at least at par with other industries in which TTC has been studied. For FABI, we further explain the factors that determine TTC in a more comprehensive way than previous studies have for other industries and demonstrate the value of shorter TTC. This moves the literature even further than what exists for other industries.

There are five additional reasons for selecting FABI. First, like the pharmaceutical industry, FABI firms are highly regulated and M&As involving them are highly time-sensitive. FABI firms are also highly dependent on leveraging “first-mover advantages” to pursue their competitive interests in a market, where, responding quickly to consumer demand can add to their competitive advantage and research and new product development can make a huge difference. However, research in the pharmaceutical industry requires huge capital investments, longer period of clinical trials, and longer period of regulatory scrutiny and regulatory approval. Therefore, for the FABI, when a merger or acquisition is chosen as a strategy to achieve “first-mover advantage”, time is of the essence and timely completion of the deal is critical to short and long-term success. Also, TTC in the FABI tends to be much shorter (e.g., average TTC is 180 days in FABI, but 250–280 days in the pharmaceutical industry). Note that for FABI M&As, TTC is more evenly distributed between negotiation, financing, and regulatory approval, while it is more skewed in the direction of regulatory approval for the pharmaceutical industry. Again, it is noteworthy that studies exist on TTC in the pharmaceutical industry, but none exists in the FABI.

Second, the economic contributions of FABI are quite substantial Adelaja et al., 1999). FABI accounts for 10%–20% of the gross domestic product (GDP) of most developing countries (Nash et al., 2013). For the United States, on average, 12.6% of the household budget is spent on food, and agriculture-related industries contributed \$992 billion to GDP and 11% to employment in 2015. Nearly 70% of the global population still depends on FABI for their livelihood (Zavatta, 2014). FABI also has a significant global footprint (total sales in 2018 reached \$8.7 trillion, with \$5 trillion coming from agribusiness and \$3.4 trillion from food). Third, FABI has featured major M&A activities. For example, 6% of global M&A transactions are attributable to FABI (global value of M&As in 2018 was US \$3.9 trillion, with \$1.6 trillion (41%) for US deals; Szmigiera, 2019). Agribusinesses alone ranked fourth in the value of

M&A deals (Martinez & Elitzak, 2019). Fourth, the GFABI has strong consumer links. For example, food alone accounts for 10% of global consumer expenditures and 40% of employment (Goedde et al., 2015).

Finally, while companies spend over \$2 trillion on acquisitions annually, the M&A failure rates are typically between 70% and 95% (Christensen et al., 2011). Deal failures in FABI are also quite rampant). About 83% of FABI M&A transactions fail to deliver management-promised shareholder value increases (Nguyen & Kleiner, 2003; Appelbaum et al., 2013; Das & Nanda, 2012)—42% fail to increase shareholders' values while 45% decrease it. A key reason is excessive TTC (Thompson & Kim, 2020), which translates into costlier transactions, deal failures, or delayed benefits realization. Lavelle's (2019) finding that average TTC rose more than 30% in the last decade is also concerning, implying that transaction costs and deal failures will increase over time.

We organize the rest of this paper as follows. Section 2 presents the conceptual framework and theoretical model of TTC determination. Section 3 describes the data and estimation techniques for hypothesis testing regarding the FABI at the global level. Section 4 presents our empirical results, including the results on the relationship between TTC and the likelihood of deal failure in the global FABI. The final section discusses the practical, policy, and research implications of this study not only for FABI but also for other industries.

2 | CONCEPTUAL FRAMEWORK AND MATHEMATICAL MODEL

To provide the theoretical foundations for how both the acquirer and target make optimization choices at each phase, we draw on existing TTC and M&A literature. In each phase, we assume that each player seeks to maximize utility and returns on invested time, money, and efforts.

2.1 | Phase 1: Negotiation and due diligence

In Phase 1, both the acquirer and target must consider the mutual costs and benefits of the transaction to arrive at mutually agreeable terms. A larger, more profitable, more liquid, less leveraged, and/or more efficient acquirers will try to accelerate the TTC by offering better deal terms. Likewise, a financially viable target may seek to delay the deal to attract higher bids (or better suitors) if it believes that it is not being adequately compensated. However, as the targeting decision is made before the start of TTC (see Figure 1), the target's characteristics may not matter by the time negotiation/due diligence starts. The acquirer is more likely to pursue a target it believes has low resistance (Jennings & Mazzeo, 1993).

We assume that each of the primary actors in Phase 1 has a preferred *TTC*. The target chooses a *TTC* that optimizes the net present value (*NPV*) of all its costs and revenues from the transaction and net revenues from current operations. The acquirer's preferred *TTC* maximizes the gap between the *NPV* of the company acquired and all costs incurred in the acquisition process, in addition to the net revenues from its current operations. Therefore, actual *TTC* is the optimal timeframes for both the bidder (acquirer or buyer) and target (seller). For simplicity, we assume an acquisition transaction. However, the outcome for a merger is easily derived.

2.1.1 | Buyer's (acquirer's) optimization problem

Superscript "B" denotes the buyer whose optimization problem is to select a single-deal completion date (T^B) that maximizes the value of the transaction to company shareholders. Recall that, the buyer pays the price P^X to the seller to acquire the assets valued previously at A^S . Denote the buyer's discount rate as r^B , the net price or per-unit profit from the devotion of the new fixed assets to the ongoing or current buyer's operation in time "t" (i.e., per unit revenue minus cost) as P^B , $f^B(\cdot)$ as the new production function of the buyer using seller's old assets and Θ^B as a

vector capturing the negotiation and due-diligence factors. Note that, Θ^B includes the SPELL variables of the buyer, deal characteristics, and transparency variables.

The buyer's optimal completion date (T^{B^*}) depends on the net present value (NPV) of future streams of income from the purchase. However, the stream of income to the buyer from buying the company (KV^B) is essentially the sum of income it earns from devoting the acquired assets to its operations after the sale, transaction costs it incurs, and the opportunity cost of the money it ties down (interest loss) for the acquisition. The interest income lost from tying down company assets for the duration of the transaction can be expressed as:

$$PV^B = \int_t^T e^{-r^B t} [i^B P^X(T^B) A^S] dt. \tag{1}$$

In Equation (1), the buyer is losing interest income by tying up resources to buy the assets of the seller. The transaction cost incurred by the sale of the assets in time T^B is also considered to be fixed at the time of discounting. That is,

$$C^B = e^{-r^B T^B} C_1^B, \tag{2}$$

where C^B is the present value of the total purchase transaction cost of buyer (C_1^B). Now,

$$TTC^B = T^B - t. \tag{3}$$

The stream of income after the purchase of assets, purchase value (PV^B), can be specified as:

$$PV^B = \int_T^{T^B} e^{-r^B t} [P^B(t) f^B(A^S, \Theta^B)] dt, \tag{4}$$

where P^B is unit profit when the acquirer devotes the target's assets to its production function f^B . T^B is the acquirer's financial planning horizon which decides to buy at T^B .

The dynamic optimal acquisition problem of the buyer can be specified as:

$$Max_{\{T^B\}} PV^B = - \int_t^{T^B} e^{-r^B t} [i^B (P^X(T^B) A^S)] + \int_{T^B}^{T^B} [e^{-r^B t} [P^B(t) f^B(A^S; \Theta^B)]] dt - e^{-r^B t} C_1^B. \tag{5}$$

Optimal completion time depends on the marginal relationship between transaction costs and returns. Differentiating Equation (5) with respect to A_a and re-arranging the terms, we obtain:

$$P^B(t) \frac{\partial f^B(A^S; \Theta^B)}{\partial A^S} = -i^B \frac{\partial P^X(t) A^S}{\partial A^S}. \tag{6}$$

From Equation (6), the buyer will buy the seller's company, as long as the return from buying it is sufficient to compensate it for the opportunity cost of the stream of costs associated with the transaction. The problem can be solved by differentiating Equation (5) with respect to T^B . Again, following the Leibniz integral rule and rearranging this expression yields:

$$-i^B (P^X(T^B) A^S) - r^B C_1^B = P^B(t) f^B(A^S; \Theta^B). \tag{7}$$

At the optimal end, which is (T^B) in Equation (7), the return from owning and managing the company will be equal to the net costs associated with the transaction, including the price paid for the assets of the seller. The conditions in Equation (7) also define the factors that determine the span of the preferred TTC of the buyer (TTC^B).

The end time T^B can be defined, at optimal, in terms of the parameters that define the optimal condition in the following equation:

$$T^{B*} = T^{B*}(P^X, A^S, P^B, i^B, \Theta^B). \quad (8)$$

From Equation (8), TTC will change with the buyer's bid price, current profitability, interest rate, anticipated market conditions, company characteristics, regulations, the industry of the company, and the business environment. The effects of each of these on TTC^B can be shown by differentiating Equation (5) with respect to T^B , using the Leibniz integral rule, totally differentiating the resulting expression, and solving for the effective relationship with each parameter. The total derivative of Equation (5) with respect to T^B (denoted by PV^B) yields:

$$\begin{aligned} dPV^B = & f^B(A^S; \Theta^B) dP^B + P^B(t) \left[\frac{\partial f^B(\cdot)}{\partial A^S} \partial A^S + \frac{\partial f^B(\cdot)}{\partial \Theta^B} \partial \Theta^B \right] - [P^X(T^B) A^S] di^B - i^B \left[\left(\frac{\partial P^B}{\partial T^B} dT^B \right) A^S \right] - i^B [P^X(T^B) \partial A^S] \\ & + r^B dC_1^B + C_1^B dr^B = 0. \end{aligned} \quad (9)$$

The comparative statistics suggest that with respect to each of the parameters in Equation (8) show that these parameters affect the length of the TTC .

$$\frac{\partial T^B}{\partial i^B} < 0, \quad \frac{\partial T^B}{\partial P^X} < 0, \quad \frac{\partial T^B}{\partial A^S} \leq 0, \quad \frac{\partial T^B}{\partial P^B} < 0, \quad \text{and} \quad \frac{\partial T^B}{\partial \Theta^S} \leq 0. \quad (10)$$

In Equation (10), P^X is assumed to be a function of T^B and other exogenous factors (z^B). *Ceteris paribus*, an increase in the potential interest rate earned if funds tied down in the acquisition process were invested at the market rate decreases the benefits from the purchase and reduces the TTC ($(\partial TTC^B / \partial i^B) < 0$). Hence, a longer TTC^B reduces the price of the assets to be purchased (i.e., $\partial P^X / \partial T^B > 0$). Hence, a positive future economic outlook will shorten the TTC .

The higher the bid price, the lower the TTC^B (i. e., $\partial T^B / \partial P^X < 0$). A modification can simply be made to accommodate higher closing than initial bid price. Buyers are more willing to accelerate a deal which offers a higher bid price. The effect of the seller's asset value is uncertain, as it depends on the profitability from purchasing the company, vis-a-vis investing in the market. If the buyer's returns from keeping its money are greater than from closing the deal, TTC^B will be longer. The effect of the current net profitability of the buyer on TTC is negative ($\partial T^B / \partial P^B < 0$). A profitable buyer is more eager to assimilate the target and will not drag on the process. Finally, the effects of specific company, industry, market, regulatory, and other characteristics will depend on each characteristic.

2.1.2 | Seller's (target's) optimization problem

Superscript "S" denotes a seller-related variable or parameter. The seller seeks to select a completion date (T^S) which maximizes the value of its company. We make a simplifying assumption that the seller expects the deal to close. The choice of an optimal T^S for the seller, however, depends on the net present value (NPV) of future income streams from (a) the sale and (b) earning between the initial deal announcement date and the sale completion date. Transaction costs represent an outflow, which must be netted against the income streams discussed above.

The seller's income stream from keeping the company is expressed as follows:

$$KV_t^S = \int_t^T e^{-r^S t} [P^S(t) f^S(A^S; \Theta^S)] dt, \quad (11)$$

where KV_t^S is seller's keep value, r^S is the seller's discount rate, P^S is the net price or per-unit profit from devoting the seller's fixed assets to ongoing or current operation in time "t" (i.e., per unit revenue minus cost), $f^S(t)$ is the production function for seller company's total output using a given level of company's assets (A^S) and Θ^S is a vector capturing the negotiation and due-diligence factors. Note that, Θ^S includes the seller's SPELL variables, deal characteristics, and transparency variables. We make a simplifying assumption that fixed assets are used in fixed proportions with other inputs and are devoted to ongoing operations until time T^S . The seller's TTC (TTC^S) can be expressed as:

$$TTC^S = T^S - t, \tag{12}$$

where t is the date of the deal announcement date and T^S is the deal closure date.

The benefit of selling the company at time T^S is the return (interest income) on funds derived by selling the assets of the company if it were invested elsewhere in the economy. Assuming that a deal, which closes at the preferred TTC^S , closes at the bid price, the stream of income from the sale or disposal of company assets, or disposal value (DV^S), can be specified as follows:

$$DV^S = \int_T^{\tilde{T}^S} e^{-r^S t} [i^S P^X(T^S) A^S] dt, \tag{13}$$

where i^S is the rate of interest that applies to the seller, P^X is the final price per unit of fixed assets at which the company is sold to the buyer (depends on the time of sale (T^S), and \tilde{T}^S is the financial planning horizon of the seller which sells at T^S . Note that \tilde{T}^S could be equal to ∞ . P^X embodies seller, buyer, and industry characteristics (z^S), and the time of sale. Also, in Equation (13), A^S denotes fixed seller assets managed by the seller's management until time T^S but made available for sale at time T^S . As P^X is the same for both, it ties both the buyer and seller together (seller pays what the buyer gets), except for transaction cost (which is discussed next).

The sale of the assets in time T^S imposes transaction costs that are charged to the seller (C^S). This includes costs associated with staff efforts, extra deal-related costs, filing fees, legal advisory fees, financial advisory fees, possible capital gains taxes, commissions to agents, and other transaction costs. To simplify, it is assumed that the company considers the transaction cost to be fixed at the time of discounting. Therefore, transaction costs can be expressed as:

$$C^S = e^{-r^S T^S} C_1^S, \tag{14}$$

where C^S is the present value of the sale transaction cost (C_1^S).¹³ Hence, the seller's TTC^S problem is determined by factors that influence the flow of benefits from continuing to operate independently and selling, as well as transaction costs.

The dynamic optimal sale problem of the seller can be specified as:

$$Max_{\{T^S\}} DV^S = \int_t^{T^S} e^{-r^S t} [P^S(t) f^S(A^S; \Theta^S)] dt + \int_{T^S}^{\tilde{T}^S} [e^{-r^S t} [i^S (P^X(T^S) A^S)]] dt - e^{-r^S T^S} C_1^S. \tag{15}$$

The optimal keep or sell decision, therefore, depends on the marginal relationship between the returns from keeping the company versus the returns from selling it, affected by the transaction costs. This is derived by differentiating Equation (15) with respect to fixed asset A^S and re-arranging the terms:

$$P^S(t) \frac{\partial f^S(A^S; \Theta^S)}{\partial A^S} = -i^S \frac{\partial [P^X(T^S) A^S]}{\partial A^S}. \tag{16}$$

From Equation (16), the seller retains its company if the return from keeping it is sufficient to compensate it for the opportunity cost of the stream of benefits if the company were to be sold. The TTC problem of the target company (TTC^S) can be solved by differentiating Equation (15) with respect to T^S . Following the Leibniz integral rule and rearranging this expression yields:

$$i^S (P^X(T^S)A^S) - r^S C_1^S = P^S(t)f^S(A^S; \Theta^S). \quad (17)$$

In Equation (17), the optimal end time, T^S , the return from keeping the company and not selling will be equal to the net benefit from selling it. It is the optimal switch point where the target will sell or not sell. The conditions in Equation (17) also define the factors that determine the timespan of the preferred TTC of the seller (TTC^S). The end time (T^S) can be defined, at optimal, in terms of the parameters that define the optimal condition in Equation (17):

$$T^S = T^S(P^S, A^S, P^X, i^S, \Theta^S). \quad (18)$$

From Equation (18), TTC will change with the bid price, current profitability, interest rate, anticipated market conditions, company characteristics, regulations, the industry of the company, and the business environment. The effect of each on TTC^S is obtained by differentiating Equation (15) with respect to T^S , using the Leibniz integral rule, totally differentiating the resulting expression, and solving for the effective relationship with each parameter. Using total differentiation, the derivative of Equation (15) with respect to T^S (denoted by DV^S) yields:

$$dDV^S = f^S(A^S; \Theta^S) dP^S + P^S \left[\frac{\partial f^S(\cdot)}{\partial A^S} \partial A^S + \frac{\partial f^S(\cdot)}{\partial \Theta^S} \partial \Theta^S \right] - [P^X(T^S)A^S] di^S - i^S \left[\left(\frac{\partial P^S}{\partial T^S} dT^S \right) A^S \right] - i^S [P^X(T^S) \partial A^S] + r^S dC_1^S + C_1^S dr^S = 0. \quad (19)$$

The comparative statistics with respect to each of the parameters in Equation (18) show that these parameters affect the length of the TTC .

$$\frac{\partial T^S}{\partial i^S} = - \frac{[(P^X(T^S, z^S)A^S) di^S]}{i^S A^S [\partial P^S / \partial T^S]} < 0, \quad (20)$$

$$\frac{\partial T^S}{\partial P^X} = - \frac{i^S A^S}{i^S A^S [\partial P^S / \partial T^S]} = - \frac{1}{\partial P^X / \partial T^S} < 0, \quad (21)$$

$$\frac{\partial T^S}{\partial A^S} = - \frac{[P^S(\partial f^S(\cdot) / \partial A^S) - i^S (P^X(T^S, z^S))]}{i^S A^S [\partial P^S / \partial T^S]} \lesseqgtr 0, \quad (22)$$

$$\frac{\partial T^S}{\partial P^S} = - \frac{f^S(\cdot)}{i^S A^S [\partial P^X / \partial T^S]} > 0, \text{ and} \quad (23)$$

$$\frac{\partial T^S}{\partial \Theta^S} = - \frac{[P^S]}{i^S A^S [\partial P^X / \partial T^S]} \frac{\partial f^S(\cdot)}{\partial \Theta^S} \lesseqgtr 0. \quad (24)$$

In Equations (20–24), P^X is assumed to be a function of T^S and other exogenous factors (z). From Equation (20), ceteris paribus, an increase in the rate of interest earned from investing sale proceeds will increase the benefits from the sale, thereby reducing the TTC . That is, $(\partial TTC^S / \partial i^S) < 0$. This assumes that a higher TTC^S increases the sale price of the assets (i.e., $\partial P^X / \partial T^S > 0$). Hence, a positive future economic outlook will shorten the TTC . From Equation (21), a higher bid price will lower the TTC^S ($\partial T^S / \partial P^X < 0$). Sellers are more willing to accelerate a deal that offers a higher bid price. From Equation (22), the effect of the company's asset value is uncertain. It depends on the returns from keeping the company versus selling it. If the former is greater than the latter, TTC^S will be longer. From Equation (23), the effect of current net profitability on TTC is positive ($\partial T^S / \partial P^S > 0$). A seller is less willing to sell a

profitable company and will drag on the M&A process. Finally, from Equation (24), the effects of specific company, industry, market, regulatory and other characteristics will depend on each specific one. These are further discussed below, where specific hypotheses are discussed.

2.1.3 | Optimal TTC in Phase 1

Equations (8) and (18) define the demand and supply sides of TTC. Hence, at equilibrium T^* ,

$$T^* = (P^S, P^X, P^B, A^S, i^B, i^S, \Theta^S, \Theta^B). \quad (25)$$

In Equation (25), P^B is the acquirer's profitability when it devotes the purchased asset of the target to its management. The pre-deal profitability of the acquirer is a reasonable proxy. P^S denotes the seller's profitability in its current operations. A reasonable proxy for this is the historical profit of the target. P^X is the equivalent profitability implied by the premium price associated with the bid. A reasonable proxy for this is the purchase price for the target (deal size). For a transaction to make economic sense to the seller if all profit-related factors are measured in equivalent terms, $P^X > P^S$. Similarly, the buyer assumes that it can create an improved management scenario where $P^B > P^X > P^S$. In Equation (25), the seller's and buyer's discount rates, r^B and r^S , are assumed also to be purely exogenous and can be proxied by several macroeconomic indicators. On the basis of the opportunity cost concept, it is expected that each party's discount rate is directly related to its profitability, such that $(\partial r^S / \partial P^S) > 0$ and $(\partial r^B / \partial P^B) > 0$. Please note that P^B , P^X , and P^S can be proxied by standard profitability ratios such as ROI, ROA, earnings per share, and investment turnover ratio.

Also, in Equation (25), Θ^S denotes seller-related characteristics while Θ^B denotes buyer-related characteristics along with deal-specific factors and transparency factors in both Θ^S and Θ^B . Finally, A^S can be proxied by such measures as tangible and intangible assets, the presence of intellectual property, and the value of the brand. In the next subsection, we show the relationships between TTC and specific financial ratios and other important factors in the M&A process.

2.2 | Phase 2: Time to finance: Profit maximization of the IB

The IB of the acquirer arranges for financing in Phase 2. We propose that the relevant factors that shape the IB's timeframe include the assessment of capital need (assessment of tangible assets of buyer and seller), shareholder approvals for both the acquirer and the target, and macroeconomic indicators such as interest rate, inflation rate, and sectoral GDP (Boateng et al., 2017; Wang, 2008). Because asymmetric information implies risk, the IB tries to minimize risk by gathering more information. This involves time and, therefore, a constraint on the reward function R .

In the financing phase, the IB has two alternatives. It can either invest in a risk-free bond that follows the following deterministic reward function:

$$R_t = e^{-rt} R_0, R_0 > 0, \quad (26)$$

where r is the risk-free return on a riskless bond. It can also invest in an alternative that involves risk due to the presence of asymmetric information in the deal (Ludkovski, 2009). As per Alsmeyer and Jaeger (2005), "the monetary loss from asymmetric information follows the following geometric Brownian Motion:

$$X_t = X_0 \exp\left(\sigma B_t \left(\mu_X - \frac{\sigma^2}{2}\right)t\right), \quad t \geq 0, \tag{27}$$

where X_t is the monetary loss from the risk associated with asymmetric information in time t ; X_0 is the monetary loss from asymmetric information at the initial level when the bank has not had time to reduce asymmetric information and follows Ito's drift-diffusion process $dY_t = \mu_Y dt + \sigma_Y W_t$; μ_X is the drift parameter such that $\mu_X \in IR$ and volatility $\sigma_X > 0$, and (B_t) for all $t \geq 0$ denotes the standard Brownian Motion (Wiener Process), starting at time period $t = 0$. In Equation (27), the volume of asymmetric information reduces over time as the IB accumulated more discovery. That is, the bank takes time to make its decision to reduce the asymmetric information until time t , and for the time-period $(T - t)$, it invests its capital K in a particular M&A deal. So, following Alsmeyer and Jaeger (2005), the discounted reward to the IB in investing is:

$$Ke^{-r(T-t)} - X_t e^{-r(T-t)} = (K - X_t)e^{-r(T-t)}, \tag{28}$$

if the IB wishes to finance the deal at time t .

To determine optimal information collection as a function of time, to maximize profits, the following optimal stopping problem needs to be solved:

$$V(x) = \sup_{\tau} \mathbb{E}_x[(K - X_t)e^{-r(T-\tau)}], x > 0, \tag{29}$$

where "sup" defines supremum, which is evaluated over the stopping time τ for $(X_t)_{t \geq 0}$. Note that $[(K - X_t)e^{-r(T-t)}]_{t \geq 0}$ is a super-martingale for $r \geq \mu$ and a martingale for $r = \mu$, when there is no arbitrage. We assume, in the case of this study, that $r = \mu$. We only consider the case of martingale.

To find the optimal stopping time, Alsmeyer and Jaeger (2005) suggested to look within the set of threshold rules. That is,

$$\tau_a \stackrel{\text{def}}{=} \mathbb{E}_x[(K - X_t)e^{-r(T-t)}], \quad \text{when } 0 < a \leq K \tag{30}$$

where τ_a is a given stopping time. Following the procedure above, the first step is to compute

$$V_a(x) \stackrel{\text{def}}{=} \mathbb{E}_x[(K - X_t)e^{-r(T-t)}], \quad 0 < a \leq K. \tag{31}$$

In the Brownian motion $(B_t)_{t \geq 0}$, the first epoch t is denoted by the stopping time τ_a and B_t is usually on or below the following line $\sigma^{-1}(\log(a/X_0) - (r - \sigma^2/2)t)$.

The density of $P_x(\tau_a \in \cdot, \tau_a < \infty)$ is known. This leads to the following after some calculations:

$$V_a(x) = \begin{cases} (K - a)\frac{x}{a}^{-2r/\sigma^2}, & \text{if } x \geq a \\ K - x, & \text{if } x \leq a \end{cases} \tag{32}$$

for every $a > 0$. For the optimal threshold of a , that is, a^* , V_{a^*} should be differentiable at a^* , to follow the smooth fit principle. So,

$$\frac{d}{dx} \left[(K - a) \left(\frac{x}{a}\right)^{2r/\sigma^2} \right]_{x=a^*} = -1. \tag{33}$$

By solving the above equation, we obtain

$$a^* = \frac{2rK}{\sigma^2 + 2r}. \quad (34)$$

Note that for $V^* \stackrel{\text{def}}{=} V_{a^*}$, $V^*(x) \geq (K + x)$, as $[V^*(X_t)e^{-r(T-t)}]_{t \geq 0}$ is a super-martingale. Thus,

$$\mathbb{E}_x e^{-r\tau}(K + X_\tau) \leq \mathbb{E}_x e^{-r\tau}V^*(X_\tau) \leq \mathbb{E}_x V^*(X_0) = V^*(x) \quad (35)$$

for $x > 0$ and stopping times τ . Therefore, we can state that $V^* = V$ and the second-order condition also holds.

So, as shown in Equations (34) and (35), the optimal time an IB takes to decide to finance a deal depends on: total capital investment (K), current interest rate (r), cost associated with remaining asymmetric information in the deal (X_t), expected risk associated with remaining asymmetric information (σ), and expected return (μ). In the empirical analysis section, we use proxy variables to explain asymmetric information and its role on the TTC that is associated with IB decision-making for financing.

2.3 | Phase 3: Time for approval: Regulator's utility maximization

In Phase 3, the regulatory authority seeks to ensure that antitrust/anticompetition laws are upheld and consumers are protected from high market concentration. The regulator's utility is the public's or society's utility. Specifically, it wishes to ensure that the utility of the public is not diminished as a result of the M&A transaction while ensuring the economic efficiency benefits of an M&A. The regulators must also ensure that the deal does not result in an excessive concentration, market power, market share consolidation, or price-setting power.

Consider a decision-making timeframe with initial period $t = 0$ and final period $t = T$ ($t = 0, 1, 2, \dots, T$). Denote the discount rate as r_t and the interest rate as ρ_t . By the time the deal is delivered to the regulator for approval, the acquirer would have already blessed the deal only if it is utility-maximizing from its end. However, the utility may be compromised if the regulator takes excessive time to bless the deal. The part of the acquirer's utility that depends on the time consumed by the regulator in decision-making can be defined as:

$$u^A(ms, mp, p) = (\alpha ms_t + \beta mp_t + \gamma p_t), \quad (36)$$

where ms is market power, mp is market share, and p is the monopoly pricing power of the acquirer after the acquisition. Thus, the present value of the acquirer's utility function is:

$$u^A = \sum_{t=0}^T \left(\frac{1}{1+r} \right)^t u^A(ms, mp, p) = \sum_{t=0}^T \left(\frac{1}{1+r} \right)^t (\alpha ms_t + \beta mp_t + \gamma p_t). \quad (37)$$

Following (Thijssen, 2005), it is assumed that $\partial u^A / \partial ms \geq 0$, $\partial u^A / \partial mp \geq 0$, $\partial u^A / \partial p \geq 0$.

When a deal is already accepted by the acquirer and moved forward to the regulator for approval, it can be assumed that the target has also already blessed the deal as utility-maximizing. Thus, the present value of the utility function of the target is defined as:

$$u^T = \sum_{t=0}^T \left(\frac{1}{1+r} \right)^t u^T(DV) = \sum_{t=0}^T \left(\frac{1}{1+r} \right)^t e^{-\rho^S t} DV, \quad (38)$$

where DV is the earning of the target from selling the company. It is also assumed that a deal presented to the regulator already satisfies the condition of the target's utility maximization. Hence, the regulator is concerned mainly about the general public, whose interests are to be protected along with the joint utility of the acquirer company and target company. Thus, the regulator wants to maximize the combined utility of the acquirer, target, and the public.

From the regulator's perspective, the general public's utility depends on market power (ms) and the market share (mp) of the acquirer post-acquisition, and monopoly pricing power (p). The utility of the community is negatively related to all three factors. That is:

$$u^P = \sum_{t=0}^T \left(\frac{1}{1+r} \right)^t u^P(t) = \sum_{t=0}^T \left(\frac{1}{1+r} \right)^t (l - \alpha ms_t - \beta mp_t - \gamma p_t). \tag{39}$$

Similarly, the general public's utility function is defined as: $u^P(ms, mp, p) = (l - \alpha ms_t - \beta mp_t - \gamma p_t)$. Note the assumption that $\partial u^P / \partial ms \leq 0$, $\partial u^P / \partial mp \leq 0$, and $\partial u^P / \partial p \leq 0$.

The regulator's utility function is further defined as follows:

$$u^G = \alpha_0 \sum_{t=0}^T \left(\frac{1}{1+r} \right)^t (\alpha ms_t + \beta mp_t + \gamma p_t) + \alpha_1 \sum_{t=0}^T \left(\frac{1}{1+r} \right)^t e^{-\rho^S t} DV + \alpha_2 \sum_{t=0}^T \left(\frac{1}{1+r} \right)^t (l - \alpha ms_t - \beta mp_t - \gamma p_t), \tag{40}$$

where $ms_t = ms_0 \exp(\sigma W_t(\mu_{ms} - \frac{\sigma_{ms}^2}{2})t)$, $mp_t = mp_0 \exp(\sigma W_t(\mu_{mp} - \frac{\sigma_{mp}^2}{2})t)$, and $p_t = p_0 \exp(\sigma Z_t(\mu_p - \frac{\sigma_p^2}{2})t)$, $t \geq 0$ are expressions of a geometric Brownian motion. To determine the optimal utility level of the regulator, we have to solve the optimal stopping problem:

$$Q_s(x) = \sup_{\tau} \left[\begin{array}{l} \mathbb{E}_x [\alpha_0 \sum_{t=0}^T \left(\frac{1}{1+r} \right)^t (\alpha ms_t + \beta mp_t + \gamma p_t) \\ + \alpha_1 \sum_{t=0}^T \left(\frac{1}{1+r} \right)^t e^{-\rho^S t} DV_t \\ + \alpha_2 \sum_{t=0}^T \left(\frac{1}{1+r} \right)^t (l - \alpha ms_t - \beta mp_t - \gamma p_t)] \end{array} \right]. \tag{41}$$

In a process similar to the financing phase, solving $Q_s(x)$, we get s^* , which is the optimal time that the regulator takes to maximize its utility. This optimal time depends on: market power (mp), market power (ms), and monopoly price power (p). Please note that it is not necessarily the existing market power of the resulting entity from an M&A transaction that ultimately determines the regulator's time to approval, which is a portion of the longer TTC for the entire transaction, from negotiation to financing to regulatory conclusion. In the empirical analysis section below, proxies used for these variables also help to explain the regulatory aspect of TTC.

On the basis of the above, hypotheses regarding the elements of Θ^S , Θ^B , $V(x)$, and $Q(x)$ are now presented, including those about deal-specific factors, financial ratios, market-specific variables, the financing factors, and regulatory approval parameters. The hypothesized independent variables are explained in order of key issues surrounding the M&A process.

In Phase 1, we assume that the acquirer has a positive attitude and wants a shorter TTC. For company-specific variables, the acquirer's and target's measures of solvency, profitability, liquidity, leverage, and efficiency, as well as non-SPELL characteristics (e.g., tax implications, assets under management, and risk factors) are expected to affect TTC. We propose that the better the SPELL ratios of the acquirer, vis-à-vis the target, the greater the ability to expedite the process, thereby lowering TTC. For deal-specific variables, we consider such factors as cash payments, advisory services, and deal size as critical determinants. Deal-specific factors describe the complexity of the deal, and we assume that the higher the complexity of the deal, the longer the TTC. The market-specific variables such as GDP growth of the country, presence of recession, and so forth. These variables could have both a positive and a negative relation with TTC.

In Phase 2, we propose that factors such as loan size, deal size and length of the loan, the risk factors associated with the deal, the creditworthiness of the acquirer, along with the SPELL variables of the subject firm determine

TTC. While better values of the first three delay financing, better SPELL ratios, and higher creditworthiness expedite financing time. Finally, in Phase 3, regulators consider the market share, market power, and price-setting power of the acquirer company after the deal. The better the values of these parameters, the more time-consuming is the approval process.

3 | EMPIRICAL FRAMEWORK

The Bloomberg M&A database (BMAD) is used as our primary data source due to its ready availability. It encompasses all M&A transactions globally which involve publicly traded companies. Specifically, it provides daily information on M&A activities for all industries from January 1987 to June 2018, including the FABI. For each deal, BMAD provides data on financial and nonfinancial variables for both the target and the acquirer, as well as on several deal-specific indicators. The BMAD is joined with other data sources such as Compustat (e.g., R&D data) and the World Bank (e.g., information on macroeconomic indicators). Note that many of the variables for which data were obtained were transformed into forms that were more appropriate for our analysis. For example, a binary variable is more appropriate measure of the presence of a financial advisor in an M&A transaction. Table 1 provides the summary statistics on a sample variable available through BMAD.

The FABI component of the BMAD database consists of 26,825 observations (transaction), out of which 89.87% were completed and 10.13% were terminated. About 50% involve disclosure about the nature of the bid (friendly or hostile), 99.34% of which were friendly bids. Note that unfriendly bids could either be hostile or unsolicited. About 69% of the transactions involved cross-sector deals (where two firms are not from the same subsector, that is, the four-digit SIC code of the target and acquirer are different) while the rest were from within the same subsector.

Regarding the mode of payment, 52.91% of the deals were settled only by cash and 5.93% only through stock purchase. The remainder, about 41%, was through a mixture of cash, stock, and debt. Depending on the model estimated, the number of observations can drop significantly. For example, the presence of a financial or legal advisor is relatively rare in M&A transactions involving FABI. Out of 26,825 transactions, only 6.25% employed a financial advisor on either the acquirer or the target side. Similarly, only 3.74% of the deals employed a legal advisor.

We use the following simple linear regression model to estimate the relationship between TTC and its proposed determinants:

$$TTC = \alpha_0 + \alpha_1 P + \alpha_2 C + \alpha_3 F + \alpha_4 R + \epsilon, \quad (42)$$

where P is the vector of SPELL variables that capture the performance factors of the acquirer; C is the vector of dummy variables which capture the complexity factor of the deal, including the hiring of a legal and/or financial advisory firm, deal-specific variables, transparency of the acquirer, and the presence of recession (captures complexity from the economic environment); F is the vector of financing variables which include the credit rating and risk factor of the acquirer; and R is the vector of variables that includes repeated acquiring behavior by the acquirer, R&D investment of the acquirer, and the deal size.

Measures are needed on variables on both sides of Equation (45). TTC itself can be measured in days, months, or even years. The independent variables can also be measured in various ways. For example, measures of profitability can range from ROI, ROE, ROA, and return on sales (ROS). Note that because publicly available data sources (e.g., BMAD) cover only large companies, data is often weak on small companies (i.e., a large percentage of M&A targets are small companies for which SPELL variables are not reported). Hence, the target's financial information is available only for a limited number of firms. Given the asymmetry of negotiating power between large acquirers and small targets, we make a simplifying assumption that most target companies are too small to offer meaningful resistance during the negotiation process. Therefore, we assume that their financial characteristics have no bearing

TABLE 1 Summary statistics

Variable category	Variable description	No. of observations	Mean	SD	Min	Max
	Time-to-completion	16,963	52.26829	127.3107	-731	6731
	Deal status (Completed, terminated, or pending)	26,825	1.125107	0.5061558	0	3
Phase 1: Negotiation and due diligence	Company-specific performance factors	13,637	164.5891	13,946	-340,000	1,126,070
	Solvency					
	Acquirer long-term borrow to total liability	1711	133.2815	1659.059	-578,514	67,744.4
	Target long-term borrow to common equity					
	Profitability					
	Acquirer ROA based on bottom EPS	15,360	-895.5896	64,027.58	-5,464,930	1191.67
	Target net sales	3226	100	0	100	100
	Efficiency					
	Acquirer asset turnover	15,275	1.14691	1.018012	-0.625493	43.3332
	Target asset turnover	3144	1.513355	1.246162	0.000039	15.0066
Leverage	Acquirer assets equity	15,906	13.93274	1319.488	-653,413	166,381
	Logarithm of target total liabilities	3262	4.145755	2.209076	-6.069482	12.01918
Liquidity	Acquirer current ratio	15,546	2.525901	31.64738	0.00000195	3501.76
	Target quick ratio	3247	2.95303	49.04697	0.00000337	1549.88
Phases 1&2: Negotiation, due diligence & financing	Deal-specific complexity factors	26,825	0.1568686	0.3636836	0	1
	Acquirer legal adviser					
	Acquirer financial adviser	26,825	0.197055	0.3977816	0	1
	Target financial adviser	26,825	0.0832805	0.2763109	0	1
	Same industry	24,569	0.3394522	0.473533	0	1
	Same country	25,984	0.621113	0.4851193	0	1
	Friendly nature of the deal	13,851	0.9934301	0.0807913	0	1

(Continues)

TABLE 1 (Continued)

Variable category	Variable description	No. of observations	Mean	SD	Min	Max
	Currency of payment (=1, if transaction currency USD/GBP/CNY/JPY)	26,825	0.7248089	0.4466188	0	1
	Mode of payment (=1, if cash)	26,825	0.5262628	0.4993191	0	1
	Percentage owned	26,825	5.420711	17.88476	0	100
	Recession	26,825	0.2087605	0.4064304	0	1
Macroeconomic environment	Acquirer transparency	17,724	0.8090563	0.2368509	0.0714286	1
Phase 2: Financing	Acquirer credit rating	6076	3.777534	2.024366	1	9
	Acquirer Altman's Z score	13,483	-29.17163	840.9268	-37762.8	9569.18
Phase 3: Regulatory approval	Acquirer repeated behavior	26,819	10.94664	35.95028	0	380
	Acquirer R&D expenditures	5306	210.3823	735.4851	0.000473	22,620
	Announced total value of the deal (\$MII)	13,492	303.3161	2563.507	0	163,350.9

on TTC in Phase 1. This is not far-fetched, as those financial characteristics are more nearly relevant in the pre-targeting phase. By the time a deal is announced, and negotiation commences, the acquirer already knows most of what it needs to know financially about the target.

TTC was measured as the number of days between the deal announcement and the deal completion date. On the basis of the data, the average TTC is about 52 days, with a standard deviation of 127.31. Around 49% of the deals were announced and completed on the same day (TTC = 0). Some 70% of the deals were completed within the first 60 days, but there are outliers. For example, the TTC was 6731 days for the longest transaction. In some cases, the deals got completed before the announcement, making the TTC negative (about 2.11% of the total observations). Thus, TTC values range from -731 to 6731.

Next, we provide more detail on the measurement of our independent variables. With respect to company-specific variables, there were over 2500 BMAD variables across the five categories of financial ratios (SPELL) of the acquirers and targets. The same applies to deal-specific variables and other variables. Since there are multiple indicators for each SPELL variable, to avoid multicollinearity in a given equation, only one measure within a SPELL category is included in a given regression. We rely on previous studies and intuition for guidance on the variables selected.

We used the following proxies: long-term borrowing to total liability for acquirer solvency; return on assets for acquirer profitability; current ratio (current assets/current liability) for acquirer liquidity; asset to equity ratio for acquirer leverage; and asset turnover ratio (net sales/total assets) for acquirer efficiency. Included deal-specific variables are: (1) engagement of a legal or financial adviser by the acquirer or target, (2) deals involving companies from the same country, (3) deals involving companies from the same industry, (4) whether the deal is friendly or hostile, (5) currency of payment (e.g., US dollar [\$], European Euro [€], British Pound [£], Japanese Yen [JPY], Chinese Yen [CNY], Canadian Dollar [CAD] and Australian Dollar [AUD]), (6) mode of payment (cash vs. a combination of cash, stocks and other), and (7) percentage of target's stocks or equity previously owned by the acquirer. Items 2–6 above are also deal with complexity variables.

Dummy variables were used to represent several determinants. For example, the proxy for the currency of payment is whether or not the payment was in hard currency (the \$, €, £, JPY, CNY, CAD, and AUD were considered hard currencies). For the mode of payment, a dummy variable was constructed so that 100% cash = 1 and other forms/combinations = 0. For the nature of the bid, a friendly bid = 1 while a hostile bid = 0. The size of the deal was measured in US\$. When the acquirer target comes from the same country, dummy = 1 (0 otherwise). When both the target and acquirer are from the same industry, dummy = (0 otherwise). The percentage of previous stock ownership was measured percentage. In the cases of advisory services, when an adviser is engaged by the buyer or seller, the dummy variable takes on the value of 1 (0 otherwise). Three such dummies are used in the regression: presence of an acquirer's legal adviser, acquirer's financial advice, and target's financial adviser. Targets in the database rarely employed legal advisers.

We also accounted for the complexity of the deal environment. Specifically, we include, as an exogenous factor, the presence of a recession at the time of the deal. We constructed a dummy variable, "Recession," which assumes the value 1 if the announcement-year was during a recession (0 otherwise). The macroeconomic literature indicates the following years as recession years for the global economy: 1990–93, 1998, 2001–02, and 2008–09.

Financing stage determinants included a transparency and a risk factor. Regarding deal transparency, we expect large companies to be more transparent as they are better able to cover transparency costs (Ashbaugh et al., 1999; Buzby, 1975) and are often required to be transparent. The literature identified four alternative measures: the CIFAR index; Dipiazz and Eccles's transparency model; Bushman, Piotroski, and Smith's transparency model; and Standard and Poor's method. We used the S&P method due to its widespread acceptance. We calculated it as follows. For each company in the sample with reported financial, nonfinancial, management, and ownership declaration, it received a score of 1 so that the total score is equal to the number of disclosures. The average of the

scores for each company is used as a proxy for transparency. To capture the risk involved in financing a deal, we included acquirer's Altman Z score. This measure is directly available through BMAD.

Finally, we included the repeated acquisition behavior of acquirer and deal size as measures of monopoly or concentration concerns of the regulator (see Adelaja et al., 1999). The number of acquisitions over the previous 30 years was used as a proxy for repeated acquisition behavior while deal size was proxied by the transaction's dollar value. Data on all relevant variables were available from 2044 observations. This represents about 8% of all M&A transactions in the GFABI.

TABLE 2 Effects of hypothesized factors on time to completion

Mergers and acquisition phases	Category	Variables	Empirical estimates	
Phase 1: Negotiation and due diligence	Company-specific performance factors	Solvency	Acquirer long-term borrowing to total liability	-0.319 (0.19)*
		Profitability	Acquirer ROA based on bottom earnings per share	-0.218 (0.16)
		Efficiency	Acquirer asset turnover ratio	-4.325 (3.86)
		Leverage	Acquirer assets equity ratio	-0.297 (0.16)*
		Liquidity	Acquirer current ratio	-2.797 (1.94)
Phases 1 & 2: Negotiation, due diligence, & financing ^a	Deal-specific complexity factors	Acquirer legal adviser	31.34 (7.85)***	
		Acquirer financial adviser	23.97 (7.21)***	
		Target financial adviser	18.15 (7.98)**	
		Same industry	7.153 (6.75)	
		Same country	4.203 (6.72)	
		Friendly nature of the deal	-22.25 (28.08)	
		Currency of payment (=1, if transaction currency USD/GBP/CNY/JPY)	-22.66 (7.04)***	
	Mode of payment (=1, if cash)	-36.54 (6.52)***		
	Percentage owned	0.139 (0.14)		
	Macroeconomic environment	Recession	15.37 (8.41)*	
Financing factors	Acquirer transparency	188.6 (124.40)		
	Acquirer Altman's Z score	-0.807 (0.71)		
Phase 3: Regulatory approval	Monopoly power factors	Acquirer repeated behavior	-0.127 (0.24)	
		Announced total value of the deal (\$Mil)	0.00142 (0.002)	
Model summary		Constant	-37.75 (116.90)	
		Observations	2044	
		R ²	0.071	

Note: Standard errors in parentheses.

^aThese variables are relevant in more than one phase.

*** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

4 | EMPIRICAL RESULTS

4.1 | Basic results

To show the causes of delay at each stage of the M&A process, Table 2 presents the OLS estimates of the impacts of hypothesized determinants on TTC by phase. The coefficients reflect the number of days, with negative numbers indicating deal acceleration and positive numbers indicating delays. From Table 2, of the five SPELL variables used to capture the acquirer's company-specific characteristics, only the solvency and leverage indicators are statistically significant (at the 10% level). Because the acquirer would have completed pre-targeting investigations before zeroing in on its target, it makes sense that its solvency is relevant. This indicator of the ability to pay is useful in convincing the target to complete the deal sooner and motivating the acquirer itself to move faster. It is hard for a suitor who is broke to convince its target to sell quickly. The finding that greater leverage on the part of the acquirer accelerates TTC is also consistent with our expectations. The finding that acquirer liquidity, profitability, and efficiency do not matter in the negotiation and due diligence stage is not surprising. These are measures of operational performance of the buyer which the seller may not pay much attention to as it is selling or giving up its independent identity.

Of the deal-specific characteristics, only deals involving the engagement of a target's financial adviser and deals where both the acquirer and target are from the same country get completed faster. Both are significant at the 5% level (the former is also significant at the 1% level). The coefficients of all advisory service variables are positive and statistically significant at the 5% level and two are significant at the 1% level. The presence of a target's financial adviser delays a deal by 18 days. We expected a target's financial adviser to use its experience in moving the negotiation process along by helping its client quickly understand the financial ramifications of the proposed transaction. But that is not what we found. Due to data limitations (very few observations) regarding the use of legal advisors by the target, this variable was not included in our model.

The presence of a legal adviser to the acquirer delays TTC by 31 days. We expected a legal adviser to be able to instill confidence in the acquirer by helping to flesh out key legal issues, including regulatory issues that may come later. However, we found otherwise. As explained below, there are possible endogeneity issues related to the interaction between deal complexity and the engagement of a legal adviser. Complex deals may attract lawyers.

The presence of an acquirer's financial adviser delays the TTC by 24 days. We expected a financial adviser to make the financial arrangements easier and help the acquirer by helping to flesh out financial issues. But it appears that while IBs may bring other forms of value, such as better terms, accelerating the deal is not a contribution of theirs. Again, we will reexamine this issue again below due to our concerns about endogeneity problems.

We hypothesized that since firms from the same industry are more familiar with industry conditions, same-industry deals would close faster than those involving other industries due to better knowledge and faster due diligence. Asymmetric information is also expected to be lower for same industry deals. However, we found that same-industry deals are no faster than deals involving a different industry. Similarly, we expected same-country deals to require fewer days to complete, as they may require less due diligence, involve a singular time zone and fewer cultural or language barriers, and may allow greater familiarity. However, surprisingly, we find that same country deals are not concluded faster. We also find that friendly deals do not close faster. We attribute these to the fact that most acquirers have engaged in proper vetting before making a bid and commencing negotiation. So, country and industry advantage or less hostility may not pay off in terms of TTC.

Deal denominated in hard currency is expected to be easier for the target to understand and to involve lower levels of cross-border currency risk exposure. Similarly, cash deals should be easier and faster than stock deals or mixtures thereof. The coefficients of currency of payment and cash as a mode of payment are statistically significant and negative at the 1% levels. On average, cash deals close 37 days faster and deals denominated in hard currency close 23 days faster.

Front-loading by the acquirer (early acquisition of the target's stocks) does not seem to affect the TTC one way or the other (no statistically significant benefit of early attempts by the acquirer to load up on the company stocks

of the target). In essence, front-loading reflects the acquirer's determination and confidence. Its insignificance may suggest that while it may be relevant in shaping the cost of the deal to the acquirer or squeezing the target more, it is not relevant to TTC. Deals initiated during a recession are slowed down by 15 days, probably reflecting the existence of limited resources and less resolve to stage a takeover.

With respect to factors that affect TTC through the financing phase, acquirer transparency is expected to accelerate TTC while a higher Altman Z score is expected to involve shorter TTC. A high Altman Z score (above 2.99) implies that the company is safe from bankruptcy while a lower score (below 1.81) implies that the company is extremely prone to bankruptcy. Our result suggests that neither of these variables have any bearing on TTC.

Finally, we theorized that regulators favor deals that do not create monopoly power. Two proxies for M&A deals delay factors in the regulatory approval process are repetitive acquisitions by an acquirer and an excessively large deal. A frequent acquirer may trigger greater SEC scrutiny. Also, large deals are more likely to lead to monopoly power than those involving small companies. Both repeat acquisition behavior and large deal size were found to be statistically insignificant.

In summary, in the negotiation and due-diligence phase, the factors that accelerate a deal include the acquirer's solvency and low leverage, as well as cash and hard currency as payment modes. However, the engagement of transaction advisers slows down phase 1 completion, be they financial or legal firms. Factors identified as relevant from the financing phase seem not to effectively delay or accelerate deal completion. Repeated acquisition behavior of the acquirer and larger deal size do not tend to lead to delays in the regulatory approval process, thereby lengthening TTC.

4.2 | Multicollinearity check

Results presented in Table 2 involve many variables which reflect the financial health of the acquirer. These variables may be highly correlated. For example, a more solvent and profitable company may be more efficient and liquid, but less leveraged. Therefore, to check for and possibly address multicollinearity, we conducted a Variance Inflation Factor (VIF) analysis and present the results in Table 3. A higher VIF score implies a probable presence of multicollinearity. Specifically, a VIF value of 5 is considered as a moderate presence of multicollinearity (Gulubov et al., 2015; Yawson & Zhang, 2021). The results in Table 3 show that the VIF is under 2 for all the variables, implying the absence of multicollinearity.

4.3 | Endogeneity test

In Table 2, we found positive impacts of the advisory services variables on TTC. Our finding that the engagement of a legal advisor and the financial advisor by the acquirer delays the TTC raises questions about an endogeneity problem, as it is possible that acquirers only bring legal advisers into complex deals. The Wu-Hausman endogeneity test was used to prove the presence of endogeneity from the acquirer's legal and financial advisor at a 1% level of significance.

Endogeneity could arise from the following: First, in an unwelcomed hostile deal, legal and financial advisers may be needed by the acquirer due to its greater complexity. Second, domestic deals are less likely to attract an adviser (being less informed about the environment of the host country, a foreign acquirer implies greater deal complexity). Third, compared with a horizontal deal where the buyer is more knowledgeable about the target, a vertical deal is more complex and more likely to attract a financial adviser. Fourth, Hard-currency deals may be less volatile, obviating the need for advisers. Fifth, with non-US deals, banks may need special approval from their central banks to borrow in hard currency. Therefore, the financing process may be more complex, thereby requiring a financial advisor. Sixth, with cash payments, to effectively access the risk

TABLE 3 Multicollinearity test using variance inflation factors (VIF)

Mergers and acquisition phases	Category	Variables	VIF coefficient	
Phase 1: Negotiation and due diligence	Company-specific performance factors	Solvency	Acquirer long-term borrow to total liability	1.21
		Profitability	Acquirer ROA based on bottom EPS	1.74
		Efficiency	Acquirer asset turnover	1.08
		Leverage	Acquirer assets equity	1.04
		Liquidity	Acquirer current ratio	1.11
Phases 1 & 2: Negotiation, due diligence, & financing ^a	Deal-specific complexity factors	Acquirer legal adviser	1.94	
		Acquirer financial adviser	1.42	
		Target financial adviser	1.34	
		Same industry	1.33	
		Same country	1.03	
		Friendly nature of the deal	1.18	
		Currency of payment (=1, if transaction currency is USD/EUR/GBP/CNY/JPY)	1.09	
	Mode of payment (=1, if cash)	1.09		
	Percentage owned	1.07		
	Macroeconomic Environment	Recession	1.04	
Financing factors	Acquirer transparency	1.21		
	Acquirer Altman's Z score	1.96		
Phase 3: regulatory approval	Monopoly power factors	Acquirer repeated behavior	1.20	
		Announced total value of the deal (\$Mil)	1.21	
Mean VIF			1.24	

^aThese variables are relevant in more than one phase.

beforehand, it may be necessary to bring in legal and financial advisers. Seventh, a recession can introduce difficulty in negotiation, financing, and decision-making. In this situation, advisory services play a major role in the deal completion. Therefore, a higher deal complexity is a probable reason for hiring financial and legal advisors. At the same time, the inherent complexity of the deal delays the deals, and often the presence of advisory services explains the delay in the completion of the complex deals.

Considering advisory services as the source of endogeneity, we use complexity variables as instrumental variables (IV) to examine if deal complexity leads to the presence of an advisor. We apply a two-stage least square model (2SLS). In stage one of the regression, we test if a financial advisor is required for a complex deal, where deal complexity is captured by the characteristics of the deal. In stage two, we measure the impact of the predicted advisory services on the TTC. Econometrically we estimate:

$$TTC = \alpha_0 + \alpha_1 P + \alpha_2 C + \alpha_3 F + \alpha_4 R + \varepsilon. \quad (43)$$

However, we break the C vector into C_1 and C_2 , where C_1 consists of the acquirer's financial, legal, and target's financial advisor and C_2 consists of the rest of the deal complexity variables in vector C. We suspect that C_1 is determined by C_2 . That is,

$$C_1 = \rho_0 + \rho_1 C_2 + v \quad (44)$$

and

$$TTC = \alpha_0 + \alpha_1 P + \alpha_2 \hat{C}_1 + \alpha_3 F + \alpha_4 R + \varepsilon, \quad (45)$$

where \hat{C}_1 is the estimated value of the advisory services from Equation (44), estimated by deal-specific variables, transparency of the acquirer, and the presence of recession. P is the vector of SPELL variables that captures the performance factor; F is the vector of financing variables which include the risk factor of the acquirer; and R is the vector of variables that includes repeated acquiring behavior of the acquirer and the size of the deal.

The results of our IV-regression model estimation are presented in Table 4. The IV-regression in Table 4 considers the acquirer's financial and legal advisory services as the sources of endogeneity and in re-estimating Table 2. The results regarding transaction advisers change somewhat. Legal advisers to the acquirer now have no impact on TTC. However, the involvement of a financial adviser by the target now accelerates a deal, by 56 days. The engagement of a financial adviser by an acquirer still lengthens TTC and does so by 259 days. The change in the results regarding financial advisers suggests some ambiguity in the relationship between TTC and the engagement of advisers.

4.4 | Does longer TTC lead to greater likelihood of deal failure?

An important TTC-related issue is whether delays matter? A key premise of our analysis is that delayed deals are less desirable than promptly completed ones. Delayed TTC can result in higher expenditure and cause companies to miss out on useful business opportunities (Luypaert & de Maeseneire, 2015). According to Bodt et al. (2014), the most relevant impact of TTC lies in the conditional likelihood of deal termination that depends on the negotiation times (hazard ratio).

In Figure 2, we plot TTC (vertical axis) against the deal completion probability. Specifically, we plot the probability of a deal that has been in existence for a given number of days to be brought to closure. Note that we limit the plot to 2000 days of TTC. Deals that last beyond that are likely to have unique deal-delaying characteristics and problems that are unrelated to TTC. Figure 2 shows that as TTC increases, the likelihood of completion decreases. The hazard rate (probability of the deal getting completed) goes down from 9% at time-period 150 to 4.5% at time-period 600 and further to 1% at time-period 1400, see panel (a). The Nelson-Aalen cumulative hazard estimate is nondecreasing, see panel (b). The Kaplan-Meier survival function shows that survival probabilities go down to 58% over 50 days and further to 32% over 100 days. That is, 32% of the M&As still have not got completed after 100 days of the announcement of the deal, see panels (c, d).

To further examine the relationship between TTC and the probability of deal failure, we conducted a regression of TTC on a dummy variable capturing deal completion (1 = deal completed, 0 = not completed). The results presented in Table 5 show that TTC has a statistically significant relationship with the odds of the deal completion. The coefficient of TTC in the Probit model is -0.00088 , which indicates that the odds of the deal getting completed as opposed to not getting completed decreases. Other coefficients in Table 5 further show how other control factors contribute to the probability of deal failure.

TABLE 4 IV Regression—effects of hypothesized factors on time to completion

Mergers and acquisition phases	Category	Variables	Endogeneity of acquirer financial advisor and acquirer legal advisor
Phase 1: Negotiation and due diligence	Company-specific performance factors	Solvency	Acquirer long-term borrow to total liability
		Profitability	Acquirer ROA based on bottom EPS
		Efficiency	Acquirer asset turnover
		Leverage	Acquirer assets equity
		Liquidity	Acquirer current ratio
Phases 1 & 2: Negotiation, due diligence, & financing*	Endogeneity: Deal-specific complexity factors	Acquirer legal advisor	-0.352 (0.242)
		Acquirer financial advisor	-0.238 (0.160)
		Target financial advisor	-1.621 (4.221)
Phase 2: Financing	Creditworthiness & risk measurement of acquirer	Acquirer Altman's Z score	-0.198 (0.330)
		Acquirer repeated behavior	1.791 (3.127)
		Announced total value of the deal (\$MII)	-57.91 (67.47)
Phase 3: Regulatory approval	Monopoly power factors	Constant	258.9 (56.52) ^{***}
		Observations	-55.94 (33.51)
		Wu-Hausman Score (<i>p</i> value)	-1.502 (0.84) [*]
Model summary		Constant	-0.185 (0.49)
		Observations	0.00153 (0.00088) [*]
		Wu-Hausman Score (<i>p</i> value)	53.83 (18.81) ^{***}

p* < 0.1; *p* < 0.05; ****p* < 0.01.

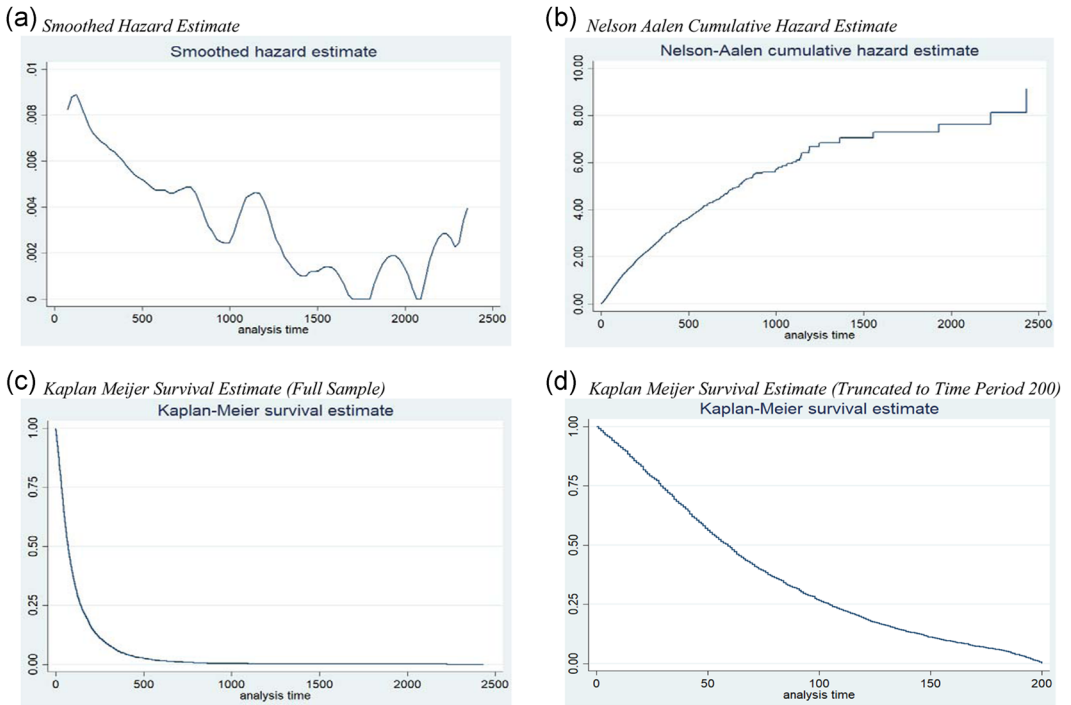


FIGURE 2 Survival analysis results—relationship between time-to-completion and the probability of deal completion

5 | SUMMARY AND CONCLUSION

While the TTC issue has received some recent research attention, the literature is quite limited and the food and agribusiness industry has not received the attention of researchers. Individual studies have focused on specific TTC determinants, but a comprehensive analysis of TTC determinants has never been attempted. This has limited the ability to explain what accelerates TTC and what does not. The previous studies also lack theoretical and conceptual rigor. These gaps in the literature motivated this present study. Here, we present theoretical models of TTC determination, breaking TTC into three time dimensions: negotiation/due diligence, financing, and regulatory approval. For each, we capture underlying buyer and seller behavior that shapes optimal TTC. These theoretical models also helped to identify company-specific, deal complexity, financing, and regulatory factors that shape TTC. Our empirical analysis further showed the relationship between TTC and its key determinants for the food and agribusiness industry.

Our key findings include the following. Due diligence/negotiation factors such as acquirer solvency and leverage, which imply acquirer execution ability, accelerate the TTC. Also, deals involving payment in cash and in hard currency conclude faster while deals involving both the target and acquirer from the same country or industry do not. We find that the presence of legal or financial advisers lengthens the TTC, although we acknowledge possible endogeneity issues with the engagement of transaction advisers. Delays in financing are not caused by limited transparency or degree of risk involved. Deals consumed during a recession take longer while regulatory phase factors such as deal size and acquirer history of repeated M&A activities neither accelerate nor delay TTC. To investigate if longer TTC is detrimental to companies involved in an M&A transaction, we further utilize survival analysis to show that delayed TTC increases the likelihood of deal failure. This result is important as it underscores the value of expedited TTC.

To summarize the potential broader implications of this paper, we focus on key stakeholder categories: targets, acquirers, M&A practitioners, investors, and regulators. With available information on company, market, deal

TABLE 5 Impact of time-to-completion (TTC) on the likelihood of deal completion (logistic regression model)

Merger and acquisition phases	Category	Variables	Model 2	
	Time-to-completion		-0.00088 (0.00024)***	
Phase 1: Negotiation and due diligence	Company-specific performance factors	Solvency	Acquirer long-term borrow to total liability	0.00458 (0.00283)
		Profitability	Acquirer ROA based on bottom EPS	0.00250 (0.00142)*
		Efficiency	Acquirer asset turnover	-0.0203 (0.0461)
		Leverage	Acquirer assets equity	-0.00485 (0.00307)
		Liquidity	Acquirer current ratio	-0.0511 (0.0283)*
Phases 1 & 2: Negotiation, due diligence & financing*	Deal-specific complexity factors		Acquirer legal adviser	-0.0475 (0.12)
			Acquirer financial adviser	0.208 (0.12)*
			Target financial adviser	-0.0969 (0.12)
			Same industry	0.205 (0.093)**
			Same country	-0.166 (0.094)*
			Friendly nature of the deal	1.256 (0.28)***
			Currency of payment (=1, if currency is USD/GBP/CNY/JPY)	0.206 (0.09)**
			Mode of payment (=1, if cash)	0.0484 (0.092)
			Percentage owned	0.00412 (0.002)**
			Macroeconomic environment	Recession
	Transparency factors	Acquirer transparency	0.417 (2.01)	
Phase 2: Financing	Creditworthiness & risk measurement of acquirer	Acquirer Altman's Z score	-0.00314 (0.0091)	
Phase 3: Regulatory approval	Monopoly power factors		Acquirer repeated behavior	-0.00269 (0.0041)
			Announced total value of the deal (\$Mil)	-1.71e-05 (8.56e-06)**
Model summary		Observations	2044	

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$.

complexity, and other variables, targets may find our procedure and results useful in predicting the duration of a given M&A process. For example, a target should expect a noncash deal or one involving an efficient acquirer to take longer. Acquirers might find our findings helpful in implementing their strategy. For example, targeting an efficient company may mean that the deal will not take as long as other deals. Acquirers may also find the results useful in predicting the likelihood of deal success. M&A practitioners, especially financial advisory firms, may find this study useful in communicating the added time it could take to complete a deal to their clients. Investors may use our results to manage their expectations about the deal completion timeframe. Finally, the results could be

useful to the SEC and other regulators in benchmarking a transaction's TTC and optimally deploying their efforts based on the characteristics of the deal.

Being the first of its nature, obviously, this study has some limitations. First, we relied on publicly available data from Bloomberg and Compustat. We recommend that future studies utilize richer private databases. Second, our analysis focuses on the F&B industry. We recommend future studies on other sectors, specifically Pharmaceuticals, IT, and E-commerce. Third, while data availability may be a challenge, we recommend more detailed studies on specific segments of GF&B. Fourth, possible endogeneity in the roles of financial and legal advisors needs to be better investigated. Finally, the benefits of the faster TTC, particularly the implication for faster realization of post-M&A objectives, need deeper investigation.

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