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A Consumer-Surplus Standard in Merger Approvals, Foreign Direct Investment, and Welfare

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A Consumer-Surplus Standard in Merger Approvals, Foreign Direct Investment, and Welfare*

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Abstract

This study scrutinizes the ramifications of a consumer-surplus standard in approvals of mergers & acquisitions (i) on an investor's choice between acquiring a firm's existing assets (via negotiations or auctions) and investing in new assets under both complete and incomplete information; and (ii) on welfare. Any firm acquisition fulfilling the consumer-surplus standard is in the best interest of the investor, who prefers to be well informed on acquisition gains and prefers sequential offers. A local firm appropriates a bigger share from acquisition gains in an auction, and prefers generating information asymmetries. Welfare improves with a larger scope for ex-post firm heterogeneity.

Keywords: Merger Policy; Acquisitions; Greenfield Investment; Welfare; Incomplete Cost Information

JEL Classification: F23

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1 Introduction

Foreign direct investment (FDI) has been the driving force of the global economy since the 1980s, and mergers & acquisitions (acquisition of existing assets in host countries) have been the leading mode of FDI, especially in developed countries in the late 1990s.[1] There is now a large body of the literature analyzing (i) the gains from acquisition of existing assets and the merger paradox (e.g., Salant *et al.*, 1983; Perry and Porter, 1985; Deneckere and Davidson, 1985; Farrell and Shapiro, 1990; Lommerud and Sorgard, 1997; Hennessy, 2000); and (ii) the choice between partnership arrangements with local firms (joint ventures, mergers or acquisitions) and a wholly-owned subsidiary (*greenfield* investment in new assets) in foreign countries (e.g., Görg, 2000; Bjorvatn, 2004; Desai *et al.*, 2004; Norbäck and Persson, 2004; 2007; Müller, 2007; Raff *et al.*, 2006; 2009a; 2012; Qiu, 2010; Fatica, 2010; Qiu and Wang, 2011).

Mergers & acquisitions are mostly subject to certain enforcement practices, which may confine their clearance to some performance measures, that is, only a subset of potentially profitable deals will be approved, which will change firm behavior and welfare. The literature focuses on aggregate surplus on this matter assuming that any firm acquisition would be approved by an antitrust authority so long as it did not decrease aggregate welfare. In most countries, however, antitrust authorities bring consumer welfare to the forefront. In New Zealand, for instance, mergers & acquisitions that lessen competition and adversely affect consumers are prohibited under the Commerce Act 1986.[2] Australia has a similar practice under the Competition and Consumer Act.[3] Similarly, enforcement practices in the US and the EU can be best approximated by a consumer-welfare standard (Breinlich *et al.*, 2016). Surprisingly, the implications of adopting a *consumer-surplus* standard on firm behavior and welfare have not yet received much attention in the literature.[4] This study, thus, would like to make progress on this. In a simple Cournot oligopoly model, considering an antitrust authority adopting a consumer-surplus standard in approvals of

[1] In the late 1990s and the early 2000s, the share of cross-border mergers and acquisitions in global FDI was around 75% and 60%, respectively (Navaretti and Venables, 2004). This type of foreign market entry mode is, however, too sensitive to global economic changes, and thus was negatively and significantly affected by the economic crises, the last of which hit the global economy in 2008. After some recovery period, according to UNCTAD (2014; 2015), around 25-30% of all global FDI took place as such investment lately (valued at US$349bn in 2013, and US$400bn in 2014).

[2] See www.comcom.govt.nz/business-competition/guidelines-2/mergers-and-acquisitions-guidelines.

[3] See www.accc.gov.au/business/mergers.

[4] Breinlich *et al.* (2015) is the only exception: in a multi-country model of Cournot oligopoly with segmented markets, they assume that antitrust authorities look at the changes in consumer welfare when evaluating the approval of a merger between firms. In this regard, this paper is related to Breinlich *et al.* (2015), although they have a different research question in mind (i.e., the sources of potential conflict between antitrust authorities), and thus the models are different, except for employing a Cournot oligopoly model and taking on board a consumer-surplus standard in merger approvals.

firm acquisitions, this study scrutinizes the ramifications of a consumer-surplus standard as the clearance rule (i) on a foreign investor's choice between acquiring a firm's existing assets (via negotiations or auctions) and investing in new assets under both complete and incomplete cost information; and (ii) on local welfare.

The literature, by and large, agrees that (i) firms benefit from combining assets, especially under sufficient efficiency gains, sufficiently convex demand or differentiated products, or when products/assets are strategic complements; and (ii) firms prefer greenfield entry to acquiring a firm's existing assets if there are significant asymmetries in asset structures and little scope for synergies, or if the costs of shared ownership (e.g., dissipation of proprietary knowledge) are relatively high. These results mostly rely on either complete information and exogenous matching of firms, or exclusive negotiations with a single firm assuming away future negotiations with other potential target firms (e.g., as in Hviid and Prendergast, 1993; Pagnozzi and Rosato, 2016). This, however, may not be in the best interest of investors, and thus, may not be self enforcing; see, for example, Koska and Stähler (2014). Including all potential targets in the bargaining process can be used as a credible threat as it generates a competition effect: the investor can still enter the market by acquiring another firm's assets even if the initial acquisition offer is rejected by a firm. Such a competition effect decreases rejection profits and thus, decreases the price for acquisition of existing assets especially if there is some degree of negative externality imposed on other firms having to compete against the investor. By the same token, auctions, depending on the design, may also be in the best interest of the agents (e.g., as in Bulow and Klemperer, 1996; Brusco *et al.*, 2007), or in the best interest of antitrust authorities especially if merger approvals are based on consumer welfare. There is only a few papers modeling firm takeovers via auctions (see Pagnozzi and Rosato, 2016; Koska *et al.*, 2016b; Ding *et al.*, 2013), although auctions are used commonly in firm acquisitions; see Boone and Mulherin (2007) for statistical evidence.

In the first part of the study, given a consumer-surplus standard as the clearance rule for firm acquisitions, and under complete cost information, an investor's selection of the firm for acquisition and the acquisition price are endogenously determined in three different mechanisms: sequential offers, generalized Nash bargaining, and an ascending auction. In this regard, the first part of the study complements Pagnozzi and Rosato (2016), who study, in a Cournot oligopoly model with complete information, an investor's choice (to acquire existing assets of a local firm that generates firm-specific synergies) between an ascending auction and bilateral negotiations. In their model, the investor has no outside option (except for staying out of the market), and thus in bilateral negotiations, they do not explicitly model sequential negotiations. Also, in an ascending auction, the investor and the local firms compete to acquire a target firm, whereas in this study,

local firms compete against each other for a deal with the investor.[5][6] Considering no private cost information and no ex-ante significant cost asymmetry between local firms, but ex-post firm heterogeneity due to an efficient firm's greenfield entry, or due to firm-specific synergies (if entry is by firm acquisition), the first part of the study shows that (i) a consumer-surplus standard in approvals of firm acquisition implies an upper-bound threshold of ex-post marginal production costs (similar to Farrell and Shapiro, 1990); (ii) if there is some potential firm takeover that does not harm consumers - so that it will be approved by an antitrust authority that adopts a consumer-surplus standard - then it is in the best interest of the investor (more profitable than greenfield investment); (iii) irrespective of the method by which the investor acquires existing assets of a local firm, the investor prefers acquiring the firm that decreases ex-post marginal costs more (the ex-post efficient firm); and (iv) the investor prefers sequential offers to an ascending auction under complete information, while local firms' profits (and thus welfare) are greater in an ascending auction than in negotiations.

In the literature on FDI, studies mostly rely on models with complete information. In cross-border investments, however, some firms are better informed than others. In the case of acquisition of existing assets, for instance, the majority of targets have been the firms that are not publicly listed (Ang and Kohers, 2001; Draper and Paudyal, 2006) resulting in information asymmetries that crucially affect firms' investment strategies (Lópes Duarte and García-Canal, 2004; García-Canal *et al.*, 2002; Shen and Reuer, 2005). To address this, the model is extended so as to take information asymmetries among firms on board. Considering incomplete cost information - firm-specific synergies (generated by acquisition of a firm's assets) are private information - the second part of the study delineates the foreign market entry choice of an investor between greenfield investment and firm acquisition, and scrutinizes welfare ramifications of adopting a consumer-surplus standard in approvals of firm acquisitions. In particular, by extending the model to the case of information asymmetries in firm takeovers with endogenous profit shares that are determined in a second-price, sealed-bid auction, the second part of the study addresses the problem of identifying good matches with potential local partners, in addition to looking at the implications of a consumer-surplus standard on the conflict between the host country and the investor in terms of the preferred market entry mode.

The extended model in the second part of the study can be related to the literature on auctions with externalities. Jehiel and Moldovanu (2000), for instance, look at the sale

[5]This is similar to reverse auctions, in which a buyer asks potential sellers to quote prices for a deal.

[6]In their model, all target firms are ex ante symmetric, but one, a dominant firm; so that they can focus on comparing the outcomes of an auction and bilateral negotiation in terms of the selected target firm (whether it is the one that generates the highest synergies - the efficient target - or the one that maximizes profits. They show that the outcomes do not always coincide.

of a cost-reducing innovation, which generates negative externalities on other firms, in a second-price, sealed-bid auction; and Goeree (2003) considers, also, an auction setup for a cost-reducing patent, and finds an upward bias on the equilibrium bidding strategies, especially when bidders signal their private information via the winning bid. Ding *et al.* (2013), in a signaling model, compare different takeover auction mechanisms (e.g., first-price vs. second-price, cash vs. profit-sharing auction) that are followed by Cournot competition. Janssen and Karamychev (2010) consider after-market Cournot competition and look into auctioning of multiple licenses. They show that the auction mechanism does not always choose the most cost-efficient firms. Although firm-specific synergies generated by a firm takeover can be argued to play a similar role as cost-reducing innovations, the main contribution of the second part of the study relative to these articles is the consumer-surplus standard and its implications on an investor's preferred foreign market entry mode, on firm behavior, on local welfare and on the nationally optimal entry mode when the ex-post marginal production cost of the acquired firm is private information.

The results suggest that, unlike the conventional wisdom, private information by local firms regarding the "quality of the match" (modeled as the size of the ex-post marginal production cost of a potential firm takeover) need not bias the investor's choice toward greenfield investment, especially when there is a consumer-surplus standard in approvals of acquisition of existing assets of a local firm such that when only the cases that do not reduce consumers' surplus are approved. On the contrary, by auctioning off its participation to local firms, the investor can identify the most profitable (ex-post efficient) local target firm and can gain from acquisition of that firm's assets, insofar as acquisition of the firm's assets fulfills the consumer-surplus standard, and thus can be approved. The welfare implications of such firm takeovers depend on the spread of the distribution of ex-post productivity: local welfare improves (i) if the local firms have ex-ante sufficiently high marginal costs; (ii) if the expected contribution of acquisition of existing assets to the productivity of the investor (or the new entity) is sufficiently large; or (iii) if the expected negative impact of a firm takeover on the other local rival is sufficiently small. If, however, local firms have only a small productivity disadvantage relative to the investor, foreign entry can have detrimental effects on local welfare.

The rest of the paper is organized as follows. Section 2 first introduces the model with complete information and the consumer-surplus standard in approvals of firm acquisition, then solves the model (i) for a subgame perfect Nash equilibrium in pure strategies for the case of sequential offers (Section 2.1), which is extended also to generalized Nash bargaining (Appendix A.1); and (ii) for a pure-strategy equilibrium for the case of an ascending auction (Section 2.2). Section 3 extends the model to a private cost information structure and introduces a second-price, sealed-bid auction by which the investor's share from acquisition profits is determined. In what follows, Section 3 scrutinizes the welfare

implications of a consumer-surplus standard, and briefly discusses the policy implications of the model. Finally, Section 5 concludes. For convenience, most of the proofs and technical details are relegated to the Appendix.

2 The model

Consider a host country that has two local firms: firms i and j. There is also a source country that has one investor, a multinational firm (MNF). All firms are risk neutral and produce a homogeneous good. The local firms have ex-ante identical marginal costs, denoted by $c = c_i = c_j \in (0, 1)$. The MNF can invest in new assets (greenfield investment) in the host country, and can produce the homogeneous good with a lower marginal cost denoted by $c^* \in (0, c)$.[7] Alternatively, the MNF can acquire existing assets of a local firm, which generates synergies and decreases marginal production costs. Let $\theta_k \in [0, \overline{\theta}]$ denote the ex-post marginal cost of the MNF after having acquired existing assets of firm k, $k \in \{i, j\}$. $\overline{\theta}$ is the upper bound that is implied by the consumer-surplus standard in approvals of acquisition of existing assets, that is, any firm takeover that generates sufficient synergies such that $\theta_k \leq \overline{\theta}$, $k \in \{i, j\}$ (so that it does not decrease consumers' surplus) will be approved by the antitrust authority; see Condition 1.[8]

Consumers have quasilinear preferences such that the inverse demand function is given by $P(Q) = (1 - Q)$, where P is the market price of the homogeneous good and Q stands for aggregate output. Total production (or sales) if the investor undertakes greenfield investment, $Q^g = q_m^g + \sum_k q_k^g$, comprises the MNF's output q_m^g and the local outputs $\sum_k q_k^g$, $k \in \{i, j\}$, where superscript g stands for the greenfield case, and subscript m represents the MNF. If the investor enters the host country by acquiring existing assets of a local firm, then there will be one less firm, in which case total sales, $Q^v = q^v + q_{-k}^e$ - if firm k's assets are acquired - will comprise the new entity's output q^v and the non-acquired firm's output q_{-k}^e, $k \in \{i, j\}$. Note that superscript v represents the new entity (after firm acquisition takes place), and superscript e represents the non-acquired firm that will have to compete against the new entity.

The MNF can acquire existing assets of a local firm either via negotiations or through an auction. In the case of negotiations, (i) the MNF can choose one firm and can make a

[7] The MNF has a cost advantage over the local firms: $c^* < c$, as this is the common observation in most countries where multinationals are actively operating; see Navaretti and Venables (2004).

[8] As the focus of this study is the implications of a consumer-surplus standard in merger approvals on firm behavior and welfare, the study focuses only on the cases that fulfills the approval criterion. That is, the cases that $\theta > \overline{\theta}$ are assumed away, as such cases will be declined by an antitrust authority adopting a consumer-surplus standard, and thus, the investor will be left with greenfield investment.

take-it-or-leave-it offer to that firm only, rejection of which will lead the MNF to undertake greenfield investment;[9] or (ii) the MNF can sequentially make take-it-or-leave-it offers to local firms with the option to interrupt negotiations any time so as to opt for greenfield investment, and if both firms reject the offers that they receive, then the MNF enters the market via greenfield FDI.[10] An extensive form (a game tree) representation of sequential offers including the greenfield outside option is given by Figure 1 (Section 2.1), where π_m^g and π_k^g, $k \in \{i, j\}$, represent, respectively, the investor's and the local firms' profits when the MNF undertakes greenfield investment, and π_m^v, π_k^v and π_{-k}^e represent those when the MNF acquires firm k, $k \in \{i, j\}$. The interaction between firms takes place such that first the MNF's entry mode is determined, then all active firms compete by quantities. The game is solved backwards.

In the last stage of the game (once the MNF's entry mode is sorted), all active firms in the market engage in Cournot competition. Given the inverse demand function above, in a linear Cournot oligopoly model with n firms, each producing a homogeneous good with a constant marginal cost, each firm maximizes its profits, given by $\pi_k(\cdot) = (p(Q) - c_k)q_k$, where $k \in \{m, i, j\}$. Each firm's Cournot-Nash equilibrium production can be represented by $q_k^* = (1 - nc_k + \sum_{l \neq k}^{n} c_l)/(n + 1)$, where $k, l \in \{m, i, j\}$, and $\sum_{l \neq k}^{n} c_l$ represents the sum of the marginal costs of all firms excluding firm k. In a Cournot-Nash equilibrium, the maximized firm profits are equal to $\pi_k^* = -p'(Q)(q_k^*)^2$, where $p'(Q) = -1$, and thus, $\pi_k^* = (q_k^*)^2$, where $k \in \{m, i, j\}$. It is straightforward to show that a firm produces and earns more with a decrease in its costs, while it produces and earns less with a decrease in its rivals' costs. Also, an increase in the number firms competing in the market raises competition, with which the market price decreases (aggregate sales increase), although average firm size (i.e., the intensive margin) decreases.

When there is no investment, there will be only two local firms ($n = 2$) that are symmetric in costs (c). Each local firm produces $q_i^a = q_j^a = (1 - c)/3$, where a represents the case of no investment. The MNF's profit from the host country is $\pi_m^a = 0$, and the local Cournot duopoly profits are

$$\pi_i^a = \pi_j^a = \frac{(1 - c)^2}{9} > 0. \tag{1}$$

The MNF can undertake greenfield investment by paying a fixed investment cost, which is normalized to zero so as to make sure greenfield investment is a profitable entry mode

[9] This would have been the *forced bargaining* case had there been only one target firm, acquisition of which would fulfill the consumer-surplus standard. Condition 1 makes sure that there are at least two target firms (acquisition of either firm's existing assets will be approved by an antitrust authority). It will soon be clear that when there are at least two target firms, exclusive negotiations with a single firm is not self-enforcing.

[10] A more general bargaining model for acquisition of existing assets of a local firm, generalized Nash bargaining, is given in Appendix A.1.

(no investment is not individually rational for the MNF).[11] Greenfield investment earns the MNF $\pi_m^g = (q_m^g)^2$, while the local firms earn $\pi_i^g = (q_i^g)^2$ and $\pi_j^g = (q_j^g)^2$ s.t.

$$\pi_m^g = \frac{(1 - 3c^* + 2c)^2}{16} > 0; \quad \pi_i^g = \pi_j^g = \frac{(1 - 2c + c^*)^2}{16} > 0. \tag{2}$$

Assuming $(1 - 2c + c^*) > 0$ - no crowding-out effect of greenfield investment[12] - compared to the no-investment case, (i) competition raises with an increase in the number of firms by one; (ii) local firms' sales and profits decrease, and (iii) the average industry marginal cost decreases, with which total industry output increases.

The MNF can enter the market also by acquiring existing assets of a local firm, which decreases competition (compared to greenfield investment) by decreasing the number of firms by one. Acquisition of existing assets, however, may generate synergies, such that the ex-post marginal cost of the MNF acquiring firm k will be θ_k, $k \in \{i, j\}$. It is clear that, unless the ex-post marginal cost of the new entity is above the ex-ante marginal cost of the (replaced) acquired firm (assuming no spillover that may change the non-acquired firm's ex-post marginal cost), compared to the no-investment case, the average industry marginal cost decreases, with which total industry output increases. This implies that, given the option to use any partnering firm's existing technology, unless there are strong diseconomies of scale, any merger or acquisition can be approved when taking the no-investment case as the benchmark case for consumer welfare. The common practice is to compare the state of competition if firm acquisition takes place with the state of competition if it does not take place.[13] The investor would opt for an alternative (profitable) market entry mode had there been no firm acquisition. Conditioning the clearance rule on how consumer welfare changes compared to the investor's second-best alternative (greenfield investment in this study) secures a level of consumer welfare at least as good as the level should there be no firm acquisition. As consumers are better off with greenfield entry (as discussed above), this practice serves the purpose of a consumer-surplus standard in approvals of firm acquisitions.[14]

[11] This implies a maximum of greenfield profitability; assuming positive fixed costs does not change the qualitative results, but makes them striking. An alternative interpretation is that acquisition of existing assets and investing in new assets require almost the same amount of fixed investment costs, and thus the MNF has no fixed-cost-saving incentive when choosing between these two entry modes.

[12] This assumption guarantees that the MNF cannot earn monopoly profits by greenfield entry. This is consistent with enforcement practices including the consumer-surplus standard.

[13] See, inter alia, www.comcom.govt.nz/business-competition/mergers-and-acquisitions/authorisations, the clearance rule of the Commerce Commission of New Zealand.

[14] The idea is simple: if greenfield entry is profitable and increases consumer welfare compared to the no-investment case, then the best an antitrust authority could do is not to approve any proposed firm acquisition unless it benefits consumers more than greenfield investment.

The investor's acquisition of existing assets of a local firm leads to Cournot duopoly between the investor (the new entity) and the non-acquired local firm, the outcome of which is the new entity producing $q^v = (1 - 2\theta_k + c)/3$ and the non-acquired local firm producing $q^e_{-k} = (1 - 2c + \theta_k)/3$, where $k \in \{i, j\}$ represents the acquired local firm. A consumer-surplus standard in approvals of firm acquisitions can, thus, be summarized as

Condition 1 (Consumer-surplus standard) *Any acquisition proposal of the investor should not decrease consumer welfare as compared to the level of consumer welfare that could be attained by the investor's greenfield entry.*

Condition 1 puts an upper bound to the ex-post marginal cost of the new entity such that $\theta_k \in [0, (2c + 3c^* - 1)/4]$, $k \in \{i, j\}$, which is the necessary and the sufficient condition for $Q^v \geq Q^g$. Intuitively, Condition 1 warrants that the negative effect of reduced competition (one rival less) on aggregate production should always be outweighed by the positive effect of increased competition caused by a more efficient new entity.

Firm profits when firm $k \in \{i, j\}$ is acquired can be expressed as:

$$\pi^v(\theta_k) = \frac{(1 - 2\theta_k + c)^2}{9} > 0; \quad \pi^e_{-k}(\theta_k) = \frac{(1 - 2c + \theta_k)^2}{9} > 0, \tag{3}$$

where the net return from acquisition of existing assets of firm $k \in \{i, j\}$ to the MNF is $\pi^v_m(\theta_k) = \pi^v(\theta_k) - \pi^v_k$, and to the acquired firm is π^v_k, that is, the acquisition price determined endogenously.

2.1 Sequential Offers

The MNF has to choose between greenfield investment and acquisition of existing assets of a local firm. Figure 1 depicts an extensive form game between the MNF and the local firms, where the MNF makes sequential offers to the local firms for potential firm acquisition. The game is solved for a subgame perfect Nash equilibrium (SPNE).

In the last subgame (on the left) starting with firm j's decision node, the MNF offers firm j its rejection profit (π^g_j) - or rather, $\lim_{\epsilon \to 0} \pi^g_j + \epsilon$ - which will be accepted by firm j. Offering firm j its rejection profit if firm i has rejected the MNF's initial offer is individually rational for the MNF as $\pi^v(\theta_j) - \pi^g_j \geq \pi^g_m$ for any $\theta_j \in [0, (2c + 3c^* - 1)/4]$. Therefore, if the MNF makes its initial offer to firm i, then this offer will be equal to firm i's rejection profit $\pi^e_i(\theta_j)$ - or rather, $\lim_{\epsilon \to 0} \pi^e_i(\theta_j) + \epsilon$ - that is, the profit firm i would have earned by competing against the investor had the investor acquired firm j's assets. Similarly, moving backwards from the last subgame (on the right) starting with

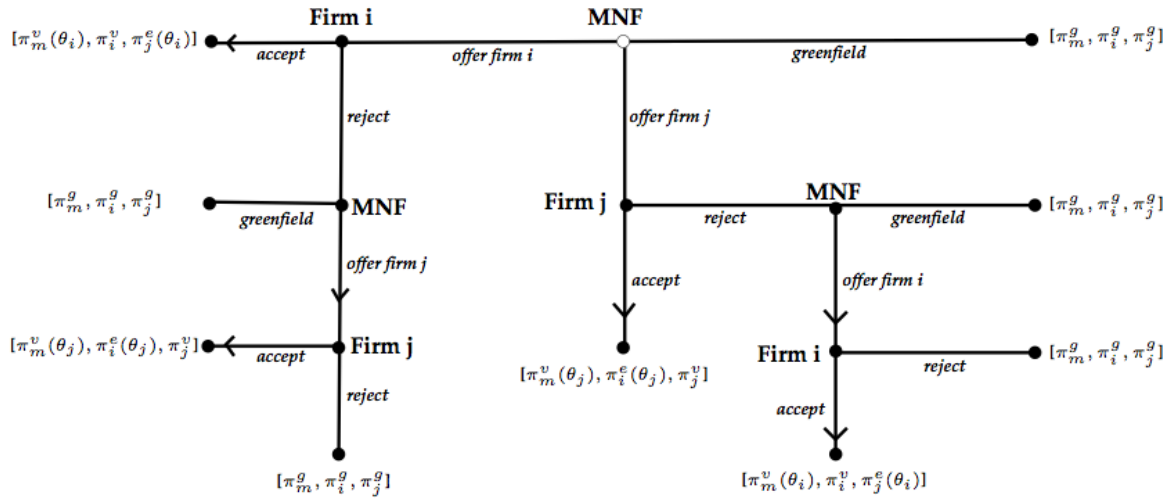

Figure 1 Sequential Offers

firm i's decision node, it can be shown that if the MNF makes its initial offer to firm j, then this offer will be equal to firm j's rejection profit $\pi_j^e(\theta_i)$ - or rather, $\lim_{\epsilon \to 0} \pi_j^e(\theta_i) + \epsilon$ - that is, the profit firm j would have earned by competing against the investor had the investor acquired firm i's assets. Therefore, the MNF can acquire firm k's assets simply by offering the firm its rejection profit $\pi_k^e(\theta_{-k})$, $k \in \{i, j\}$. Note that firm k's rejection profit would have been π_k^g had the MNF made a single offer to a single firm (rejection of which would lead to greenfield investment), which leads to

Lemma 1 (Sequential vs exclusive offers) *Excluding a firm from negotiations (i.e., committing to make a single offer only to a single firm) increases the acquisition price ($\pi_k^g \geq \pi_k^e(\theta_{-k})$ for any $\theta_{-k} \in [0, (2c + 3c^* - 1)/4]$, $k \in \{i, j\}$), and thus is not individually rational, that is, the MNF can acquire the same firm's assets for a cheaper price.*

With a consumer-surplus standard in merger approvals (Condition 1) that puts an upper bound on the ex-post marginal cost of the new entity, the antitrust authority trades off an increase in consumer welfare with a negative impact of an approved firm acquisition on the non-acquired firm's production and profits. The investor can use this potential negative externality as a credible threat so as to decrease the acquisition price and to increase post-acquisition (net) profits, which implies a single offer to a single firm is not self enforcing, and thus the investor cannot credibly commit to exclude the other firm from negotiations.

Which local firm should the investor target and make the initial offer? Which entry mode is optimal for the MNF? If the MNF makes the initial offer to firm i, then it pays $\pi_i^e(\theta_j)$ and acquires firm i's assets, and earns $\pi^v(\theta_i) - \pi_i^e(\theta_j)$. If, however, it makes the initial

offer to firm j, then it pays $\pi_j^e(\theta_i)$ and acquires firm j's assets, and earns $\pi^v(\theta_j) - \pi_j^e(\theta_i)$. The equilibrium paths (excluding the MNF's initial decision on making an offer first to firm i or firm j, or undertaking greenfield investment) are depicted by arrow heads in Figure 1. The MNF has to compare its payoffs to find out about the optimal entry mode. Without loss of generality, let firm i be the ex-post efficient firm such that $\theta_i \leq \theta_j$. It is clear from equation (3) that the MNF has to pay more to acquire the ex-post efficient firm such that $\pi_i^e(\theta_j) \geq \pi_j^e(\theta_i)$. That said, the ex-post efficient firm, however, increases ex-post profits by more than the increase in the acquisition price leading to

Lemma 2 (Selection of the target) *The investor makes the initial offer to the firm that reduces the ex-post marginal cost of the investor the most.*

Proof. Comparing the MNF's payoffs shows that $[\pi^v(\theta_i) - \pi_i^e(\theta_j)] \geq [\pi^v(\theta_j) - \pi_j^e(\theta_i)]$, $\forall\ \theta_k \in [0, (2c + 3c^* - 1)/4]$, $k \in \{i, j\}$, where $\theta_i \leq \theta_j$. ■

It is also straightforward to show that the MNF prefers acquiring a local firm's assets to greenfield investment, which leads to the unique SPNE of the game depicted in Figure 1.

Proposition 1 (SPNE in pure strategies) *The unique SPNE of the game in pure strategies is that the MNF makes the initial offer to the ex-post efficient firm k, $k \in \{i, j\}$, and this offer is accepted, which leads the MNF to acquire the ex-post efficient firm k and earn $\pi_m^v = \pi^v(\theta_k) - \pi_k^e(\theta_{-k})$, and leads the acquired and the non-acquired firms to earn, respectively, $\pi_k^v = \pi_k^e(\theta_{-k})$ and $\pi_{-k}^e(\theta_k)$.*

Proof. There is a clear ranking of the payoffs: $[\pi^v(\theta_i) - \pi_i^e(\theta_j)] \geq [\pi^v(\theta_j) - \pi_j^e(\theta_i)] \geq \pi_m^g$, $\forall\ \theta_k \in [0, (2c + 3c^* - 1)/4]$, $k \in \{i, j\}$, where $\theta_i \leq \theta_j$. ■

This result suggests that

Corollary 1 (Optimal entry mode via negotiations) *Acquisition of existing assets of a local firm that fulfills the consumer-surplus standard given by Condition 1 is also in the best interest of the investor as compared to greenfield entry.*

As firm profits are strictly convex in firm output, an empirical prediction of these results can be that after controlling for country- and firm-specific factors that influence firms' choice between cross-border mergers & acquisitions and greenfield investment, in countries where a consumer-surplus standard in merger approvals is adopted, firm size is greater when entry is via acquisition of existing assets of a local firm than when it is by greenfield investment.

2.2 Ascending Auctions

The MNF can make multiple offers simultaneously as an alternative to sequential offers. Multiple offers in this respect can be modeled as auctions. In this section, acquisition of existing assets of a local firm is modeled such that the MNF's (net) acquisition profit is determined by the local firms' bids in an open (reverse) ascending auction. That is, the investor (buyer) asks the local firms (sellers) to participate in an ascending auction and to quote prices that they would like to give to the investor as the investor's share from acquisition profits.[15] Given that there are only two firms, the specific mechanism is as follows. The price starts from low levels and increases continuously, while bidders keep pressing a button. At any price, any bidder can release the button and can drop out from the auction. Once one firm drops out, the other firm is declared to be the winner.[16] The investor acquires the winning firm's assets, and competes against the other firm in Cournot duopoly. Acquisition profits are shared between the investor and the acquired firm such that the price at which the firm has dropped out in the auction will be kept by the investor, and the rest will be paid to the winning firm as a compensation for its assets.

In the auction, firm k's willingness to pay to the MNF as the MNF's share from acquisition profits is given by

$$v_k = \pi^v(\theta_k) - \pi^e_k(\theta_{-k}); \quad k \in \{i, j\}, \tag{4}$$

which represents the local firms' valuation of acquisition of their assets by the MNF. Their valuation depends on two effects:

1. The increase in profits compared to greenfield profits if the investor acquires firm k's assets, that is, $\pi^v(\theta_k) - \pi^g_k > 0$; $\theta_k \in [0, (2c + 3c^* - 1)/4]$; $k \in \{i, j\}$.

2. The decrease in profits compared to greenfield profits if the investor acquires the other firm's assets, that is, $\pi^e_k(\theta_{-k}) - \pi^g_k \leq 0$; $\theta_{-k} \in [0, (2c + 3c^* - 1)/4]$; $k \in \{i, j\}$.

The second effect is the negative externality exerted on the non-acquired firm due to the consumer-surplus standard in approvals of acquisition of a firm's existing assets given by Condition 1. As discussed earlier, the negative externality exerted on the non-acquired firm increases with a decrease in the ex-post marginal cost of the new entity, while the gain from acquisition of assets by the MNF increases with a decrease in the ex-post

[15] There are many formats by which this auction could be run. As the investor's revenues coincide for all formats, an ascending auction format is considered here; see Pagnozzi and Rosato (2016) for a slightly different version of an ascending auction employed in firm takeovers. In the case of incomplete cost information, for the ease of exposition, a second-price sealed-bid auction is considered.

[16] If both firms drop out at the same price, then the investor randomly picks one firm.

marginal cost of the new entity. The proof of Proposition 1 has already shown that (i) the local firms' valuations given by equation (4) are greater than the MNF's greenfield profits, which can be considered as the minimum acceptable (reservation) bid, that is, the MNF will not accept any lower price; and that (ii) the ex-post efficient local firm has a higher valuation than the other firm. For the ex-post efficient firm, it is easy to show that it is individually rational to participate in the auction. As for the firm with a lower valuation, however, a specific belief structure is warranted. The reason is that in this model with complete information, the firm with a lower valuation (the ex-post inefficient firm) is indifferent between participating and seriously bidding in the auction and not participating (or participating, but dropping out at zero price); in either case it can be argued that the ex-post inefficient firm would have to compete against the new entity. If, however, the ex-post inefficient firm believes there is some chance (though arbitrarily small) that the ex-post efficient firm may drop out before the price reaches its valuation, then not only participating (bidding seriously) in the auction is individually rational for both local firms, but also in a pure-strategy equilibrium, the firm with lower valuation will stay active in the auction until the price reaches its valuation. This leads to

Lemma 3 (Equilibrium price in the auction) *In a pure-strategy equilibrium, (i) the (ex-post inefficient) firm with a lower valuation drops out once the price is equal to its valuation; (ii) the (ex-post efficient) firm with a higher valuation wins the auction at a price that is equal to the ex-post inefficient firm's valuation; and thus, (iii) the investor can acquire the ex-post efficient firm's assets and compete against the ex-post inefficient firm in Cournot duopoly, and can earn a share of acquisition profits equal to the ex-post inefficient firm's valuation, given by equation (4).*

Proof. Following Pagnozzi and Rosato (2016), let ϵ be an arbitrarily small probability of the ex-post efficient firm dropping out before the price reaches the ex-post inefficient firm's valuation. In open ascending auctions, bidders, observing each other's decision on staying active, evaluate whether or not to stay active at every price that is announced. Given that the firms' valuations are common knowledge, each firm knows the maximum price, beyond which a firm will not stay active so as to secure non-negative surplus. The ex-post efficient firm (with a higher valuation than the other firm) participates in the auction and stays active so long as the rival firm is active. As for the firm with a lower valuation, given its belief that the ex-post efficient firm drops out at any price below its valuation with (an arbitrarily small) probability ϵ ($\lim_{\epsilon \to 0}$), participating in the auction is also individually rational, and it stays active until the price reaches its valuation as there is some chance (though arbitrarily small) that the ex-post efficient firm may drop out leading to a greater profit (see below) than the profit it can earn should it not participate in the auction or should it drop out at any price below its valuation. ■

Without loss of generality, let firm i be the ex-post efficient firm such that $\theta_i \leq \theta_j$. The investor acquires firm i's assets and competes against firm j in Cournot duopoly. Firm j earns $\pi_j^e(\theta_i)$, while the acquisition profits are equal to $\pi^v(\theta_i)$, and are shared by the investor and firm i such that

- the investor will receive a share equal to the equilibrium price in the auction: $\pi_m^v = \pi^v(\theta_j) - \pi_j^e(\theta_i) \geq \pi_m^g$ for any $\theta_k \in [0, (2c+3c^*-1)/4]$, $k \in \{i, j\}$, where $\theta_i \leq \theta_j$, and
- firm i will keep the rest: $\pi_i^v = \pi^v(\theta_i) - [\pi^v(\theta_j) - \pi_j^e(\theta_i)] \geq \pi_i^e(\theta_j)$, for any $\theta_k \in [0, (2c+3c^*-1)/4]$, $k \in \{i, j\}$, where $\theta_i \leq \theta_j$.

This immediately leads to

Corollary 2 (Optimal entry mode via an auction) *Acquisition of existing assets - that fulfills the consumer-surplus standard given by Condition 1 - via an auction does not change the investor's optimal entry mode: firm acquisition is in the best interest of the investor as compared to greenfield entry.*

Comparing the investor's and the local firms' profits in the auction with those from sequential offers (given by Proposition 1) leads to

Proposition 2 (Optimal acquisition mechanism) *The investor prefers the method of sequential offers to an auction, whereas the sum of the local firms' profits are greater in the auction than in the case of sequential offers.*

Proof. The investor's share from acquisition profits is bigger when the acquisition mechanism is to make local firms sequential offers than when it is an auction, that is, $[\pi^v(\theta_i) - \pi_i^e(\theta_j)] \geq [\pi^v(\theta_j) - \pi_j^e(\theta_i)] \geq \pi_m^g$, $\forall\ \theta_k \in [0, (2c+3c^*-1)/4]$, $k \in \{i, j\}$, where $\theta_i \leq \theta_j$. The non-acquired firm's profit is the same in both acquisition mechanisms as the investor acquires the ex-post efficient firm's assets in either case. The ex-post efficient firm, however, appropriates a share of gains from acquisition in the auction as the price it pays to the investor (the non-acquired firm's valuation) is below its valuation: $\pi_i^v = \pi^v(\theta_i) - [\pi^v(\theta_j) - \pi_j^e(\theta_i)] \geq \pi_i^e(\theta_j)$, for any $\theta_k \in [0, (2c+3c^*-1)/4]$, $k \in \{i, j\}$, where $\theta_i \leq \theta_j$. ■

Proposition 2 implies that although the investor prefers negotiations over an auction, a regulation authority may force the investor to acquire a local firm via an auction as (while consumer welfare is the same in both acquisition mechanisms) the sum of the local firms' profits (and thus aggregate welfare) are greater in the auction than in negotiations. To extend the discussions in this section to a general bargaining model, a generalized Nash

bargaining solution concept is considered in Appendix A.1. The results suggest that, depending on the MNF's and the local firms' bargaining power, and on their disagreement profits (threat points), (i) the MNF's profit can be the same as in sequential offers, or less than that in both negotiations and the auction; (ii) the acquired firm's profit can be the same as, or even more than that in sequential offers; and (iii) conditional on firm acquisition taking place, the non-acquired firm's profits will always stay the same as in any mechanism. That said, irrespective of the firms' bargaining power and disagreement profits, the MNF prefers acquiring the ex-post efficient firm's assets, which is at least as good as greenfield entry (strictly preferred to greenfield investment for non-zero values of the MNF's bargaining power) so long as firm acquisition fulfills Condition 1.

3 Private Cost Information

This section extends the model to incomplete cost information. Suppose now that the ex-post marginal cost of the new entity (the acquired firm) is the local firm's private information. As is commonly used in the literature, the private information that each firm holds is referred to as its *type*, and thus the ex-post marginal cost of the new entity will be referred to as the local firm's type: θ_k, $k \in \{i, j\}$, represents firm k's type.[17] Each local firm knows the realization of the new entity's marginal cost if it is the local partner, but this is not known by the rival local firm or by the MNF.[18] However, the distribution of θ is common knowledge. To keep the extension of the model as simple as possible, the local firms' types θ_k, $k \in \{i, j\}$, are assumed to be independently and (identically) uniformly distributed over the interval $[0, \overline{\theta}]$ where $\overline{\theta}$ can take any value in the range $0 < \overline{\theta} \leq (2c + 3c^* - 1)/4$, and measures the size of the support of the possible cost types.[19] The upper bound follows Condition 1. The analysis in this section (and in the following section) is carried out for any value of $\overline{\theta}$ in the relevant range (including the case that this measure is maximized for a consumer-surplus standard in merger approvals) so as to see the impact of this measure on firm behavior and on welfare.

[17] Firm i is a *good*-type firm relative to firm j if $\theta_i < \theta_j$, or a *bad*-type firm if $\theta_i > \theta_j$.

[18] The new entity's marginal cost is the local firms' private information at the time of the auction, but will be revealed after the auction. This is merely a simplification as the MNF can easily find out each firm's type, simply by observing how much each firm offers in the auction, then by solving the problem backwards. In particular, with the revelation assumption, the optimal entry mode can be figured out without assigning any probabilities to the realization of firms' true types. If the firms' types were to remain private information even after the auction, there would have been Bayesian equilibria without further insights such that the firms would have determined their equilibrium production levels according to their beliefs about their opponent's type, and hence the equilibrium profit levels given by equation (3) would have changed to include such beliefs.

[19] An alternative interpretation could be that it measures ex-post firm heterogeneity. For a similar interpretation, see Koska *et al.* (2016a).

In this section, firm acquisition is modeled such that the MNF's (net) acquisition profit is determined by the local firms' bids in a second-price, sealed-bid auction.[20] In a second-price sealed-bid auction, each risk-neutral firm independently submits a single bid without observing the rival's bid. The investor acquires the existing assets of the firm making the highest bid, and earns the second-highest bid as its share from acquisition profits.[21] Similar to the valuations of the firms in the ascending auction under complete information, each local firm's bid represents its willingness to pay to the investor as the investor's share from acquisition profits, and thus, the investor will earn π_m^v equal to the runner-up's willingness to pay. The difference is that there is now incomplete cost information: firm k of type θ_k has a valuation that is not only a function of its own type, but also a function of the rival firm's type (due to negative externality implied by the consumer-surplus standard in merger approvals), which is the rival firm's private information; see equation (4) for the local firms' valuations.

Proposition 3 (Equilibrium bids & optimal entry) *In a pure-strategy symmetric separating equilibrium, firm* $k \in \{i, j\}$ *bids* $b_k(\theta_k) = [\pi^v(\theta_k) - \pi_k^e(\theta_{-k})|_{\theta_{-k}\to\theta_k}] > \pi_m^g$, $\forall\ \theta_k \in [0, \overline{\theta}]$, *where* $0 < \overline{\theta} \leq (2c + 3c^* - 1)/4$ *and* $b_k'(\theta_k) < 0$.

Proof. See Appendix A.2. ■

Firm acquisition that fulfills the consumer-surplus standard in merger approvals (given by Condition 1) is better than greenfield entry, even when private targets know more about potential gains from firm acquisition.[22] Holding an auction leads the MNF to avoid the lemon's problem such that it always picks a relatively efficient firm. The reason is that a firm's optimal bid is negatively related to its own type. The more productive the partnership, the smaller the size of θ_k, $k \in \{i, j\}$, the higher the local firm's bid. Therefore, the MNF can pick a *good*-type firm via the auction because the winner will be the firm making the highest bid, that is, the firm making the partnership most productive.

[20] In terms of the firms' bidding strategies with independent private values, a second-price auction is equivalent to an ascending auction, while a first-price auction is equivalent to a descending auction. That said, the Revenue Equivalence Theorem suggests that if the bidders are risk-neutral and if they have privately known values independently and identically drawn from a common and strictly increasing distribution, any symmetric equilibrium of any standard auction, in which the expected payment of the bidder with the lowest value is zero and the bidder with the highest value wins, yields the same expected revenue for the seller; see Krishna (2002).

[21] If the firms bid the same price, then the MNF randomly chooses the firm to acquire. The acquisition profits are determined after the auction is over, and after the MNF and the non-acquired firm competes against each other in Cournot duopoly. Once the Cournot profits are realized, the investor and the acquired firm share the acquisition profits according to the outcome of the auction.

[22] Raff *et al.* (2009b), considering a model in which a local firm's private information is its potentially valuable assets, and Qiu and Zhou (2006), considering a model in which local firms know more about local demand, find a similar result. Raff *et al.* (2009b) also show that this prediction is consistent with the ownership choices of Japanese multinationals.

Without loss of generality, let firm i be the ex-post efficient firm such that $\theta_i \leq \theta_j$. Then, the investor acquires firm i's assets and competes against firm j in Cournot duopoly. Firm j earns $\pi_j^e(\theta_i)$, while the acquisition profits are equal to $\pi^v(\theta_i)$, and are shared by the investor and firm i such that

- the investor will receive a share equal to the firm j's bid in the second-price auction: $\pi_m^v = \pi^v(\theta_j) - \pi_j^e(\theta_i)|_{\theta_i \to \theta_j} \geq \pi_m^g$ for any $\theta_k \in [0, (2c + 3c^* - 1)/4]$, $k \in \{i, j\}$, where $\pi_j^e(\theta_i)|_{\theta_i \to \theta_j} \equiv \pi_i^e(\theta_j) \geq \pi_j^e(\theta_i)$, as can be seen from equation (3), and $\theta_i \leq \theta_j$;
- firm i will keep the rest: $\pi_i^v = \pi^v(\theta_i) - [\pi^v(\theta_j) - \pi_j^e(\theta_i)|_{\theta_i \to \theta_j}] \geq \pi_i^e(\theta_j)$, for any $\theta_i \leq \theta_j$, where $\pi^v(\theta_j) - \pi_j^e(\theta_i)|_{\theta_i \to \theta_j} \leq \pi^v(\theta_j) - \pi_j^e(\theta_i)$ as $\pi_j^e(\theta_i)|_{\theta_i \to \theta_j} \equiv \pi_i^e(\theta_j) \geq \pi_j^e(\theta_i)$.

This immediately leads to

Proposition 4 (Gains from information asymmetries) *From an ex-post perspective, the (ex-post) efficient firm appropriates a bigger share from acquisition gains (thus the investor receives a smaller share than that in the case of symmetric cost information) when potential gains from firm acquisition are the local firms' private information than when such gains are common knowledge.*

This result and the preceding ones suggest that the investor prefers to be well informed on the potential gains from firm acquisition, and if applicable, to acquire a firm's assets through negotiations, whereas the local firms (especially the ex-post efficient firm) prefer an auction method, and have an incentive to generate some private information on the acquisition gains as this will lead both firms to bid less for firm acquisition so as to avoid the *winner's curse* (so as to avoid an undesirable outcome of paying unnecessarily more due to information asymmetries). One way to generate such private information could be to engage in R&D activities. This indicates that a consumer-surplus standard in merger approvals may have important implications also on local R&D activities (as the outcome would be uncertain), which may be considered another empirical prediction of the model that has to be qualified.[23]

[23]The model can easily be extended so as to include firms' R&D activities that generate uncertainty about a firm's marginal cost in the minds of the rival firms. In such a model, one can show firms put more effort in R&D not only to avoid a possible negative externality exerted by a rival's takeover, but also to appropriate even a bigger share from acquisition gains.

4 Welfare Implications

In this section, welfare ramifications of a consumer-surplus standard in approvals of firm acquisitions are scrutinized. Local welfare is defined as the sum of consumer welfare and total profits of the domestic firms (equation (A.5), Appendix A.3). Let $W^a(c)$ and $W^g(c, c^*)$ denote local welfare, respectively, when there is no foreign investment in the host country and when the MNF invests in new assets. Also denote by W_a^g the welfare change relative to the no-investment case when the MNF undertakes greenfield investment. It is straightforward to show that (see Appendix A.3 for details)

Lemma 4 (Greenfield FDI & welfare) *Compared to the no-investment case, local welfare improves with greenfield entry ($W_a^g > 0$) if the MNF is sufficiently productive vis-à-vis the local firms.*

Local competition increases with greenfield investment because a more productive firm enters the market and increases the number of firms, which increases production and decreases the market price, and thus increases consumer welfare. The more productive the foreign firm - the smaller is c^* - the more the increase in consumer welfare. Although the local firms' profits decrease with the investor's greenfield entry, consumer welfare increases by more than the decrease in local firms' profits, especially when the industry's average marginal cost decreases sufficiently with greenfield entry.

From an ex-ante perspective, the antitrust authority has to form expectations over local welfare when the MNF enters the host country by acquiring a local firm's assets, denoted W^v, as the ex-post marginal cost of the acquired firm is private information. Let $E_\theta[W^v]$ denote the expected value of W^v, which is a function of $\overline{\theta}$, as θ_k, $k \in \{i, j\}$, is distributed over support $[0, \overline{\theta}]$. Computations show that the wider is the interval over which the ex-post marginal costs are distributed (the bigger is the size of $\overline{\theta}$), the higher is local welfare with firm acquisition (see Appendix A.3 for details). The intuition is as follows. If the size of the support of the possible cost types is bigger, the ex-post marginal cost of the acquired firm is expected to be higher, with which the expected increase in aggregate production will be less, and thus the expected decrease in the market price will be less: consumer welfare is expected to increase less. Similarly, the expected gains from firm acquisition will be less, although the local firm is expected to increase its share from acquisition profits as the bids decrease by more than the decrease in expected acquisition profits. As for the non-acquired firm, the negative impact of firm acquisition is expected to be less severe. Denoting by $E[W_a^v]$ the expected welfare change relative to the no-investment case when the investor acquires a local firm's existing assets, it can be shown that (see Appendix A.3 for details)

Proposition 5 (Firm acquisition & welfare) *Compared to the no-investment case, acquisition of a firm's assets is expected to improve welfare ($E[W_a^v] > 0$) if the local firms have, ex ante, sufficiently high marginal costs, or if the size of the support of the potential cost types is sufficiently large.*

With which entry mode does local welfare improve more? Let $E[W_g^v]$ denote the expected welfare change relative to greenfield investment when the investor enters the market by acquiring a local firm's assets. It is clear from Lemma 4 and Proposition 5 that both entry modes improve local welfare (relative to the no-investment case) when the MNF is sufficiently productive (relative to the local firms), and when the local firms have, ex ante, sufficiently high marginal costs. Also, Proposition 5 suggests that a sufficiently wide interval over which the ex-post marginal cost of the acquired firm is distributed plays an important role in the welfare implications of firm acquisition. It can be deduced that ex-ante cost asymmetry between the MNF and the local firms, or potential (ex-post) firm heterogeneity (as measured by the size of the support of the potential cost types) seems to be the key for welfare improvement. Appendix A.4 proves that

Proposition 6 (Welfare comparison) *Compared to the no-investment case, when the degree of potential firm heterogeneity following the investor's market entry is sufficiently high, welfare improves with FDI, and does so more with firm acquisition subject to a consumer-surplus standard than with greenfield FDI.*

Both greenfield entry and firm acquisition increase local competition relative to the no-investment case. In the greenfield FDI case, a more productive firm enters the market and increases the number of firms, whereas in the case of firm acquisition, a more productive firm replaces a less productive firm. The average productivity in the industry increases, which increases aggregate production and decreases the market price, and thus consumer welfare increases with FDI. A consumer-surplus standard in approvals of acquisition of existing assets guarantees a size of consumer welfare with firm acquisition that is at least as big as one with greenfield FDI. Moreover, while greenfield entry decreases both firms' profits relative to the no-investment case, acquisition of existing assets decreases only the non-acquired firm's profits.

The following questions are important to understand the policy implications of the model. Under what parameter values of c, c^* and $\overline{\theta}$, if any, is it optimal for a regulation authority to overrule a consumer-surplus standard in approvals of acquisition of existing assets and to prohibit firm acquisition, while permitting greenfield entry? In which situations, if any, is it optimal for a regulation authority to ban foreign investment altogether? Figure 2 uses the parameter constraints implied by the model and illustrates the policy implications,

simply by dividing the relevant area into four different regions. In *Regions I, II* and *III*, $c^* > (26c - 11)/15$, and in *Region IV*, $c^* < (26c - 11)/15$; relative to the no-investment case, greenfield entry improves welfare only in *Region IV* (Lemma 4 and Appendix A.3). Moreover, in *Regions III* and *IV*, $c > 4/9$; relative to the no-investment case, firm acquisition improves welfare in these two regions, whereas in *Region II*, where $c < 4/9$, firm acquisition improves welfare if and only if $\overline{\theta} > \widetilde{\overline{\theta}}(c)$ (Proposition 5 and Appendix A.3). In *Region I*, where $c < 4/9$ and $\overline{\theta} < \widetilde{\overline{\theta}}(c)$, relative to the no-investment case, welfare deteriorates not only with greenfield entry, but also with firm acquisition.

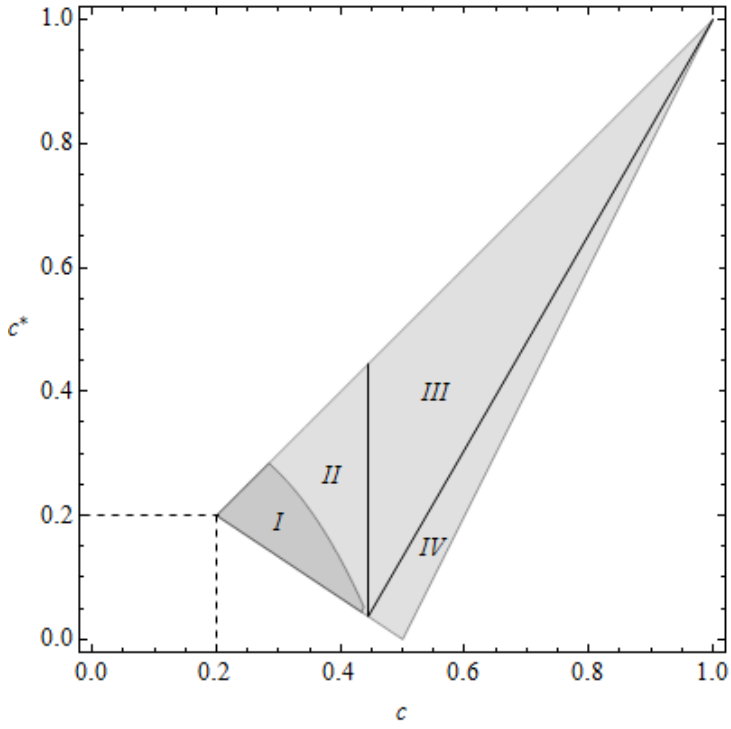

Figure 2 Welfare implications.

Clearly, firm acquisition that fulfills the consumer-surplus standard is preferred not only by the investor, but also by the host country, especially in *Regions III*, and *IV*, as well as in *Regions II* insofar as the size of the support of the potential cost types is sufficiently large. In *Regions II* and *III*, however, a regulation authority may consider introducing restrictive measures on greenfield FDI as it deteriorates welfare. In *Region I*, however, a regulation authority may want to overrule a consumer-surplus standard and to introduce restrictive measures on both greenfield entry and firm acquisition. This is also the case in *Region II* if the size of the support of the potential cost types is not sufficiently large.

Corollary 3 (Policy implication) *A consumer-surplus standard in approvals of firm acquisition aligns the nationally optimal entry mode to the investor's optimal entry mode, unless the local firms are fairly productive.*

It is not optimal for a regulation authority to prohibit firm acquisition, while permitting greenfield entry. On the contrary, for any permissible greenfield entry (*Region IV* in Figure 2), the model predicts that firm acquisition that fulfills the consumer-surplus standard in approvals of acquisition of a firm's existing assets is optimal not only for the investor, but also for the host country. This prediction is consistent with what UNCTAD (2000) has reported, that is, allowing for foreign ownership is mostly accompanied by permitting acquisition of firms' assets subject to some enforcement practices.[24]

5 Concluding remarks

Firm acquisitions can be anti-competitive and can have detrimental effects on consumer welfare. To avoid anti-competitive outcomes of firm acquisitions, most countries follow enforcement practices and employ restrictive measures that can be best approximated by a consumer-surplus standard. This study has scrutinized the implications of a consumer-surplus standard in approvals of firm acquisitions on a foreign investor's choice between greenfield investment and firm acquisition, on firm behavior, on the unilaterally (from the investor's perspective) and the nationally optimal acquisition mechanism (negotiations or auctions), on the nationally optimal market entry mode under both complete and incomplete (cost) information structures, and on welfare. The results have shown that any firm acquisition fulfilling the consumer-surplus standard is in the best interest of the investor, who prefers to be well informed on acquisition gains and prefers to acquire an ex-post efficient firm's assets via sequential offers. The ex-post efficient firm, however, appropriates a bigger share from acquisition gains in an auction, and prefers generating information asymmetries. Although a consumer-surplus standard in approvals of firm acquisitions does not guarantee an increase in aggregate welfare, it has been shown that aggregate welfare certainly improves with a larger scope for ex-post firm heterogeneity. In particular, a consumer-surplus standard in approvals of firm acquisitions aligns the nationally optimal entry mode to the investor's optimal entry mode and proves to be most beneficial especially in under-performing industries (in which local firms are fairly unproductive). The results also point to some important empirical predictions on post-market-entry sorting by firm size and on local R&D activities that may be the outcome of a consumer-surplus standard in approvals of firm acquisition.

[24]For similar findings, see Norbäck and Persson (2005), and Markusen and Stähler (2011).

Appendix

A.1 Generalized Nash Bargaining

Let α and $(1-\alpha)$ be, respectively, the MNF's and firm k's, $k \in \{i, j\}$, bargaining power given exogenously, such that $\alpha \in [0, 1]$. Note that $\alpha = 1/2$ corresponds to the random-proposer case: each firm can make a take-it-or-leave-it-offer with equal probabilities. Denote the MNF's and firm k's disagreement profits (threat points), respectively, by π_m^d and π_k^d, $k \in \{i, j\}$. If the firms agree on the terms, the MNF acquires firm k's assets and competes against the other firm in Cournot dupoly, in which case the acquisition profit is $\pi^v(\theta_k)$, and the non-acquired firm earns $\pi_{-k}^e(\theta_k)$, $k \in \{i, j\}$. The MNF's share from acquisition profits is $\gamma\pi^v(\theta_k)$, while firm k earns $(1-\gamma)\pi^v(\theta_k)$, where $\gamma \in [0, 1]$. Each firm tries to maximize its share, such that the MNF tries to maximize the Nash product $[\gamma\pi^v(\theta_k) - \pi_m^d)]^\alpha[(1-\gamma)\pi^v(\theta_k) - \pi_k^d]^{(1-\alpha)}$ with respect to γ, the solution to which leads to $\gamma\pi^v(\theta_k) = \alpha[\pi^v(\theta_k) - \pi_k^d - \pi_m^d] + \pi_m^d$. Similarly, the local firm earns a share equal to $(1-\gamma)\pi^v(\theta_k) = (1-\alpha)[\pi^v(\theta_k) - \pi_k^d - \pi_m^d] + \pi_k^d$. The first term on the RHS, which is positive given Condition 1, is the gain from acquisition, that is, the increase in the sum of firm profits (when the two firms opt for their outside options) with firm acquisition; and the second term is the firm's outside profits. Depending on each firm's exogenously given bargaining power, each firm shares the gains from acquisition in addition to receiving (at least) their outside profits. It is clear that if the MNF has full bargaining power such that $\alpha = 1$, then the MNF's acquisition profit will turn out to be $\pi^v(\theta_k) - \pi_k^d$. Depending on the local firm's disagreement profit $\pi_k^d \in \{\pi_k^e(\theta_{-k}), \pi_k^g\}$, where $\pi_k^e(\theta_{-k}) \leq \pi_k^g$ for any $\theta_{-k} \in [0, (2c + 3c^* - 1)/4]$; $k \in \{i, j\}$, the MNF's acquisition profit can be the same as in sequential offers (the upper bound of its profits), or the same as in exclusive (bilateral) negotiations (given that the MNF's outside option is either to acquire the other firm, or to undertake greenfield investment). Full bargaining power for the investor implies no bargaining power for the local firm, in which case the local firm will earn its outside profit $\pi_k^d \in \{\pi_k^e(\theta_{-k}), \pi_k^g\}$. If, however, the MNF has no bargaining power such that $\alpha = 0$, then the MNF will earn its outside profit π_m^d (the lower bound of its profits). When the threat point is greenfield entry such that $\pi_m^d = \pi_m^g$, and when the local firm has full bargaining power, then its share from acquisition profits will be $\pi^v(\theta_k) - \pi_m^g$.

A.2 Proof of Proposition 3

The proof follows from Jehiel and Moldovanu (2000). Firm k's valuation, $k \in \{i, j\}$, as in equation (4), includes two effects: (1) an increase in profits compared to greenfield profits when firm k's assets are acquired by the investor; and (2) a decrease in profits compared

to greenfield profits when the other firm is acquired. Let $\omega_k(\theta_k) = \pi^v(\theta_k) - \pi^g_k > 0$ denote the first effect, where π^g_k and $\pi^v(\theta_k)$ are given by equations (2) and (3), respectively:

$$\omega_k(\theta_k) = \left(\frac{1 - 2\theta_k + c}{3}\right)^2 - \left(\frac{1 - 2c + c^*}{4}\right)^2. \tag{A.1}$$

When firm k's assets are acquired, the non-acquired firm's loss compared to the greenfield case can be written as $\pi^e_{-k}(\theta_k) - \pi^g_{-k} \leq 0$, $k \in \{i, j\}$, where π^g_k and $\pi^e_{-k}(\theta_k)$ are given by equations (2) and (3), respectively, such that

$$\pi^e_{-k}(\theta_k) - \pi^g_{-k} = \left(\frac{1 - 2c + \theta_k}{3}\right)^2 - \left(\frac{1 - 2c + c^*}{4}\right)^2. \tag{A.2}$$

By re-arranging equation (A.1) as a function of the gains from firm acquisition, such that

$$\theta_k = \frac{1}{2}\left(1 + c - 3\sqrt{\left(\frac{1 - 2c + c^*}{4}\right)^2 + \omega_k}\right),$$

and by substituting it into equation (A.2), the non-acquired firm's loss can be re-written as a function of the gains from firm acquisition, such that $\pi^e_{-k}(\theta_k) - \pi^g_{-k} = h_{-k}(\omega_k) \in \mathbb{R}_{\leq 0}$, where $|h|' > 0$ (the non-acquired firm's loss increases with an increase in the gains from firm acquisition). Given $\theta_k \in [0, \overline{\theta}]$, it is straightforward to show that $\omega_k \in [\underline{\omega}, \overline{\omega}]$, where $\underline{\omega}$ and $\overline{\omega}$ can be computed by replacing for θ_k, respectively, $\overline{\theta}$ and 0 in equation (A.1). Note that the non-acquired firm does not observe ω_k (as this is the acquired firm's private information) when bidding in the auction. Firms' valuations are determined by their beliefs. If, for example, firm $k \in \{i, j\}$ believes that there is no chance that the investor will acquire the other firm's assets, then its valuation will be equivalent to $\omega_k = \pi^v(\theta_k) - \pi^g_k$ (i.e., zero probability mass on the second effect). If, however, it believes that the investor certainly will acquire the other firm's assets should firm k fail to win the auction, then firm k's valuation will be equivalent to $v_k \equiv H_k(\omega_k, \omega_{-k}) = \omega_k - E[h_k(\omega_{-k})]$, $k \in \{i, j\}$. In what follows, a symmetric fully-separating equilibrium in monotonically increasing (pure) bidding strategies is considered, such that in equilibrium, the firms bid according to their valuations; the bidding strategies of the firms are optimal given their beliefs; and their beliefs are consistent with their bidding strategies.

Suppose, first, that there exists a monotonically increasing and a differentiable bidding strategy $\gamma(\omega_j)$ according to which firm j bids, such that $b_j = \gamma(\omega_j)$. Given firm j's bidding strategy, firm i's maximization problem can be written as

$$\max_{\{b_i\}} \int_{\underline{\omega}}^{\gamma^{-1}(b_i)} (\omega_i - \gamma(\omega_j)) f(\omega_j) d\omega_j + \int_{\gamma^{-1}(b_i)}^{\overline{\omega}} h_i(\omega_j) f(\omega_j) d\omega_j, \tag{A.3}$$

where the FOC, by using Leibniz's Rule and differentiating equation (A.3) with respect to b_i, can be expressed as

$$\frac{\partial \gamma^{-1}(b_i)}{\partial b_i} f(\gamma^{-1}(b_i)) \left[\omega_i - \gamma(\gamma^{-1}(b_i)) - h_i(\gamma^{-1}(b_i))\right] = 0. \tag{A.4}$$

In the case of symmetric bidding strategies, given $\gamma^{-1}(b_j) = \omega_j$, it must hold also true that $\gamma^{-1}(b_i) = \omega_i$. Substituting this into equation (A.4) and solving for firm i's bidding strategy $b_i = \gamma(\omega_i)$ leads to $b_i = H_i(\omega_i, \omega_i) = \omega_i - h_i(\omega_i)$, which strictly increases with an increase in ω_i over range $[\underline{\omega}, \overline{\omega}]$ (or rather, which strictly decreases with an increase in θ_i over range $[0, \overline{\theta}]$ should it be re-written as $b_k(\theta_k) = [\pi^v(\theta_k) - \pi^e_k(\theta_{-k})|_{\theta_{-k} \to \theta_k}]$, $k \in \{i, j\}$).

To prove the optimality of the bidding strategy of firm i of type ω_i, $b_i = H_i(\omega_i, \omega_i)$, given the bidding strategy of firm j of type ω_j is $b_j = H_j(\omega_j, \omega_j)$, consider the two possibilities: firm i bids above $H_j(\omega_j, \omega_j)$ leading the investor to acquire its assets, with which firm i's payoff is $\omega_i - H_j(\omega_j, \omega_j)$; or firm i bids below $H_j(\omega_j, \omega_j)$ leading the investor to acquire firm j, with which firm i's payoff is $h_i(\omega_j)$. Due to symmetry such that $h_k(\omega_k) = h_{-k}(\omega_k)$, $k \in \{i, j\}$, (and by the mean value theorem), it is straightforward to show that it is optimal for firm i to bid more than firm j (as the payoff is greater) if and only if $\omega_i > \omega_j$, or rather if and only if $\theta_i < \theta_j$. Note that the investor will not accept any price below its greenfield profits, π^g_m. This, however, constitutes a non-binding constraint on the local firms as the lower bound of bids in the relevant range is greater than the investor's greenfield profits $H(\underline{\omega}) > \pi^g_m$, that is, even acquiring the assets of the lowest possible type (the firm that leads to the highest ex-post marginal cost, $\overline{\theta}$), which fulfills the consumer-surplus standard in merger approvals, earns the investor higher profits than greenfield profits. Therefore, firm k's belief that the investor will acquire the other firm's assets with certainty should it fail to win the auction is consistent with its bidding strategy.

A.3 Welfare implications

Local welfare (W) is given by

$$W^t = \left[\frac{1}{2}\left(Q^t\right)^2 + \sum_k \pi^t_k\right]; \quad t \in \{a, g, v\}; \quad k \in \{i, j\}, \tag{A.5}$$

where Q^t is aggregate output, $\sum_k \pi^t_k$ is the sum of local firms' profits, and t stands for the investor's mode of entry.

Investing in new assets & Proof of Lemma 4

W^a and W^g computed according to equation (A.5), are given by equations (A.6) and (A.7), respectively:

$$W^a = \frac{4}{9}(1-c)^2, \tag{A.6}$$

$$W^g = \frac{3(1-c)^2}{8} + \frac{(1-c^*)^2}{32} + \frac{(c-c^*)^2}{8} - \frac{(1-c)(c-c^*)}{8}. \tag{A.7}$$

The difference between W^g, given by equation (A.7), and W^a, given by equation (A.6), denoted W^g_a, is

$$W^g_a = \frac{1}{288}(-11+26c-15c^*)(1-3c^*+2c), \tag{A.8}$$

suggesting that compared to the no-investment case, local welfare improves with greenfield entry ($W^g_a > 0$) if the MNF is sufficiently productive vis-à-vis the local firms such that $c^* < (26c-11)/15$.

Acquisition of existing assets & Proof of Proposition 5

Suppose the investor acquires a local firm's existing assets. Given that the ex-post marginal cost of the acquired firm is not observable ex ante, the computations of both aggregate output and profits of the firms depend on a random variable. The expected value of consumers' surplus $E_\theta\left[(Q^v)^2/2\right]$ can be expressed as

$$E\left[\frac{1}{2}\left(\frac{2-c-\min\{\theta_i,\theta_j\}}{3}\right)^2\right], \tag{A.9}$$

where $\min\{\theta_i,\theta_j\}$ is the ex-post marginal cost of the acquired firm (the new entity). Similarly, the local firms' expected profits can be expressed as

$$E\left[\frac{(1-2\min\{\theta_i,\theta_j\}+c)^2}{9} - \min\{b_i,b_j\} + \frac{(1-2c+\min\{\theta_i,\theta_j\})^2}{9}\right], \tag{A.10}$$

where $\min\{b_i,b_j\}$ is the investor's share from acquisition gains, that is, the second-highest bid in the auction that will have been paid to the investor out of acquisition profits:

$$\min\{b_i,b_j\} = \frac{(c-\max\{\theta_i,\theta_j\})\,(2-\max\{\theta_i,\theta_j\}-c)}{3}. \tag{A.11}$$

The expected values of the random variables in equations (A.9), (A.10), and (A.11) are computed as

$$
\begin{aligned}
E\left[\min\{\theta_i,\theta_j\}\right] &= \int_0^{\overline{\theta}}\int_0^{\overline{\theta}} \min\{\theta_i,\theta_j\} f(\theta_i)d\theta_i f(\theta_j)d\theta_j &&= \overline{\theta}/3,\\
E\left[\min\{\theta_i^2,\theta_j^2\}\right] &= \int_0^{\overline{\theta}^2}\int_0^{\overline{\theta}^2} \min\{\theta_i^2,\theta_j^2\} f(\theta_i^2)d\theta_i^2 f(\theta_j^2)d\theta_j^2 &&= \overline{\theta}^2/6,\\
E\left[\max\{\theta_i,\theta_j\}\right] &= \int_0^{\overline{\theta}}\int_0^{\overline{\theta}} \max\{\theta_i,\theta_j\} f(\theta_i)d\theta_i f(\theta_j)d\theta_j &&= 2\overline{\theta}/3,\\
E\left[\max\{\theta_i^2,\theta_j^2\}\right] &= \int_0^{\overline{\theta}^2}\int_0^{\overline{\theta}^2} \max\{\theta_i^2,\theta_j^2\} f(\theta_i^2)d\theta_i^2 f(\theta_j^2)d\theta_j^2 &&= \overline{\theta}^2/2.
\end{aligned}
$$

Note that the p.d.fs are $f(\theta_i) = f(\theta_j) = 1/\overline{\theta}$, $f(\theta_i^2) = (\theta_i^2)^{-1/2}/2\overline{\theta}$, $f(\theta_j^2) = \left(\theta_j^2\right)^{-1/2}/2\overline{\theta}$. Using these expected values of the random variables accordingly in equations (A.9) and (A.10), expected welfare when the investor acquires a local firm's existing assets, denoted $E\left[W^v\right]$ - the sum of equations (A.9) and (A.10) - can be expressed as a function of the size of the support of the possible ex-post cost types, such that

$$
E\left[W^v\right] = \frac{1}{108}\left(48 + 102c^2 + \overline{\theta}\left(32 - 7\overline{\theta}\right) - 4c\left(30 + 7\overline{\theta}\right)\right), \tag{A.12}
$$

where $\partial E\left[W^v\right]/\partial\overline{\theta} > 0$ for $\overline{\theta} < (16 - 14c)/7$. The difference between $E\left[W^v\right]$, given by equation (A.12), and W^a, given by equation (A.6), denoted $E[W_a^v]$, is

$$
E[W_a^v] = \frac{1}{108}\left(54c^2 + \overline{\theta}\left(32 - 7\overline{\theta}\right) - 4c\left(6 + 7\overline{\theta}\right)\right). \tag{A.13}
$$

It is now clear that $E[W_a^v] = 0$ for $\overline{\theta} = \widetilde{\overline{\theta}}(c) \in \mathbb{R}^+$, such that $\widetilde{\overline{\theta}}(c) = (16 - 14c)/7 - \Lambda$, where $\Lambda = \left(\sqrt{256 + 14c(-44 + 41c)}\right)/7$. It can easily be seen by inspection that

(i): $\lim_{c\to 0}\widetilde{\overline{\theta}}(c) = \lim_{c\to 4/9}\widetilde{\overline{\theta}}(c) = 0$,

(ii): $\forall\ c \in [0, 4/9]\,,\ \widetilde{\overline{\theta}}(c) \in [0, 1]$,

(iii): $\forall\ c \in [4/9, 1]\,,\ \widetilde{\overline{\theta}}(c) < 0$.

Since $\partial E\left[W_a^v\right]/\partial\overline{\theta} > 0$ for $\overline{\theta} < (16 - 14c)/7$, from (i) and (ii), we can show $E[W_a^v] < 0$ if $\overline{\theta} < \widetilde{\overline{\theta}}(c)$, given $c < 4/9$. Also from (iii), $\forall\ c \in [4/9, 1]$, $E[W_a^v] > 0$, because any given $\overline{\theta} > 0$ will be larger than $\widetilde{\overline{\theta}}(c) < 0$. Therefore, compared to the no-investment case, acquisition of a local firm's assets is expected to improve welfare ($E[W_a^v] > 0$) if the local firms have, ex ante, sufficiently large marginal costs ($c > 4/9$). If, however, the local firms are, ex ante, sufficiently productive ($c < 4/9$), then a positive expected welfare change depends on the size of the support of the possible cost types such that expected welfare improves with firm acquisition if and only if $\overline{\theta} > \widetilde{\overline{\theta}}(c)$.

A.4 Proof of Proposition 6

The difference between $E[W^v]$, given by equation (A.12), and W^g, given by equation (A.7), denoted $E[W_g^v]$, is

$$E[W_g^v] = \frac{(-11+46c-15c^*)(-1+2c+3c^*)}{288} + \frac{\overline{\theta}(8-7c)}{27} - \frac{7\overline{\theta}^2}{108} \ . \tag{A.14}$$

Both entry modes improve local welfare relative to the no-investment case when the investor is sufficiently productive vis-à-vis the local firms such that $c^* < (26c-11)/15$ (Lemma 4 and Appendix A.3), and when the local firms' marginal cost is sufficiently large such that $c > 4/9$ (Proposition 5 and Appendix A.3). Inspecting equation (A.14), given $c > 4/9$ and $c^* < (26c-11)/15$, shows that whenever greenfield entry improves welfare compared to the no-investment case, acquisition of a local firm's assets does it more ($E\left[W_g^v\right] > 0$) so long as there is, ex ante, sufficient cost asymmetry between the MNF and the local firms, or when the size of the support of the potential cost types is maximized for the consumer-surplus standard in approvals of acquisition of existing assets, such that $\overline{\theta} = (2c+3c^*-1)/4$, so that the negative impact on the firm competing against the new entity is minimized. This can be shown as follows:

(i): $E\left[W_g^v\left(\overline{\theta} \equiv (2c+3c^*-1)/4\right)\right] = (23+50c-37c^*)(2c+3c^*-1)/576$, the sign of which is clearly positive, that is, $\lim_{\overline{\theta}\to(2c+3c^*-1)/4} E[W_g^v] > 0$, and

(ii): $\lim_{\overline{\theta}\to 0} E[W_g^v] = (-11+46c-15c^*)(2c+3c^*-1)/288$, which clearly has a positive sign for $c^* < (-11+26c)/15$, and which increases as $\overline{\theta}$ increases, because $\partial E\left[W_g^v\right]/\partial\overline{\theta} > 0$ for $\overline{\theta} < (16-14c)/7$.

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