Picking cherries or lemons: A unified theory of cross-border mergers and acquisitions

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1 | INTRODUCTION

Foreign direct investment (FDI) is an important driver of economic growth, especially in developing countries. Understanding of the components that enhance or impede FDI flows is important, and is still evolving. Geography and national characteristics have often been referred to as the determinants of FDI flows. On the one hand, the trade-off between proximity (i.e. setting up a plant close to the market) and concentration (i.e. producing everything in one place to take advantage of the economies of scale) could be used to explain horizontal FDI when firms contemplate having similar businesses abroad. In particular, FDI is more prominent in remote and large markets (Brainard, 1997; Markusen & Venables, 1998). On the other hand, if we assume away transport costs and tariffs (which practically rule out the proximity incentive), factor endowment differences lead to vertical FDI when firms contemplate adding additional businesses abroad (Helpman, 1984). Recently with the development of new theories, and the availability of new micro data, firm heterogeneity has been widely accepted as another important feature in an international economic model (Melitz & Redding, 2015). This feature thus opens a whole new dimension of FDI determinants. For example, not every firm decides to invest abroad. In fact, the literature suggests that only the most productive firms engage in FDI (Helpman, Melitz, & Yeaple, 2004).

This article investigates the role of firm heterogeneity in understanding the motives of mergers and acquisitions (M&A), activities that are considered to be one of the most important components of FDI (greater detail is offered in the following section). The motives for M&A activities are different and they are all important (Bower, 2001). Mergers can attempt to create market power by forming monopolies or oligopolies (e.g. Gowrisankaran, 1999; Kamien & Zang, 1990). Mergers may generate opportunities for diversification and may reduce cost or demand uncertainty (e.g. Zhou, 2008). Mergers have also been shown to provide market discipline, for example, if they change inefficient management at the target firm; or to counteract market discipline, for example, if they allow the management of the firm in the acquiring role to over-expand (Andrade, Mitchell, & Stafford, 2001). Moreover, when the contractual relationship between two parties is too complex (to the extent that a contract cannot encompass all possibilities), an integration is preferred to outsourcing (Antras, 2003).

In this article, I look at the efficiency-related reasons to explain the formation of a joint venture. Some of these reasons already feature in the literature, such as unit cost reductions, or economies of scale (e.g. Bloch, 1995; Davidson & Ferrett, 2007; Farrell & Shapiro, 2001; Teece, 1980). The efficiency improvement in my paper results from the complementarities between the two parties: the home firm and the foreign firm. These complementarities come from two different sources. On the one hand, the attractiveness of production in the home country (due to import tariffs or consumer preferences) complements the expertise (e.g. management expertise or technological expertise) brought by the foreign partner. On the other hand, high-quality foreign inputs work best with high-performance domestic firms, as suggested by the O-ring theory (Kramer, 1993).

Understanding the motives underlying M&A agreements could help map firm characteristics to FDI choices. Nocke and Yeaple (2007) argue that M&A enable the firm to enjoy the "non-mobile" capability (for instance, marketing expertise), while greenfield FDI (when the firm establishes a new plant from the ground up) enables the firm to avoid the transportation costs. Their result extends the work of Helpman et al. (2004) by showing that the most productive firms choose greenfield FDI while the less-productive firms (but still more productive than the others according to Helpman et al., 2004) choose M&A. However, they remain silent on another important question: what is the mapping from the characteristics of the acquired firm to the type and the amount of FDI? This question takes on academic and economic significance when we switch our interest from greenfield FDI to M&A.

The answers to this question have been mixed empirically. On the one hand, M&A could be defined as a "natural selection" process where the non-performing firms are bought by the better firms (Neary, 2007). Unproductive firms, which we shall refer to as "lemons," can be attractive purchases because they can provide a cheap way to enter the local market (Nocke & Yeaple, 2007). This natural selection is supported by the evidence documented in Lichtenberg and Siegel (1987): US firms essentially target non-performing firms. On the other hand, better performing firms, which we shall refer to as "cherries," are frequently prime FDI choices in Chile (Ramondo, 2009), Indonesia (Arnold & Javorcik, 2009), the United Kingdom (Criscuolo & Martin, 2009) and Spain (Guadalupe, Kuzmina, & Thomas, 2012). To explain these facts, Guadalupe et al. (2012) suggest that firms pick "cherries" because productivity improvement is higher with initial productivity. This positive selection occurs thanks to the complementarity between the acquired firm's characteristics and the acquiring firm's low cost of innovation, and, thus, can potentially generate more profit. Blonigen, Fontagne, Sly, and Toubal (2012) have another story to explain why firms pick cherries: although a negative productivity shock may render cherries unprofitable and hence accept to be acquired, they nonetheless have a large market network that makes them attractive to the foreign partner.

The above discussion raises a question regarding how and when a merger or acquisition will target low or high-productivity firms. Is it possible that firms target both lemons and cherries? The interaction between the factor complementarities and the nature of assets generate the conditions under which either type (or both types) can be picked. Foreign firms prefer to buy low-productivity firms ("lemons") in a horizontal integration due to the complementarities between intangible assets and local market access; they tend to pick high-productivity firms ("cherries") in a vertical integration because their productivity brings out the best of the tangible assets that can be provided by the acquiring firms.

My paper contributes to the literature in three different ways. First, it could be used to explain complex FDI strategies. These strategies arise in the presence of different transport costs (Yeaple, 2003). The interaction between geography and national characteristics such as country size and

factor endowment could also be an explanatory factor (Markusen, Venables, Konan, & Zhang, 1996). My paper differs from these papers by opening another dimension: it is not the difference at the country level, but firm heterogeneity that drives complex FDI strategies. And this firm heterogeneity dictates the share of the domestic firm. Indeed, although both types of firms could be chosen, high-productivity firms have to be offered a high share of profit as they have better outside options (they are more profitable as stand-alone entities).

Second, my paper can also explain the M&A waves as a result of trade liberalisation. Markusen (1984) shows that the proximity-fixed cost trade-off determines FDI decisions. In particular when the trade costs are high, foreign firms will invest more in the home country to avoid such costs. This result cannot explain the waves of M&A after trade liberalisation. Chudnovsky and Lopez (2000) document that, as a result of the Mercado Comun del Sur or Southern Common Market (MERCOSUR) integration, and, in particular, trade liberalisation with Brazil, Argentine firms faced more import competition. They had to reduce costs and to increase efficiency. FDI inflows increased as a result. In 1991, the ratio of FDI and GDP was less than 2%, but the figure rose to 8% in 1999. The cross-border M&A annual average was $1.1 billion during the period 1991–94, increased to $7.9 billion during the period 1995–99, and reached a record high of $19.2 billion in 1999. Similarly, the European Commission (1996) documented that "the EU's outstanding performance in attracting FDI flows during the single market's establishment period could well be linked to the single market process." To explain these facts, Neary (2007) suggests that comparative advantage and trade liberalisations lead to the waves of M&A. The propositions in my paper provide another explanation to these waves: when the intermediate markets are liberalised, more M&A agreements will be observed as the high-productivity domestic firms will be sought by foreign partners in a vertical integration.

Finally, my paper is related to the young but growing literature that analyses matching between sellers and buyers. Small sellers typically are matched with one large buyer (Blum, Claro, & Horstmann, 2010). Eaton, Eslava, Jinkins, Krizan, and Tybout (2014) build a model that incorporates the evolution of the set of clients to explain these export dynamics. Typically a firm aiming to enter a foreign market will need to know its potential clients there. Information from its first client will help it update its belief regarding the demand in the market in question. These updates in turn will lead the firm to adjust its decisions, including finding new clients and managing existing ones. Using the shipments data from Colombia to the United States, they find that while most Colombian exporters drop out within a year, those who survive expand rapidly. This leads to a Pareto-like distribution where the market is dominated by a few large exporters. Bernard, Moxnes, and Ulltveit-Moe (2014) also assume heterogeneity both on the demand side and the supply side. They show the negative assortative matching between exporters and importers: in general, the average connectivity of an importer decreases with the connectivity of the exporter. Instead of explaining the matches between importers and exporters in the international good markets, my paper expands this literature by providing the framework to understand the matches between the acquired firms and the acquiring firms in the investment markets.

The rest of the paper is organised as follows: Section 2 presents facts that illustrate the importance of FDI and M&A, and provides supporting evidence for the paper. Section 3 presents the main features of the model. Section 4 provides the equilibrium analysis and offers a real-world example (the Volkswagen business strategy in China) that illustrates the dynamics revealed by the framework. Section 5 concludes.

2 | STYLISED FACTS

2.1 | The importance of FDI

Although tariffs and transportation costs have fallen markedly,[1] FDI has far outpaced global trade and output over the past decades. Between 1980 and 2007, FDI net inflows rose from 0.5% of World GDP to 5.2% of World GDP - a 1000% increase. Trade flows, in contrast, rose from 38.8% of World GDP to 59.4% of World GDP over the same period 1980–2007 - an increase of only 50%.[2] Chudnovsky and Lopez (2000) document that as a result of the MERCOSUR integration, and, in particular, trade liberalisation with Brazil, Argentine firms faced more import competition. They had to reduce costs and increase efficiency. FDI inflows increased as a result. In 1991, the ratio of FDI and GDP was less than 2%, but the figure rose to 8% in 1999. The cross-border M&A annual average was $1.1 billion during the period 1991–94, increased to $7.9 billion during the period 1995–99, and went on to reach a record high of $19.2 billion in 1999. Similarly, the European Commission (1996) documented that "the EU's outstanding performance in attracting FDI flows during the single market's establishment period could well be linked to the single market process."

An understanding of "FDI makers" is important in explaining the direction of exchanges between countries. Indeed, Mayer and Ottaviano (2007) report that FDI makers are likely to be more productive, and, therefore, bigger than pure exporters. There is also ample evidence that exports are dominated by the big players (Arkolakis & Muendler, 2010; Bernard & Jensen, 1995). Therefore, analysing the choices of these FDI makers has the potential to offer insights about what drives FDI more broadly.

2.2 | The importance of M&A activities

Mergers and acquisitions have become an important component of FDI. Indeed Gugler, Mueller, Yurtoglu, and Zulehner (2003) study 2,753 mergers worldwide from 1981 to 1998 and find an upward trend in the percentage of mergers that are cross-border, a trend that is particularly pronounced for EU countries in the 1990s. For example, the percentage of all mergers in Continental Europe that were cross-border rose from 24.2% in 1991–92 to 39.8% in 1997–98. More recently, according to the United Nations Conference on Trade and Development (UNCTAD, 2013), cross-border M&As rose from $111 billion in 1990 to $349 billion in 2013 (the peak was attained in the pre-crisis period 2005–07 at $780 billion). Figure 1 shows that while greenfield FDI continued to plummet after the 2008 crisis, cross-border M&A picked up its pre-crisis momentum.

From the year 2011 to 2012, both forms of FDI showed a decline in value. However, the M&A activities still fared better than greenfield FDI. Figure 2 reports that manufacturing took the biggest hit. From 2011 to 2012, there was a total drop of $257 billion in these sectors, while the drop in services and in primary sectors was $152 billion and $141 billion, respectively. The steep decline in manufacturing FDI originated largely from a decline in the value of greenfield projects across all three groups of economies—developed, developing and transition economies. These numbers fell 21% globally. By contrast, the decline in the value of cross-border M&A was driven primarily by a decrease in the average deal value, but not by the number of deals; weak business sentiment—particularly in some developed economies—prevented companies from engaging in

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[1]World tariffs have fallen markedly due to the trade reforms in many countries. Moreover, Hummels (2007) reports that air transportation costs fell by 92% between 1955 and 2004, and that ocean shipping costs have exhibited a steady, though considerably smaller, 20-year decline since the mid-1980s.

[2]World Development Indicators (http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators).
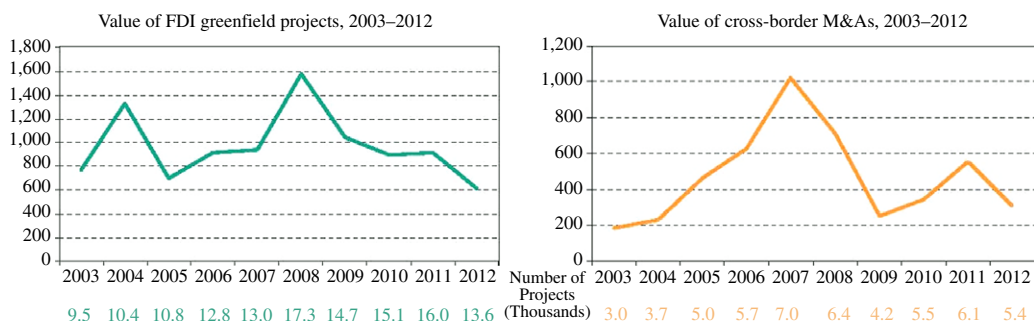
FIGURE 1 The value of greenfield foreign direct investment versus cross-border M&A, 2003–12
Source: UNCTAD FDI-TNC-GVC Information System, cross-border M&A database for M&As and information from the Financial Times Ltd, FDI Markets (www.FDImarkets.com) for greenfield projects.

FIGURE 2 The drop in foreign direct investment from 2011 to 2012
Source: UNCTAD FDI-TNC-GVC Information System, cross-border M&A database for M&As and information from the Financial Times Ltd, FDI Markets (www.FDImarkets.com) for greenfield projects.
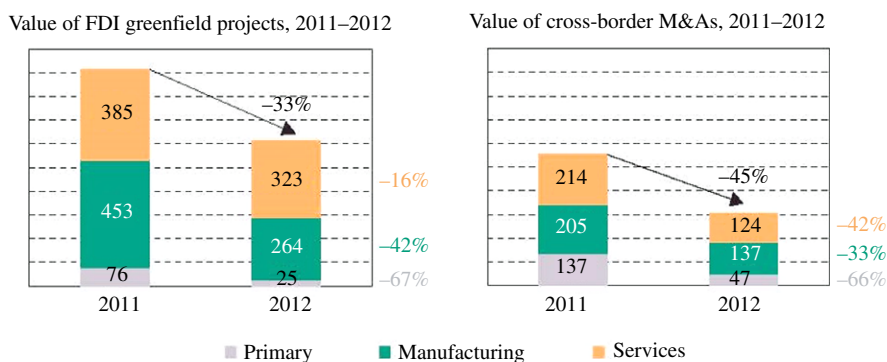
large projects (UNCTAD, 2013). In other words, M&A activities, at least in the extensive margin, were doing better than Greenfield FDI during the 2011–12 period.

Understanding M&A is important for policymakers. In recent years, governments have made more use of industrial policies, adjusted previous investment liberalisation efforts, tightened screening and monitoring procedures, and closely scrutinised cross-border M&A. One important example of how governments have become more selective in their admission procedures concerns cross-border M&As. The UNCTAD (2013) analysed 211 of the largest cross-border M&A withdrawn between 2008 and 2012 and found that approximately 22% of the withdrawn cases were because of regulatory concerns such as competition issues, economic benefit tests and national security screening, or political opposition.

2.3 | The relationship between FDI and ex-ante productivity

The relationship between FDI and a firm's productivity is an important topic and hence receives a great amount of attention from economists. The consensus is that FDI boosts productivity. However, the subject is ex-post productivity—that is, the productivity after the firm has received FDI. A novel aspect of our paper is its ability to provide a micro-foundation for the relationship between

FDI and the ex-ante productivity—that is the productivity of the firm before it is targeted as the FDI recipient. The finance literature asserts that M&A activity is a form of natural selection: better performing firms acquire low-performing firms. Indeed, Lichtenberg and Siegel (1987) document that the productivity of the US plants that were bought during the 1974–80 period was 3–4% lower than the productivity of the plants that were not bought in the same period. However, recent evidence suggests that even high-productivity firms are the target of the M&A activity. Guadalupe et al. (2012) show that moving from the first sales quartile to the second sales quartile increases the probability of becoming a foreign-owned firm in Spain by 3.3%. Similarly, moving from the first sales quartile to the third and the fourth quartile increases this probability by 4.8% and 14.8%, respectively. Criscuolo and Martin (2009) document that wholly British plant were 42% less productive than a plant owned by a US firm and 30% less productive than other foreign-owned plants. Similar results can be found in Chile (Ramondo, 2009) and in Indonesia (Arnold & Javorcik, 2009).

3 | SMALL OPEN ECONOMY

In this section, I lay out the model used in the paper. The set-up involves one small open economy. Over the last century, mergers occurred in waves and, within a wave, mergers clustered by industry (Mitchell and Mulherin, 1996). Inspired by their finding, I consider one industry in this economy. These two features imply that the home firms here take the prices (input and output) as given when making their decisions.

3.1 | Demand

The preferences of a representative consumer are given by a CES utility function over a continuum of goods indexed by i:

$$U = \left[\int_{i \in \Omega} x(i)^{\frac{\sigma-1}{\sigma}} \, dG(i) \right]^{\frac{\sigma}{\sigma-1}},$$

where the measure of the set Ω represents the mass of the available goods. These goods are substitutable with the elasticity of substitution σ. From this utility function, the demand for each variety is given by:

$$q(i) = \left(\frac{p(i)}{P} \right)^{-\sigma} \frac{E}{P} \tag{1}$$

P is the price index, and E is the total spending allocated to this industry. More specifically:

$$P = \left[\int_{i \in \Omega} p(i)^{1-\sigma} dG(i) \right]^{\frac{1}{1-\sigma}},$$

and

$$E = P.U.$$

[Correction added on 28 July 2017, after first online publication: Second and third equations were previously incorrect and these have been corrected in this current version.]

3.2 | Supply

There is a continuum of firms, each choosing to produce a distinct variety. They are different by their total factor productivity. Upon paying an entry cost f_e, they will learn their productivity level φ which is drawn from a Pareto distribution $G(.)$. All firms share the same fixed cost F. The production technology is described as follows:

$$Y = \varphi \lambda L^{\alpha} X^{1-\alpha},$$

where φ is the productivity level of the domestic firm and L is the bundle of domestic inputs (labour, materials, etc.). The home firm can choose to be either a stand-alone firm or form a joint venture with a foreign entity. In the latter case, it can either receive a productivity boost λ or the bundle of imported inputs X. The foreign firm has to form a joint venture with a domestic partner if it wishes to serve the home market.[3] This assumption is similar to Nocke and Yeaple (2007). Indeed, we can think of the licence as the country-specific capabilities, such as the information about the local market through the marketing or distribution network. It is also consistent with the policies in the automobile industry issued by the Chinese government in the 1990s: import tariffs were high, and a foreign firm could only control up to 50% of the joint venture.

3.2.1 | Stand-alone domestic firms

The domestic firms use only inputs available at home because they do not have access to the foreign inputs. Without the technical and managerial assistance, they also receive no boost in productivity. In other words, we have $\lambda = \alpha = 1$. Its technology is then similar to the one used in Melitz (2003), which exhibits constant returns to scale:

$$Y = \varphi L.$$

If we denote the price of the domestic inputs by w, then from the demand function (1) the pricing strategy is given by:

$$p = \frac{\sigma}{\sigma - 1} \frac{w}{\varphi},$$

and the profit is given to them as:

$$\pi_1(\varphi) = \frac{(\sigma - 1)^{\sigma - 1}}{\sigma^{\sigma}} \left(\frac{\varphi}{w}\right)^{\sigma - 1} P^{\sigma - 1} E.$$

More productive firms receive higher profit and therefore have more chance to pay the fixed cost F. In other words, there is a cut-off φ^* such that:

$$\pi_1(\varphi^*) = F.$$

As in Melitz (2003), all firms with a productivity level above this cut-off φ^* can make a profit, and the ones with a productivity level lower than φ^* stand to make a loss.

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[3]There are two additional ways to serve the home market. The foreign firm can either ship its products (direct export) or establish a new plant in the home country (greenfield FDI). However, these options are not of our interest as far as the characteristics of the firms in the M&A activities are concerned. This is because they involve no domestic firm and we already know the characteristics of the firms that directly export (see Helpman et al., 2004) or the firms that engage in greenfield FDI (see Nocke & Yeaple, 2007).

3.2.2 | Joint venture with foreign firms

In addition to operating as a stand-alone entity, the domestic firm can agree a joint venture with a foreign entity. Upon the agreement, the home firm can have access to the intangible or tangible assets depending on the types of the foreign partner.

The foreign firm is of management type(M-type)

The first type of a foreign partner is the M-type. Forming a joint venture with the M-type foreign firm provides the technological advances as in Nocke and Yeaple (2007) or the managerial expertise to the home firm. Both these assets, which are intangible in nature, make the home firm more productive. This is consistent with other studies such as Guadalupe et al. (2012), Healy, Palepu, and Ruback (1992) and Andrade et al. (2001) where they find the merged firms experience productivity improvement relative to their peers in the same industry. In this case, the productivity boost parameter λ is larger than 1. The contribution of domestic inputs is still 100% ($\alpha = 1$). Denote θ the share of the domestic firm, its profit becomes:

$$\theta \pi_1(\lambda \varphi).$$

The foreign firm is of input type(I-type)

In addition to the intangible assets as discussed above, foreign firms can bring the tangible assets to the joint venture in the spirit of vertical integration as introduced by Helpman (1984). The foreign firm plays as the upstream firm by supplying better inputs to the home firm that serves as the downstream firm. In other words, the quality-adjusted price of these inputs r is lower than that of the domestic inputs (i.e. $r < w$). The foreign firm in this case is called the I-firm.

The technology production takes the form:

$$Y = \varphi L^\alpha X^{1-\alpha}.$$

The fraction $(1 - \alpha)$ indicates the extent to which the home firm is merged with the foreign company. In particular, if $\alpha = 0$, the home firm is entirely acquired by the foreign company. This endogenous parameter is a choice variable of both parties, the home and the foreign firms.

With the imported inputs, the marginal cost becomes $\frac{w^\alpha r^{1-\alpha}}{\varphi}$ which is lower than if the inputs are only domestic. The pricing strategy is then:

$$p(\varphi) = \frac{\sigma}{\sigma - 1} \frac{w^\alpha r^{1-\alpha}}{\varphi}.$$

Each party has a share of the joint profit. Their share is the contribution of their input to the production. In particular, the home firm retains a share α and their profit is given by:

$$\alpha \pi_2(\alpha, \varphi) = \alpha \frac{(\sigma - 1)^{\sigma-1}}{\sigma^\sigma} \left(\frac{\varphi}{w^\alpha r^{1-\alpha}} \right)^{\sigma-1} P^{\sigma-1} E.$$

3.2.3 | Discussion of the set-up

My set-up is similar to that in McGrattan (2012). Indeed, in her set-up, the output of a multinational firm is as follows:

$$Y = A_{it}\sigma_{it}(N_{it}M_t^j)^\phi (Z_{it}^j)^{1-\phi},$$

where A_{it} is TFP, σ_{it} is the degree of openness to FDI of country i (when $\sigma_{it} < 1$ the foreign firms face more difficulty to operate in the host country), N_{it} is the number of locations available, M_t^j is the intangible technology capital, Z_{it}^j is the composite capital-labour input:

$$Z_{it}^j = (K_{T,i}^j)^{\alpha_T}(K_{I,i}^j)^{\alpha_I}(L_i^j)^{1-\alpha_T-\alpha_I}.$$

My parameter λ plays the same role as M_t^j, and the imported inputs are similar to the tangible capital $K_{I,i}^j$.

4 | EQUILIBRIUM ANALYSIS

The price of M&A depends on the bargaining power of the two parties. As in Guadalupe et al. (2012), the bargaining power of the domestic firm is a fixed parameter θ. In the case of the joint venture with the I-firm, the bargaining power of the firm is its share of inputs. In particular, the home firm receives a share α of the joint profit. In the case of the joint venture with the M-firm, this firm will bring the managerial expertise to the new forged entity. In other words, it takes over the managerial role to boost the productivity of the merger. Hence, they make a "take it or leave it" offer with the share to the home firm being θ. In particular, if π is the new profit of the joint venture, then the domestic firm receives $\theta\pi$, and the rest goes to the foreign firm.

4.1 | Horizontal FDI—picking lemons

The M-type foreign firm problem is to maximise the joint surplus subject to the two participation constraints. First, this M-type foreign firm has to convince the home firm to participate in the joint venture. I will argue here that the M-firm will look for the home firms whose productivity level is lower than the domestic cut-off φ^*. These firms have an outside option whose value is 0 because they cannot make any profit by standing alone. Therefore, a minimal share θ, together with positive joint surplus is enough to convince the domestic firm to join. To make positive profit, the target must have a high enough productivity level. Given that the required productivity level to make a profit is φ^* and that the M-firm can boost the productivity by a factor λ, the first constraint then implies that the M-firm should target the home firms with a productivity level in the range $\left(\frac{\varphi^*}{\lambda}, \varphi^*\right)$.

The joint venture also has to satisfy the second participation condition, which is that the share of the M-firm from the joint venture must be enough to cover the fixed cost of the merger:

$$(1-\theta)\pi_1(\lambda\varphi) \geq F_H.$$

F_H is the fixed cost associated with this horizontal FDI. This will generate a second lower bound φ' for the productivity level such that:

$$(1-\theta)\pi_1(\lambda\varphi') = F_H.$$

The two participation constraints combined imply that the M-firm will optimally deal with the domestic firms as long as $\varphi \in (\varphi_1, \varphi^*)$ with $\varphi_1 = \max\left(\frac{\varphi^*}{\lambda}, \varphi'\right)$. They will offer a minimal share θ to attract the domestic party to join. With this small share, the domestic firms with productivity level higher than φ^* will rather want to stand alone. Indeed, as long as $\theta < \lambda^{\sigma-1}$, a joint venture with the M-firm brings a smaller profit, that is $\theta\pi_1(\lambda\varphi) < \pi_1(\varphi)$.

4.2 | Vertical FDI—cherries picking

Foreign inputs are normally of better use than the domestic ones. Indeed, they either have some functionality that the domestic inputs cannot provide or they are of higher quality. As I do not discuss the quality differentiation of inputs here, this feature implies that the quality-adjusted price of the foreign input is lower, that is $r < w$. Therefore, it is clear that adopting the foreign inputs is more profitable (because the marginal costs are lower, i.e. $\frac{w}{\varphi} > \frac{w^{\alpha}r^{1-\alpha}}{\varphi}$). In other words, we have:

$$\pi_2(\alpha, \varphi) > \pi_1(\varphi), \forall \alpha, \varphi,$$

α is the share of the domestic inputs which also represents the share in the joint profit of the domestic firm.

The problem of the joint venture is to maximise the joint profit which depends on the home share α and the home productivity φ. I will solve for these two variables in two steps with the use of two participation constraints. First, the joint venture must be more attractive to the home partner than standing alone. Second, the share from the joint venture must be enough for the foreign firm to cover its fixed cost. I can write down the maximisation problem of the I-firm as:

$$\max_{\alpha, \varphi} \pi_2(\alpha, \varphi),$$

$$\text{Subject to}: \quad \alpha\pi_2(\alpha, \varphi) > \pi_1(\varphi), \forall\varphi, \tag{2}$$

$$\text{and} \quad (1 - \alpha)\pi_2(\alpha, \varphi) \geq F_V, \tag{3}$$

F_V denotes the fixed cost of the vertical FDI. As $\pi_2(\alpha, \varphi)$ decreases with α and increases with φ, my two constraints will impose the conditions to find the optimal solution. Indeed, the participation constraint (2) yields the condition:

$$\alpha\left(\frac{1}{w^{\alpha}r^{1-\alpha}}\right)^{\sigma-1} \geq \frac{1}{w^{\sigma-1}},$$

or

$$\alpha^{\frac{1}{1-\alpha}} \geq \left(\frac{r}{w}\right)^{\sigma-1}.$$

As the left-hand side increases with α, the condition above suggests that the home share must be no less than a threshold. As the merger profit decreases with the home share α, the solution for domestic share in the joint venture of this type of vertical FDI is exactly this threshold:

$$\alpha^{\frac{1}{1-\alpha}} = \left(\frac{r}{w}\right)^{\sigma-1}.$$

Note that this share α works for all productivity levels of the home firm. In other words, all the home firms would like to form a joint venture with the I-firm because the home firms can have access to better inputs. However, given α, the participation constraint (3) imposes the lower bound φ_2 for the productivity level of the domestic party:

$$(1 - \alpha)\pi_2(\alpha, \varphi_2) = F_V.$$

FIGURE 3   Modes of operation

4.3 | Summary of results

We can summarise the decisions of the home firms by Figure 3. In particular, the least-productive firms are inactive. The firms above them choose horizontal FDI by merging with the M-firm. The most productive firms choose vertical FDI by merging with the I-firm while the ones with intermediate level of productivity choose to become domestic by standing alone.

The analysis above leads to the following propositions.

> *Proposition 1*: The low-productivity firms (lemons) receive the intangible assets as they are targeted by the M-firm. The high-productivity firms (cherries) receive the tangible assets and are targeted by the I-firm.

As we can see above, all the home firms (with a productivity above a certain threshold) are attractive to the foreign firms with the intangible assets. This is similar to Guadalupe et al. (2012). But only a fraction of these home firms are bought by these M-firms. Indeed, the more productive domestic firms are too expensive because they can generate profits when they stand alone. But they are attractive to the I-firm because their high productivity is a good fit for the high-quality imported inputs brought by the I-firm. Therefore, we have:

> *Proposition 2*: There is U-shaped relationship between the home firm's productivity and the foreign share.

From Proposition 1, both the low-productivity firms and the high-productivity firms are attractive, although for different reasons. Low-productivity firms are cheap and can provide access to local market. By contrast, high-productivity firms offer complementarity with tangible assets. My paper, hence, extends our understanding of the matching between the acquired firm and the acquiring firm in the M&A literature. Indeed, the monotonic relation between the home firm's productivity and its foreign share that is suggested in other studies such as Guadalupe et al. (2012) or Neary (2007) can be obtained under certain conditions. In particular, if $\varphi_1 > \varphi^*$ then we will not observe lemon picking. Note that the low-productivity firms must lack the capacity to stand alone so that they will accept being purchased by foreign firms. Moreover, we will not observe cherry picking if there is an upper bound for the productivity level of domestic firms: if φ_2 is higher than this upper bound, then no cherry picking will take place. In other words, there must be enough domestic firms that are able to make use of the imported inputs.

4.4 | The case of Volkswagen in China

The propositions above can nicely explain the investment strategies of Volkswagen in China. In the early 1980s, joint venture agreements provided a window for foreign manufacturers to tap the

China market (Harwit, 2001). This growing market[4] and a heavy import tariff (more than 200% in the 1980s) prompted foreign automobile manufacturers, in particular Volkswagen, to invest in China. However, the policy on foreign investment stipulated that any foreign firm would need a domestic partner. In 1984, Volkswagen formed a joint venture with the Shanghai Automotive Industry Corporation (SAIC) and gave SAIC the minimum 50% share as required by the Chinese foreign investment policy. At the time, SAIC was a small company, described as merely "an administrative department that assigned local government production tasks" and "supervised the completion of production plans" (Richter, 2000). As a result, it was much smaller and less efficient than the likes of First Auto Works (FAW) and the Dong Feng Motor Corporation, companies that could have been Volkswagen's partner at that time. Nor was SAIC supported financially by the central government and hence might not have been able to stand alone. In other words, SAIC did not make much profit, and, as a result, nicely fit the definition of a lemon firm, and one that was needed to provide the market entry vehicle for the foreign firm.

However, starting from the 1990s market conditions in China changed dramatically. Import tariffs fell from 260% in the 1980s to less than 100% on average in 1996 and to 70–80% after accession to the WTO in 2001. As a result, automobile manufacturers in China had to look for ways to cut costs, and to improve the quality of their products. Volkswagen responded to this change in trade policy by selecting a different kind of firm to serve as a partner for its second joint venture in China. In 1991, Volkswagen chose FAW, which represented a bigger and more efficient partner than SAIC. The motive was no longer to enter the Chinese market as in the Volkswagen–SAIC partnership. Instead, Volkswagen with its advanced technology and equipment saw the potential in FAW to match with a firm that could offer complementary size and productivity in order to establish a mature, modern car industrial base in China. Thus, so to speak, Volkswagen was ready to pick a cherry.

5 | CONCLUSION

In this paper, I propose a model to explain the match between the acquired and acquiring firms in M&A which is a very important form of FDI. My model reconciles the empirical fact that acquiring firms may have valid reasons for picking two completely different kinds of firms: both the productive home firms, the so-called cherries, and the unproductive home firms, the "lemons." In particular, I argue that while market access brought by the lemons complement the managerial expertise of the foreign firms, the efficiency of the cherries complements the high-quality inputs brought by the foreign firms. This implies a U-shaped relationship between the share of foreign owners and the productivity of the target firms.

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[4]The opening of international tourism and business thanks to the reforms in the early 1980s meant that there was an increasing demand for cars and trucks. However, the domestic production could not meet demand (as late as 1985, the country produced a total of only 5,200 cars, according to the Automotive Industry of China (1996, p. 12.). This implied a surge in imported vehicles, from 16,077 in 1981 to 353,992 in 1985.

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