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Abstract

We develop a dynamic model of merger assuming a monopolistic competitive market with heterogeneous firms. We show the existence of a non-trivial equilibrium in the merger market and the conditions under which mergers lower the industry aggregate price. Most importantly, we show as our main result that merger and acquisition activities are in a sense protectionary, nonetheless they can be welfare improving.

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1 Introduction

Merger and acquisition activities have been a hallmark of developed economies over the past few decades. While theoretical as well as empirical economic literature is relatively rich and intensive, it is heavily focused on merger profitability. This well-worked branch of literature was instigated by a celebrated paper by Salant et al. (1983) where it argues that merger in an oligopolistic industry is not profitable unless more than 80 percents of firms merge, an observation that is sometimes called “merger paradox.”¹ Despite heavy volume of research on the causes of profitable mergers, the literature on the issue of mergers in open economies and as it relates to international trade is relatively thin. In particular, one seemingly unrelated causal link between merger and trade protectionism is overlooked on which our current paper is focused. We raise a somewhat provocative conjecture that *merger and acquisition activities are in essence a form of self-protectionism.*² Thus, the main contribution of our paper is to this branch of literature.

The main theme of this latter growing strand of literature is that trade liberalization affects merger activities. Long and and Vodsoun (1995) show how trade liberalization encourages mergers in an oligopoly market. Another theme is that trade liberalization through its pro-competitive effects reduces the need for domestic competitive policies (for example, see Dixit (1984)). However, Horn and Levinsohn (2001) show in an oligopolistic setup that although trade liberalization is pro-competitive, it does not suggest that trade liberalization will result in a less stringent competitive policy. In another body of literature the effects of trade liberalization on cross-border mergers have been studied (for example, see Long and Vodsoun (1995), Neary (2007), and Mukharjee and Davidson (2007)).

To study the validity of our main claim with regard to merger activities and protectionism we first construct a dynamic model of merger, assuming a monopolistic competitive market with continuum of goods and firm heterogeneity. The latter feature of our merger model is in sharp contrast to Salant et al. (1983) type model and is at the heart of our results. There are significant empirical studies that confirm the existence of firm level heterogeneity, for example, see Bernard and Jensen (1999) for firm heterogeneity in the United States. This feature also has become a

¹See also Daughety (1990) and Farrel and Shapiro (1990), among others.

²We coin this term to make a distinction from protectionary trade policies, such as tariffs, that are employed by governments.

common feature of some recent significant research in international trade theory (see for example Bernard et al. (2000) and Melitz (2003) for the theory of intra-industry trade). Our dynamic model of market for merger and acquisition activities in itself contributes to the broader industrial organization literature on mergers and acquisitions. As one of our results, we show that there exist an equilibrium (under fairly general and lax conditions) at which the most productive firm profitably acquires some of the lower productive firms. This theoretical result serves to resolve (parallel to other attempts that already exist in the literature such as Farrell and Shapiro (1990)) the so called merger paradox in a closed economy. In addition, we derive the conditions under which merger will result in a decrease in aggregate industry price.

Next, we reformulate our partial equilibrium merger model for an open economy that imports some of the varieties. As our main result we show that merger and acquisition activities work in an open economy like trade policies that prohibit trade on a range of goods. We coin these activities self-protectionism, whereby an industry protects itself from foreign competition. Finally, we address an important policy implication of our merger theory by showing that under fairly general conditions mergers and acquisitions can improve welfare and therefore there will be no need for domestic competitive policies that requires regulatory approval for merger.

Following this introduction, we present our setup. We then introduce our theory of merger and acquisition in section 3. Section 4 is at the heart of our paper, where we derive our main proposition regarding the trade protectionary nature of merger and acquisition activities. We will discuss some concluding remarks in Section 5.

2 The setup

Assume a continuum of available substitute goods represented by a subset of real numbers $\Omega \equiv [0, \alpha]$.³ Our representative consumer's preferences are given by:

$$u = \left[\int_{\omega \in \Omega} [q(\omega)]^\rho d\omega \right]^{\frac{1}{\rho}} \quad (1)$$

³Continuum of good models have recently become common in trade literature. For example, see Melitz (2003) and Beladi and Oladi (2011), among others.

where $q(\omega)$ is quantity of good $\omega \in \Omega$ and $\rho \in (0, 1)$, which implies demand elasticity of substitution $\sigma = 1/(1 - \rho) > 1$. Following Dixit and Stiglitz (1977) and Melitz (2003), it can be shown that the aggregate industry output is $Q \equiv u$ and its associated aggregate price is given by:

$$P = \left[\int_{\omega \in \Omega} [p(\omega)]^{1-\sigma} d\omega \right]^{\frac{1}{1-\sigma}} \quad (2)$$

where $p(\omega)$ is the price of variety $\omega \in \Omega$. Then, the optimal consumption of good $\omega \in \Omega$ is given by:

$$q(\omega) = Q [\xi(\omega)]^{-\sigma} \quad (3)$$

where $\xi(\omega) \equiv p(\omega)/P$ is the intra-industry relative price of variety ω . That is, the optimal consumption of any good is increasing in aggregate industry output and decreasing in its intra-industry relative price. Similarly, the optimal expenditure for any good $\omega \in \Omega$ is defined as:

$$e(\omega) = E [\xi(\omega)]^{1-\sigma} \quad (4)$$

where $E \equiv PQ = \int_{\omega \in \Omega} e(\omega) d\omega$ is the aggregate expenditure, implying that the optimal spending on any variety is increasing (decreasing) function of aggregate industry expenditure (its intra-industry relative price).

Turning next to firms, as in Krugman (1979), we assume all firms enjoy increasing return to scale production technology. However, in contrast to Krugman (1979), let the labor usage for good $\omega \in [0, \alpha]$ be given by:

$$l(\omega) = \delta + \frac{q(\omega)}{\gamma(\omega; k)} \quad (5)$$

where $\gamma(\omega; k) > 0$ is the measure of productivity for good $\omega \in [0, \alpha]$, as in Melitz (2003), and k denotes the number of goods (or firms) in the industry. Nevertheless, in contrast to Melitz (2003), our measure of productivity is also a function of number of varieties. We assume that $\gamma_\omega > 0$, $\gamma_k < 0$, and $\gamma_{k\omega} = \gamma_{\omega k} > 0$. The first partial derivative states that goods with higher productivity measures are indexed higher, while the second partial derivative states that for any given good ω the higher the number of varieties (firms) in the industry the lower the productivity of that good will be. Finally, the cross partial derivative says that the more productive firm would benefit more

in terms of their productivity measure if the number of varieties (firms) falls. Note that since each good $\omega \in [0, \alpha]$ is produced only by one firm, as shown by Dixit (1977), we identify each good by a firm in the rest of the paper. Therefore, we have $k \leq \alpha$. Since each firm faces a residual demand with constant elasticity, it chooses the same profit maximizing markup $1/\rho$, resulting in pricing rule given by:

$$p(\gamma(\omega; \cdot)) = \frac{W}{\rho\gamma(\omega; \cdot)} \quad (6)$$

where W is the wage rate which we normalize it to unity in the rest of the paper. The profit of the firm that produces good $\omega \in [0, \alpha]$ can be derived as:

$$\pi(\gamma) = \frac{p(\omega)[\xi(\omega)]^{-\sigma}Q}{\sigma} - \delta \quad (7)$$

Note that, as γ is monotonically increasing in ω , each firm (good) is uniquely identified with γ . Therefore, for any $\omega_1, \omega_2 \in [0, \alpha]$ where $\omega_1 < \omega_2$, we have $\gamma_1 \equiv \gamma(\omega_1; \cdot) < \gamma(\omega_2; \cdot) \equiv \gamma_2$. Then, it follows that $p(\omega_2) < p(\omega_1)$ which implies that $\xi(\omega_2) < \xi(\omega_1)$. This in turn implies that $q(\omega_1) = [\xi(\omega_1)]^{-\sigma}Q < [\xi(\omega_2)]^{-\sigma}Q = q(\omega_2)$, $e(\omega_1) = [\xi(\omega_1)]^{1-\sigma}E < [\xi(\omega_2)]^{1-\sigma}E = e(\omega_2)$, and $\pi(\gamma_1) = E(\rho\gamma_1)^{\sigma-1}/\sigma - \delta < E(\rho\gamma_2)^{\sigma-1}/\sigma - \delta = \pi(\gamma_2)$. All these state that a more productive firm has a lower price and a higher output, sales and profit.

Now let $\hat{\gamma}$ be the productivity level for the marginal firm for which $\pi(\hat{\gamma}) = 0$. This condition and equation (7), as well as monotonicity of γ , imply that:

$$\hat{\gamma}(\hat{\omega}; \cdot) = \left[\frac{(\rho P)^{\sigma-1} E}{\sigma \delta} \right]^{\frac{1}{1-\sigma}} \quad (8)$$

Then, it follows that the equilibrium number of firm is given by $k = \alpha - \hat{\omega}$. That is, all goods $\omega \in [0, \hat{\omega})$ will not be produced.

3 Merger and acquisition

Let $\nu \in (0, 1)$ be the common discount rate for all firms. Then, the value of firm $\omega \in [0, \alpha]$ is given by $V(\omega) = \max\{0, \pi(\omega)/(1 - \nu)\}$. Assume that there is no institutional restriction on merger. We further assume that any offer of merger, denoted by $\Omega \geq 0$, to a target firm $\omega \in [\hat{\omega}, \alpha]$ will be

accepted by this firm if $\Omega \geq V(\omega)$. That is, profit is the only factor in merger decision for the target firm. If firm $\omega_2 \in [\hat{\omega}, \alpha]$ acquires a target firm $\omega_1 \in [\hat{\omega}, \alpha]$ then the post merger value of firm ω_2 will equal $[\pi(\omega_2) + d\pi(\omega_2)/dk]/(1 - \nu)$. Firm ω_2 will benefit from acquiring target firm ω_1 if its acquisition offer does not exceed its acquisition benefit, i.e., $\Omega \leq [d\pi(\omega_2)/dk]/(1 - \nu)$.

An interesting question that we first address is the effect of merger on the aggregate price. In other words how a reduction in number of firms would effect the aggregate price. Suppose (for now) that the least productive firms are acquired by other firms. For ease of mathematical expression let $\lambda(\omega)$ be the effect of number of firms in the industry on productivity measure for firm $\omega \in [0, \alpha]$, i.e., $\lambda(\omega) = -d\gamma(\omega)/dk$. The following result indicates how the aggregate price will be affected by acquisition.

Proposition 1. *Acquisition of the least productive firms will reduce the aggregate industry price if $\lambda(\omega)$, $\omega \in (\hat{\omega}, \alpha]$, is sufficiently large.*

Proof. Since all goods $\omega \in [0, \hat{\omega})$ will not be produced, the aggregate price is defined as:

$$P = \left[\int_{\hat{\omega}}^{\alpha} [p(\omega)]^{1-\sigma} d\omega \right]^{\frac{1}{1-\sigma}} \quad (9)$$

By differentiating equation (9), and with a great deal of simplification, we obtain:

$$\frac{dP}{d\hat{\omega}} = \frac{\Delta}{1 - \sigma} \left([\sigma - 1] \int_{\hat{\omega}}^{\alpha} [p(\omega)]^{2-\sigma} \lambda(\omega) d\omega - [p(\hat{\omega})]^{1-\sigma} \right) \quad (10)$$

where $\Delta = [\int_{\hat{\omega}}^{\alpha} [p(\omega)]^{1-\sigma} d\omega]^{\sigma/(1-\sigma)} > 0$. It follows from equation (10) that $dP/d\hat{\omega} < 0$ if $\lambda(\omega)$, $\omega \in (\hat{\omega}, \alpha]$, is sufficiently large since $\sigma > 1$. □

To understand the intuition behind this result, assume that $\rho = 1/2$, i.e., $\sigma = 2$. Then, equation (9) will be $P = [\int_{\hat{\omega}}^{\alpha} [p(\omega)]^{-1} d\omega]^{-1}$. Note that the aggregate price level is now a harmonic mean scale by the number of firms.⁴ Now, if for any reason firm $\hat{\omega}$ exists, its effect on price level is twofold. On the one hand the inverse of the good with the highest price in the basket would be deleted from the basket which lowers the sum of the inverted prices (i.e., the integral). This, in turn, results in an increase in the inverse of the sum of inverses (i.e., an increase in P). On the other hand, such an

⁴It is noteworthy that in general case the price level in our set-up is a generalized mean scaled by the number of firms.

exit results in a decrease in price of all other goods, leading to an increase in reciprocals of prices for these remaining goods $\omega \in (\hat{\omega}, \alpha]$. Thus, this latter effect will increase the value of the integral, which in turn decreases its inverted value (i.e., P). Now, if $\lambda(\omega), \omega \in (\hat{\omega}, \alpha]$, is sufficiently large (that is, when the industry enjoys large enough economies of scale), then the latter effect would outweigh the former and the price level would fall.

We next study the possibility of merger in this industry. Again, for now we maintain that the most productive firm acquires some of the least productive firms. We will later prove that this outcome (that we presume at this point) will indeed be our equilibrium outcome. Let $\psi(\omega), \omega \in [\hat{\omega}, \alpha)$ be the marginal benefit of acquisition for firm α . Notable, we have $\psi(\omega) = [1/(1-\nu)]d\pi(\alpha)/dk, \forall \omega \in [\hat{\omega}, \alpha)$. That is, the gross benefit of acquiring one additional lower productive firm is equal to the extend that firm α benefits from its scale economies. To make it interesting we assume that $\psi(\hat{\omega}) > 0$; of course, otherwise there will not be any acquisition activity in the industry. We further assume that the aggregate industry demand is unitary elastic, i.e., $\epsilon_P \equiv (dQ/dP)(P/Q) = -1$.⁵ The following lemma will prove to be useful.

Lemma 1. $\lim_{\omega \rightarrow \alpha} \psi(\omega) < 0$.

Proof. Use equation (7), differentiate it with respect to k and simplify it to obtain:

$$\frac{d\pi(\alpha)}{dk} = e(\alpha) \left(\frac{1}{p(\alpha)} \frac{dp(\alpha)}{d\gamma} \frac{d\gamma}{dk} + \frac{\epsilon_P}{P} \frac{dP}{dk} - \sigma[\xi(\alpha)]^{-1} \frac{d\xi(\alpha)}{dk} \right) \quad (11)$$

Now, use the definition of $\xi(\omega)$ to simplify equation (11) to:

$$\frac{d\pi(\alpha)}{dk} = e(\alpha) \left(\frac{\sigma - 1}{p(\alpha)} \frac{dp(\alpha)}{dk} + \frac{\sigma + \epsilon_P}{P} \frac{dP}{dk} \right) \quad (12)$$

where we used the fact that $(1/\gamma(\alpha))(d\gamma/dk) = (1/p(\alpha))(dp(\alpha)/dk)$. Now let $\tilde{\omega}$ be the the last firm acquired by α (in limit). Since $P \rightarrow p(\alpha)$ as $\tilde{\omega} \rightarrow \alpha$, using equation (12), we can obtain:

$$\lim_{\omega \rightarrow \alpha} \psi(\omega) = - \frac{2\Lambda(\sigma - 1)}{p(\alpha)} \frac{dp(\alpha)}{d\gamma} \frac{d\gamma}{dk} \quad (13)$$

⁵This can follow from fairly common assumption such as Cobb-Douglas type preferences over our aggregate good and other goods.

where $\Lambda = e(\alpha_m)/(1-\nu) = E/(1-\nu) > 0$ is the present value of α 's revenue when it is a monopolist. This concludes the lemma since $dp(\alpha)/d\gamma < 0$ and $d\gamma/dk < 0$. \square

Now turning to the supply side of acquisition market, as stated earlier, an acquisition offer will be accepted by a target firm $\omega \in [\hat{\omega}, \alpha]$ if $\Omega \geq \pi(\omega)/(1-\nu)$. Thus, the marginal cost of acquisition for firm α is defined as $\phi(\omega) = \pi(\omega)/(1-\nu)$, $\omega \in [\hat{\omega}, \alpha]$. The following lemma characterizes this cost function.

Lemma 2. $\phi(\omega)$ is monotonically increasing in $\omega \in [\hat{\omega}, \alpha]$.

Proof. As we already established in Section 2 that $\pi(\omega_2) > \pi(\omega_1)$ for all $\omega_1, \omega_2 \in [0, \alpha]$ if $\omega_2 > \omega_1$, the result of the lemma immediately follows. \square

Having characterized ψ and ϕ , we now can present one of our main results.

Proposition 2. *There exists an equilibrium at which all firms $\omega \in [\hat{\omega}, \bar{\omega}]$, where $\hat{\omega} \leq \bar{\omega} < \alpha$, will be acquired by the most productive firm α at acquisition price of $\phi(\omega)$.*

Proof. First note that any lower productive firm $\omega \in [\hat{\omega}, \bar{\omega}]$ will accept the acquisition offer $\Omega(\omega) \equiv \phi(\omega)$ as $\Omega(\omega) \geq \pi(\omega)/(1-\nu)$. Second, given that the most productive firm has put an offer of $\Omega(\omega)$ on any firm $\omega \in [\hat{\omega}, \bar{\omega}]$, at any given k , no other firm would benefit more by outbidding α 's offer. In addition, firm α will benefit from these acquisitions since $\psi(\omega) \geq \phi(\omega)$, $\forall \omega \in [\hat{\omega}, \bar{\omega}]$; that is, any such offer dominates the strategy of “not making the offer,” given that all other firms stay put. Therefore, the fixed point of the composite function $\psi(\phi^{-1})$, where ϕ^{-1} is the inverse of ϕ , is a Nash equilibrium (accepted) offer, which also gives us the upper bound of the range of acquired firms $\bar{\omega}$. Finally, Lemmas 1 and 2 guarantee the existence of such an equilibrium. \square

We depict the equilibrium in the acquisition market in Figure 1. We show the marginal benefit of acquisition by ψ and its marginal cost by ϕ . These can be viewed as the demand and supply of acquisition, respectively. Firm α keeps acquiring the lower productive firms so long as the marginal benefit of acquisition exceeds its marginal cost. That is, firm α acquires any firm $\omega \in [\hat{\omega}, \alpha]$ if $\psi(\omega) \geq \phi(\omega)$.

4 Free trade

In this section we assume that foreign firms can also produce goods only for export to home country. Let the space of goods for the foreign country be defined as $\Omega^* \equiv (\alpha, \beta]$. We further assume that the productivity measure for foreign firms, denoted by $\gamma^*(\omega, K)$, $\omega \in (\alpha, \beta]$, is monotonically decreasing in ω , i.e., $\gamma_\omega^* < 0$. That is, we index foreign goods/firms such that their productivity is decreasing in good index. Moreover, as in the preceding sections, we maintain that $\gamma_K^* < 0, \forall \omega \in (\alpha, \beta]$, where $K = k + k^*$ is the total number of firms/goods normalized to (potentially) equal β . Note that some of such potential number of goods may not be produced as in our autarky case. Similar to the home firms, we let $\gamma_{K\omega} = \gamma_{\omega K} < 0$. Finally, we assume that the distribution of firm productivity is symmetric across both countries in a sense that that $\gamma(\alpha - \epsilon; \cdot) = \gamma^*(\alpha + \epsilon; \cdot), \forall \epsilon \in (0, \alpha]$. Note that under our cross-country symmetry assumption clearly we have $\beta = 2\alpha$. This symmetry property of the distribution states that for every firm in the home country there exists a foreign firm with similar productivity that produces a different foreign brand (except for α).⁶ Figure 2 depicts such a distribution. We will maintain all other features and assumptions of the preceding sections throughout the rest of the paper with a slight modifications. Specifically, we replace K for k in productivity measure for home country firms. Also, under free trade, equation (1) will have to be modified to:

$$u = \left[\int_{\omega \in \Omega \cup \Omega^*} [q(\omega)]^\rho d\omega \right]^{\frac{1}{\rho}} \quad (14)$$

As in the preceding section, the aggregate output is $Q \equiv u$ and the aggregate price is given by:

$$P = \left[\int_{\omega \in \Omega \cup \Omega^*} [p(\omega)]^{1-\sigma} d\omega \right]^{\frac{1}{1-\sigma}}. \quad (15)$$

Let $\hat{\omega}^*$ denote the marginal foreign produced good and $\hat{\gamma}^*$ be the associated foreign firm's productivity measure. Extension of Proposition 1 to our freely trading economy is somewhat straightforward. That is, an acquisition of the home country's marginal firm can lower the industry aggregate price. Similarly, characterization of acquisition market would be similar to that of our closed economy case of the preceding section. That is, some least productive home firms will be acquired by the most productive firm.⁷ Now we raise a more crucial question which is at the heart

⁶Note that this cross country symmetry does not change our within country firm heterogeneity.

⁷We leave the verification of this result to our interested readers.

of our paper. What effect such a type of acquisition will have on foreign firms? To answer this vital question, we first present a proposition that apart from being fruitful in our further results, it offers an interesting result in of itself.

Proposition 3. *Acquisition of the least productive domestic firm will increase the intra-industry relative price of the good produced by the least productive foreign firm if $\lambda(\omega)$, $\omega \in (\hat{\omega}, \beta)$, is sufficiently large.*

Proof. The intra-industry price of foreign marginal good is defined as:

$$\xi(\hat{\omega}^*) = \frac{p(\hat{\omega}^*)}{P} \quad (16)$$

where $P = [\int_{\hat{\omega}}^{\hat{\omega}^*} [p(\omega)]^{1-\sigma} d\omega]^{1/(1-\sigma)}$. By differentiation equation (16) and with a great deal of simplification, we obtain:

$$\frac{d\xi(\hat{\omega}^*)}{d\hat{\omega}} = \xi(\hat{\omega}^*) \left[\rho P \left(\int_{\hat{\omega}}^{\hat{\omega}^*} [\xi(\omega)]^{2-\sigma} \lambda(\omega) d\omega - \xi(\hat{\omega}^*) \lambda(\hat{\omega}^*) \right) - \frac{1}{\sigma-1} [\xi(\hat{\omega}^*)]^{1-\sigma} \right] \quad (17)$$

Since $\int_{\hat{\omega}}^{\hat{\omega}^*} [xi(\omega)]^{2-\sigma} \lambda(\omega) d\omega = \int_{\hat{\omega}}^{\hat{\omega}^*-\epsilon} [\xi(\omega)]^{2-\sigma} \lambda(\omega) d\omega + \int_{\hat{\omega}^*-\epsilon}^{\hat{\omega}^*} [\xi(\omega)]^{2-\sigma} \lambda(\omega) d\omega$, for any $\epsilon \in [\hat{\omega}, \hat{\omega}^*]$, we can re-write equation (17) as:

$$\begin{aligned} \frac{d\xi(\hat{\omega}^*)}{d\hat{\omega}} = & \xi(\hat{\omega}^*) \left[\left(\rho P \int_{\hat{\omega}}^{\hat{\omega}^*-\epsilon} [\xi(\omega)]^{2-\sigma} \lambda(\omega) d\omega - \frac{1}{\sigma-1} [\xi(\hat{\omega}^*)]^{1-\sigma} \right) \right. \\ & \left. + \rho P \left(\int_{\hat{\omega}^*-\epsilon}^{\hat{\omega}^*} [\xi(\omega)]^{2-\sigma} \lambda(\omega) d\omega - \xi(\hat{\omega}^*) \lambda(\hat{\omega}^*) \right) \right] \end{aligned} \quad (18)$$

Now, recall that due to our assumption on γ and γ^* , $\lambda(\omega) > \lambda(\hat{\omega}^*)$, $\forall \omega \in (\hat{\omega}, \hat{\omega}^*)$. Thus, we conclude that $\int_{\hat{\omega}^*-\epsilon}^{\hat{\omega}^*} [\xi(\omega)]^{2-\sigma} \lambda(\omega) d\omega - \xi(\hat{\omega}^*) \lambda(\hat{\omega}^*) > 0$, for sufficiently large $\epsilon \in [\hat{\omega}, \hat{\omega}^*]$. On the other hand, $\rho P \int_{\hat{\omega}}^{\hat{\omega}^*-\epsilon} [\xi(\omega)]^{2-\sigma} \lambda(\omega) d\omega - \frac{1}{\sigma-1} [\xi(\hat{\omega}^*)]^{1-\sigma} > 0$ for sufficiently large $\lambda(\omega)$, $\omega \in (\hat{\omega}, \hat{\omega}^*)$. These conclude the proposition. \square

Although, this proposition is somewhat mathematically challenging, the intuition is rather straightforward. It follows from the implication of our analysis of Section 2 that the absolute price of foreign good $\hat{\omega}^*$ falls as a result of a merger in the home country. On the other hand, the extension of Proposition 1 for our open economy case indicates that such a type of merger will lower

the aggregate industry price P . Given that the effect of reduction in K on productivity measure is large enough (i.e., firms enjoy sufficient economies of scale), the decrease in aggregate price is proportionally bigger than that of foreign good $\hat{\omega}^*$, resulting in an increase in its intra-industry relative price.

Getting back to our more pressing question, we now can see how acquisition of domestic firms can effect trade and foreign firms. We formally address this issue in the following result.

Proposition 4. *Acquisition of domestic firms in the domestic acquisition market will force any foreign firm $\omega \in [\bar{\omega}^*, \hat{\omega}^*]$, where $\bar{\omega}^* \in (\alpha, \hat{\omega}^*]$, to exit from the market if $\lambda(\omega), \omega \in (\hat{\omega}, \beta)$, is sufficiently large.*

Proof. It is enough to show that profit for the least productive (marginal) foreign firm turns negative as a result of domestic acquisition. By differentiation the equivalence of equation (7) for the least productive foreign firm with respect to $\hat{\omega}$ and with some simplification, we obtain:

$$\frac{d\pi(\hat{\omega}^*)}{d\hat{\omega}} = \frac{p(\hat{\omega}^*)Q[\xi(\hat{\omega}^*)]^{-\sigma}}{\sigma} \left(\frac{1}{p(\hat{\omega}^*)} \frac{dp(\hat{\omega}^*)}{d\hat{\omega}} + \frac{\epsilon_P}{P} \frac{dp}{d\hat{\omega}} - \frac{\sigma}{\xi(\hat{\omega}^*)} \frac{d\xi(\hat{\omega}^*)}{d\hat{\omega}} \right) \quad (19)$$

Recall that as prior to acquisition activities in the home country we have $\pi(\hat{\omega}^*) = 0$ and since $\epsilon_P = -1$, we can further simplify equation (19) to get:

$$\frac{d\pi(\hat{\omega}^*)}{d\hat{\omega}} = \delta \left(\frac{1}{p(\hat{\omega}^*)} \frac{dp(\hat{\omega}^*)}{d\hat{\omega}} - \frac{1}{P} \frac{dp}{d\hat{\omega}} - \frac{\sigma}{\xi(\hat{\omega}^*)} \frac{d\xi(\hat{\omega}^*)}{d\hat{\omega}} \right) \quad (20)$$

Finally, since $d\xi(\omega)/d\hat{\omega} = \xi(\omega)([dp(\omega)/d\hat{\omega}]/p(\omega) - (dP/d\omega)/P), \forall \omega \in (\hat{\omega}, \hat{\omega}^*]$, we can re-write equation (20) and simplify it further to obtain:

$$\frac{d\pi(\hat{\omega}^*)}{d\hat{\omega}} = \frac{\delta(1-\sigma)}{\xi(\hat{\omega}^*)} \frac{d\xi(\hat{\omega}^*)}{d\hat{\omega}} \quad (21)$$

Then it follows from Proposition 3 that $d\pi(\hat{\omega}^*)/d\hat{\omega} < 0$ since $\sigma > 1$. This implies that post merger profit of this foreign firm must be negative as we know that its pre-merger profit is equal to zero. \square

In essence, the above proposition suggests that merger can be used by domestic firm as a means of protectionism. Although such a proposition that merger can be used as a protectionism tool seems unbelievable at the surface, there is a logical economic intuition behind it. Assuming that

the firms in the industry enjoy sufficient economies of scale, the type of merger we addressed here (i.e., acquisition of domestic least productive firms by the most productive firm) will force some foreign firms in competitive disadvantage in the industry by increasing the intra-industry relative price of their goods. The increase in their intra-industry relative price of their goods forces these foreign firms to exit from the market. In other words, such type of acquisition activities by the most productive domestic firm is a kind of "two-bird-by-one-stone" strategy. By buying domestic firms out, the most productive domestic firm will further benefit from some foreign firms exiting from the market.

Mergers are often subject to regulations. It is therefore interesting to see what is the effects of regulatory restrictions. In our set-up the question boils down to whether or not a restriction imposed by the regulator would be welfare improving. It is notable that the rationale for restricting merger and acquisition activities is their anti-competitive effects on consumers due to their supposed negative impact of mergers on consumers. Back to our equilibrium of Figure 1, let us assume that a binding restriction is imposed by the regulator that prevents the most productive firm to acquire the entire range of firms $(\hat{\omega}, \bar{\omega}]$. That is, due to the regulation, any firm $\omega \in [\tilde{\omega}, \bar{\omega}]$, where $\tilde{\omega} \in [\hat{\omega}, \bar{\omega}]$, will not be acquired. Following Proposition 1, this implies that the effect of such regulatory intervention in the acquisition market will be an increase in the industry aggregate price if $\lambda(\omega), \omega \in (\hat{\omega}, \beta)$, is sufficiently large. This, in turn will reduce the industry aggregate consumption, Q . Since $Q = u$, such interventions will lead to a reduction in consumer welfare in this monopolistic competitive market. On the other hand, if the regulator's objective is to maximize welfare rather than just consumer surplus, we then have to look at the sum of consumer surplus and profits in this industry. First, note that $\psi(\omega) \geq \phi(\omega), \forall \omega \in [\bar{\omega}, \hat{\omega}]$, i.e., the marginal benefit of all such acquisitions is no less than their marginal cost for the most productive firm. Second, all target firms would accept an acquisition offer only if the offer is no less than the present value of the future stream of their profits. All other firms will enjoy the positive externalities of such acquisitions. Therefore, a binding restriction on acquisition activities will be welfare reducing. We formally highlight this in the following corollary.

Corollary 1. *Any regulatory intervention in the acquisition market to restrict acquisition by the most productive firm is welfare reducing if there are sufficient scale economies in the industry.*

This corollary has an important policy implication. The recommendation of our analysis of this section is that policy makers should not interfere in merger and acquisition activities in monopolistic competitive markets that enjoy significant scale economies.⁸

5 Conclusion

This paper has explored the effects of mergers and acquisitions on international trade in differentiated goods. In order to study such impacts, we developed a dynamic model of merger activities with firm level heterogeneity as its central assumption. This assumption is crucial since there are anecdotal evidence as well as empirical studies that support the existence of firm level heterogeneity in developed as well as developing economies. In addition, when it comes to mergers and acquisitions, it is often a more productive firm that acquires a less productive firm. We have demonstrated that, in our model merger market, there exist an equilibrium at which the most productive firm in a monopolistic competitive industry can beneficially acquire a range of less productive firms in a closed economy. We have also showed that such a type of merger will lead to a reduction in aggregate industry price if there are sufficient economies of scale, an observation which is in sharp contrast with the conventional wisdom that in general higher degree of concentration will result in higher prices.

We then extended our merger market model for an open economy with some of its consumed varieties are imported from abroad and also produced by heterogeneous foreign firms. We have showed as our main result that in the absence of any trade barrier merger and acquisition activities can in essence be protectionary. Domestic firms can self-protect the domestic market by consolidating through acquisitions. This self-protectionary nature of mergers provides additional incentive for firms to engage in such activities. In other words, mergers and acquisitions can have both direct and indirect effects. Assuming that firms in the industry enjoy sufficient scale economies, a productive firm directly benefits from acquiring some least productive firms. But such acquisitions would also force some foreign firms out of the market, resulting in secondary indirect benefit for the productive firm. In contrast to the conventional wisdom that mergers might be welfare reducing,

⁸This is similar to the case of “shutting down a firm raises welfare,” first noted by Lahiri and Ono (1988) and re-casted in the context of cross-border merger by Neary (2007).

which has been stated as a common reason for regulatory restriction on merger activities, we have also showed that acquisition activities can be *welfare improving*.

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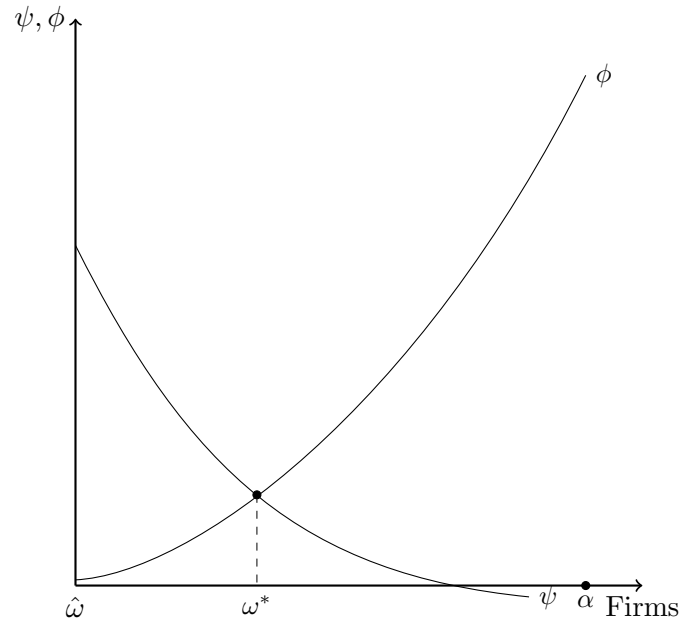


Figure 1: Equilibrium in the acquisition market

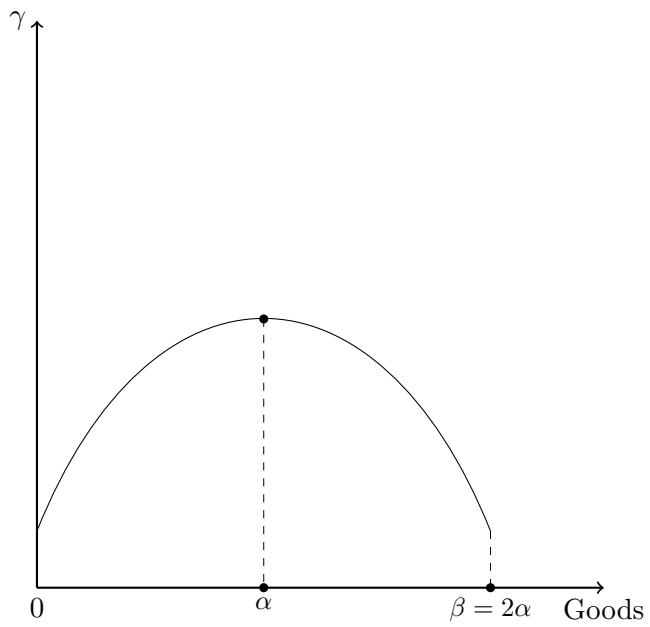


Figure 2: Global distribution of productivity