

Can For-Profit Business Alleviate Extreme Poverty in Developing Countries?

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ABSTRACT

We investigate whether for-profit firms can alleviate extreme poverty at the "base of the pyramid" of the income distribution in poor countries. The scope for market penetration is enhanced when multinationals capable of performing R&D for appropriate technologies team up with local enterprises to provide marketing and distribution. For the (severely credit-constrained) potential customers, the willingness to pay for a product is divorced from the latter's productivity-enhancing aspects. We show that partnerships with non-governmental organizations (NGOs) dedicated to poverty alleviation are more effective than even mergers with local for-profit firms. NGOs that elicit the trust of the target clientele determine their marketing and distribution effort by a product's potential to reduce poverty and hence by its productivity-enhancing capabilities. This circumvents the credit market constraints of the buyers and, by increasing the market size, provides multinationals with the incentive to innovate for appropriate technologies. Furthermore, since pecuniary externalities increase the profitability of sequential technologies, partnerships with NGOs—by dint of their greater potential for common agency—alleviate extreme poverty by facilitating a Big Push at the base of the pyramid more effectively than do mergers with local for-profit firms. Corporate social responsibility forms no part of the argument offered here.

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1 Introduction

Despite the fact that the Millennium Development Goal of cutting world poverty in half between 1990 and 2015 was achieved five years ahead of time, the alleviation of extreme poverty remains a very pressing issue [Chandy et al (2013), Ravallion (2012, 2016)]. People living in extreme poverty in developing countries are also the ones least accessible to poverty-alleviating programs. Lack of education, skills, assets, access to credit, coupled with residence in remote regions with poor infrastructure (roads, electricity, safe water) condemns them to continued poverty. Adding to their woes is the recently documented evidence that when the resources needed for survival are very scarce it impairs cognitive function, and this forces poverty to persist [Mani et al (2013), Mullainathan and Shafir (2014), Schilbach et al (2016)]. It also been recently theorized that poverty can be self-perpetuating because it undermines self-control [Bernheim et al (2015)]. It is imperative, therefore, that every possible avenue to reduce dire poverty be explored. There has been surprisingly little attention given in mainstream development economics to the question of whether business could contribute in this endeavor.¹ This paper offers some insights into when we may expect purely *for-profit* businesses to seriously contribute to lifting the very poor out of their condition.² To our knowledge, this is the first paper to offer a formal theory—and one that strictly eschews corporate social responsibility as a possible vehicle.³

By extreme poverty we shall roughly mean that per capita income is less than \$1.90 a day, in 2011 international dollars [Chen and Ravallion (2010)]. The latest estimate of people in extreme poverty is around 1 billion the world over, with 551 million in Asia and 436 million in Africa [Roser (2016)]. In this paper, these people comprise the "Base of the Pyramid" (hereafter BoP) of the income distribution—to use a telling phrase coined by Prahalad (2004).⁴ Those in extreme poverty spend most of their incomes on essential goods such as food, shelter, and fuel.⁵ Their limited capacity to spend of other goods, is obviously one of the main reasons why business does not come up with products specifically earmarked for the BoP.

Recently, Emerick et al (2016) found in a randomized experiment in Odissa, India, that

¹Academics in business schools have given more attention to this question. See Prahalad and Hammond (2002), Prahalad (2004), and the literature these studies have spawned.

²In our analysis, firms are assumed to pursue the dictum of Friedman (1970), namely, that they should confine themselves to maximizing shareholders' wealth within the confines of the law.

³See Kitzmueller and Shimshack (2012) for a synthesis of the literature on corporate social responsibility.

⁴In his work, Prahalad actually included people who earned higher incomes than the poorest 1 billion we are focusing on here.

⁵For example, in India this proportion is as high as 80% of the budget [Gangopadhyay and Wadhwa (2004)].

when a new agricultural technology (flood-resistant rice) that is suited to the local environment is introduced, the subsequent increase in productivity is greatly augmented by a ‘crowding in’ of complementary inputs. This underlines the importance of having access to technology that is *appropriate for the environment*. As the authors point out, lack of access to such appropriate technologies condemns people to use low-productivity ones that also require low levels of inputs.⁶

Despite the attractive prospect of the claim made by Prahalad (2004) and others that business and poverty reduction are mutually compatible, there are relatively few success stories to be found in the real world. Navigation of the BoP market presents formidable challenges. To begin with, the prices of the potential products have to be very low because the willingness to pay is severely constrained by the incomes of BoP buyers. Since the absence of collateralizable assets puts credit out of their reach or is severely rationed, this willingness to pay is independent of how much the new product may increase a potential buyer’s productivity.⁷ Secondly, the consumers at the BoP have to be convinced that the product will be appropriate for the economic and social environment they live in and that it will be useful to them. In effect, the corporation needs to actually create a market for its product, which requires a fair amount of credibility among potential buyers to pull off and multinationals do not typically inspire trust amongst the poor. Thirdly, potential consumers at the BoP are often distributed geographically across regions with woefully inadequate infrastructure by way of roads, rails, electricity, telephones, etc. The costs of distribution are thus exorbitant; so, building an innovative and economically viable supply chain from scratch becomes a prerequisite for success. Fourthly, the corporation aspiring to serve the BoP must undertake product innovation from the ground up in the context of the BoP. Attempts to sell stripped down versions of products designed for developed countries invariably fail.⁸

The bulk of the people at the BoP barely engage in formal market transactions. Their behavior is not dictated by the explicit contracts common in market economies; rather, it is shaped and mediated by social relationships in which personal familiarity, trust, and norms are paramount. It is appropriate to invoke the classic sociological analysis of Granovetter (1985) to characterize their behavior as ‘socially embedded’. To be successful in profitably serving the BoP, corporations would likewise be required to embed themselves in these communities, discover their needs, identify their constraints, and develop products that are suitable for them.⁹

⁶The example of an expensive failed attempt is Procter & Gamble’s water purifying powder [Hanson and Powell (2006)]. Contaminated drinking water kills 2 million children every year.

⁷See Collins and Morduch (2010) for a description of the financial portfolios of the 2.6 billion people who live under \$2 a day per person. (We are focussing here on the poorest 1 billion.) For an overview of the problems constraining the poor in credit markets, see Ghosh et al (2000).

⁸A good example of this is Nike’s ‘World Shoe’ intended for China [Hart and London (2004)].

⁹For a review of the literature on the social embeddedness of multinationals, see Heidenreich (2012).

The aspiring firm, therefore, must be willing to devote itself to this endeavor for a considerable stage of time. Only firms with substantial access to capital can weather this out, and for this reason multinational companies are good candidates for such ventures.

A survey of the business successes and failures in catering to the BoP suggests that there are two crucial inputs required by an MNC for success. One is research and development on appropriate but inexpensive products, and the other is marketing and distribution (shortened hereafter to ‘marketing’). MNCs are experienced at R&D but lack the local knowledge to typically produce a product tailored to the context. In such scenarios, it is essential for the MNC to partner with a local organization. A local firm or NGO would have greater familiarity with the cultural and economic milieu of the BoP and can provide the MNC with detailed input on the sort of product that has a reasonable chance of being embraced. And importantly, they are likely to have informal networks and region-specific methods for marketing. In the model proffered in this paper, the MNC performs the R&D, while the local organization undertakes the marketing. The MNC has a choice between acquiring a local firm or forming a partnership with an NGO.¹⁰ We refer to the resulting organizations hereafter as MNC-LFs and MNC-NGOs, respectively. The R&D of the MNC generates a product and reduces the marginal cost of manufacturing the product. The product is profitable for the MNC if the price-marginal cost markup (as determined by R&D) and the sales (as determined by the local organization’s marketing effort) are large enough that the MNC’s revenues more than cover its R&D and fixed entry costs for the BoP market.

The model offers some insights into when an MNC might opt to partner with an NGO as opposed to acquiring a local, for-profit firm. At the BoP, NGOs have an advantage over local firms in marketing and distribution because they work with the poor, know their needs, and evoke their trust. This in itself, however, does not confer an advantage to an MNC-NGO partnership. NGOs have their own agendas—their nonprofit orientation being a distinguishing feature—that are usually inconsistent with those of profit-maximizing MNCs. But there is another aspect of poverty-alleviating NGOs that enables their superior marketing advantage with the BoP to benefit MNCs. In a market economy, the price of a product should reflect the productivity improvement it can bring about. But these entities are divorced in the BoP because of their limited ability to borrow and pay. In this setting what matters to for-profit firms is the price of the product, not the productivity improvement it brings about. The NGO, however, which cares for poverty reduction is cognizant of the productivity increase the product brings about in the adopters. Thus the NGO’s marketing effort increases with the productivity

¹⁰There is a burgeoning literature in business on entrepreneurship for the BoP, including suggestions of partnerships with NGOs (see e.g. Prahalad and Hart (2002), Chesbrough et al (2006), Dahan et al (2010), Webb et al (2010)), but there is no formal economic model which could evaluate such possibilities.

boost the product offers, *irrespective of its price*. Since the marketing effort is a natural strategic complement to R&D effort (in view of the larger market size the former brings about), this raises the return to R&D which in turn elicits an increase in the R&D effort. This lowers the MNC's marginal cost of production, making it feasible for the MNC to achieve a price low enough for the BoP. In this manner, even if the BoP clientele's willingness to pay is so severely constrained that an MNC-LF merger cannot viably introduce the product, we show that the productivity aspect of it may enable profitable entry through an MNC-NGO partnership.

By placing value on poverty reduction and, therefore, on the productivity improvement the product generates, the NGO at least partly offsets the credit market constraints that plague the BoP. In the light of this, NGOs' marketing edge over local firms can potentially accomplish for the MNC what local firms cannot. This theory suggests one reason for the rising number of corporate-NGO partnerships that is being observed in recent decades across the world [Poret (2014)].

Few technologies single-handedly lift people out of poverty. The more promising scenario is that a sequence of technologies could collectively accomplish this if they can each manage to profitably achieve the required scale. The productivity boost made possible by one technology often enables its adopters to embrace a second innovation that may provide a completely different productivity-enhancing benefit (which in turn may enable them to adopt a third, and so on).¹¹ For example, the adoption of cell phones in Kenya made possible the introduction of M-Pesa, a service offered to people without bank accounts to make money transfers using a cell phone. The latter released a considerable amount of time in executing transactions, which made M-Pesa a heavily-used and hugely successful service.¹² With such sequential introduction of technologies, the first confers a pecuniary externality on the second; the latter by using the first as an input into its own production raises the demand for the first. These forward and backward linkages potentially bolster the profitability of both [Hirschman (1958)]. There are serious difficulties, however, in actualizing this at the BoP, and we show that partnerships with NGOs could prove doubly advantageous here.

By setting up a two-stage model, we investigate the difference between the effects on the BoP of sequential introduction of products (technologies) by MNC-NGO partnerships, as opposed to

¹¹In an examination of the spread of mass consumption in the development process, Matsuyama (2002) has identified conditions under which there can be a trickle-down of consumer products from the rich to the poor triggered by the price reductions, and also a reverse trickle-up whereby consumption by the poor lowers price further and frees up resources for the rich to consume newer products. This virtuous circle, however, is not applicable to the BoP because they require very different products, ones that the rich are unlikely to consume. MNCs cannot approach the BoP by first catering to the well-off, and this is the difficulty. Nevertheless, even within the BoP, there is scope for pecuniary externalities across products that are appropriate for the very poor.

¹²Jack and Suri (2014) have shown that the M-Pesa innovation in Kenya reduces transactions costs and facilitates more efficient risk-sharing.

MNC-LF mergers. If the services provided by the two products are very different, the MNCs and the local firms acquired by them will be very different, too, in their expertise. Poverty-alleviating NGOs, however, are open to partnerships with any reputable MNC and the same NGO can partner with both MNCs. In the context of sequential productivity-enhancing innovations, we show that MNC-NGO partnerships are better for poverty alleviation than MNC-LF mergers for yet another reason. Specifically, they encourage more R&D in pioneering innovations for the BoP by enhancing the backward linkage and helps internalize the pecuniary externality that the pioneering MNCs confer on the MNCs that follow. Moreover, they magnify the poverty-reducing complementarity between sequential technologies.

The backward linkage from a viable second innovation to the first can lead to a potential coordination problem. If the pioneer's entry costs are sufficiently high, the first innovation may not be viable if the MNC acquires a local firm or when it partners with an NGO that does not anticipate a sequential innovation in the second stage. But the pioneer may be viable, however, if the NGO does anticipate this. Thus, in a manner similar to the Big Push of Rosentein-Rodan (1945), there may potentially be two equilibria: one where both products are viable if the MNCs' entry decisions are coordinated and another—in which neither is viable—if the decisions are not. But even when a multiplicity of equilibria obtains with MNC-NGO partnerships, only the Pareto-inferior equilibrium with entry by neither product would obtain with MNC-LF mergers because local firms do not help internalize the pecuniary externality conferred by the pioneers. NGOs, therefore, are better poised to facilitate a Big Push at the base of the pyramid.

The rest of the paper is as follows. In Section 2 we set out our basic model for the BoP in which we compare the relative profitability of an MNC of partnership with an NGO as opposed to a merger with a local firm. We show that products intended for the BoP that are not merely consumer goods but also have aspects of producer goods are more likely to make an entry through MNC-NGO partnerships. In Section 3, we consider the effects of sequential entry of productivity-enhancing technologies into the BoP market and demonstrate that MNC partnerships with NGOs are more likely to enable profitable entry and facilitate greater reductions in poverty than mergers with local firms. The concluding section summarizes the findings of this paper and offers some additional thoughts.

2 A Model of Business Serving Clients in Extreme Poverty

Suppose a multinational company produces a new product/technology that is appropriate for people who are in extreme poverty. The product may be a consumption good or it may be a producer good which increases the productivity of a buyer and thereby her income. Denote

this increase in income by ϕ , which might be zero in case of a pure consumption good. Since people in the BoP are very close to subsistence, they will buy the new product only if the price is within a narrow band. Assume, for simplicity, that they buy at most one unit of the good if the price is not greater than P , which is exogenous and, due to severe credit constraints, is independent of ϕ .¹³ The demand, however, is not perfectly elastic at price P ; rather, demand is restricted by lack of knowledge, lack of trust in the product, perceived relevance of the product to their economic environment, and many other factors. This is why marketing effort is crucial to promoting sales meant for people in the base-of-the-pyramid [Austin (2008)].

As pointed out in the Introduction, a multinational company needs to innovate from the ground level, with full awareness of the reality of the poor—their needs and their economic, social, and cultural constraints.¹⁴ Since multinationals typically lack knowledge in this, they must team up with profit-oriented local firms or with NGOs that are altruistically motivated to reduce poverty. The MNC seeks the local knowledge of a local firm or NGO. Importantly, the local organization provides the marketing for the product.

The sales of the product, Q , depends on the marketing effort, z , provided by the local organization. The sales will also depend on the productivity of this effort—and this productivity is determined by many factors such as the level of education of the poor, their cultural practices and beliefs, the trust that the local organization evokes, how closely or sparsely they are distributed geographically, and the ease of physical access to them (which depends on the existence and quality of roads and rails). We capture the combined effect of the exogenous factors on marketing productivity by the parameter β , with higher values rendering marketing effort more productive. We may write

$$Q = f(z; \beta), \tag{1}$$

with $\partial f / \partial z > 0$, $\partial^2 f / \partial z^2 < 0$ (f is strictly concave in z), and $\partial f / \partial \beta > 0$, $\partial^2 f / \partial z \partial \beta > 0$ (β raises the sales and the marginal sales of marketing effort).

Denote by R the R&D expenditure of the MNC on the new product that could alleviate the poverty of its buyers and c be the (constant) marginal cost of producing a unit of that product. R&D not only generates a relevant product but it also enables it to be manufactured at lower marginal cost. We posit that

$$c = C(R, \gamma), \tag{2}$$

¹³One way to rationalize this is to posit hierarchical preferences [Eswaran and Kotwal (1992)]. With a strict hierarchy in needs, the poor first spend their income only on essentials (like food, shelter) and are willing to spend only any additional income, if available, on other goods.

¹⁴An example of the importance of social and cultural constraints is provided by ApproTec, a pump set for drawing water for irrigation [Chesbrough (2006)]. Early versions of this technology required women to operate them in a position that was not deemed socially and culturally acceptable in Africa. It was only after it was redesigned that ApproTec became a successful product at the BoP.

where $\gamma > 0$ is a cost parameter relevant to this marginal cost. We assume that $\partial C/\partial R < 0$ and $\partial^2 C/\partial R^2 > 0$, that is, products or technologies that can be manufactured at low marginal cost (and hence could be sold at a low price) require more R&D and there are diminishing returns to R&D in terms of reduction in the marginal cost. Furthermore, we assume that $\partial C/\partial \gamma > 0$ and $\partial^2 C/\partial R \partial \gamma > 0$, that is, when the parameter γ increases, it raises the marginal production cost at a given level of R&D and also lowers the marginal cost reduction brought about by R&D. One difficulty that MNCs have in serving the BoP comes partly from the fact that γ is typically too large for R&D to be viable. We also posit that the MNC incurs a fixed cost denoted by F in operating at the BoP. This fixed cost is usually quite substantial because the MNC often has to compensate for lack of infrastructure, find ways of making do without legal contracts, etc.

We assume that if the multinational manages to create a new product at a marginal cost that is below the reservation price P , it chooses to limit price. This is reasonable because lowering the cost of the new product in order to sell to the poor is already a most formidable challenge that most MNCs fail at. Finally, we assume that maximizing profit is the exclusive objective of the MNC. Since the goal here is to investigate how poverty may be reduced when corporations are strictly in the for-profit business, we suppress other motivations such as corporate social responsibility.

2.1 Merging with a Local Firm

Suppose, first, that in catering to the BoP the MNC merges with (acquires) a local, for-profit firm. This enables us to circumvent agency problems arising from the non-contractibility of inputs, thus enabling the MNC to achieve the most profitable outcome with a local firm. This merged firm (MNC-LF) is assumed to be a monopoly in the BoP market. The MNC innovates, develops, manufactures, and supplies the product while the acquired local firm undertakes the marketing.

The MNC-LF's profit maximizing problem is

$$\max_{z,R} [P - C(R, \gamma)]f(z; \beta_f) - wz - R - F, \quad (3)$$

where w is the wage rate of the labor employed for marketing. We assume that the above function is strictly concave jointly in z and R . The first order condition with respect to z and R are given, respectively, by

$$[P - C(R, \gamma)]f'(z; \beta_f) = w \quad (4)$$

$$-C'(R, \gamma) f(z; \beta_f) = 1, \quad (5)$$

where prime denotes derivative with respect to the first arguments of $f(z; \beta_f)$ and $C(R, \gamma)$. In our analysis, we shall presume that $P > C(R, \gamma)$, for if even manufacturing costs are not covered, entry into the market is doomed. Given our assumption of strict concavity of the objective function, the second order conditions for a maximum is satisfied. We denote the (unique) solution to (4) and (5) by $\{\widehat{z}(P, \beta_f), \widehat{R}(P, \beta_f)\}$, and the corresponding MNC profit in this scenario by $\Pi^F(P, \beta_f)$. (For brevity, we suppress γ as an argument of these functions.) Note that this profit depends, of course, on the price P that the BoP consumers are willing to pay for the product but, for the reasons already stated, it does not depend on the productivity improvement, ϕ , that the product may bring about in the buyers. Routine comparative static exercises readily show that, as expected, $\widehat{z}(P, \beta_f)$, $\widehat{R}(P, \beta_f)$, and $\Pi^F(P, \beta_f)$ are increasing in both their arguments.¹⁵ The basic problem confronting MNCs attempting to serve the BoP is that P is too low to profitably elicit the marketing and R&D effort to cover the R&D and fixed cost.

2.2 Partnering With an NGO

Suppose, instead, that in its endeavor to reach the poor the MNC teams up with an NGO dedicated to reducing poverty. This MNC-NGO partnership, too, is assumed to be a monopoly in the BoP market. In contrast to the MNC-LF case, here we assume that, though the MNC and the NGO recognize the synergies in their activities (R and z , respectively), these activities are non-contractible. This is reasonable in this context because MNCs cannot monitor the NGO's activities in the rural hinterlands of poor countries and NGO's know little of the MNC's R&D efforts. So, we consider the non-cooperative outcome and we examine below the Nash equilibrium outcome within the partnership.¹⁶

Consistent with the stated goals of NGOs dedicated to poverty alleviation, we posit that the NGO is concerned with the increase in the aggregate income of the poor made possible by the new product or technology. This will be proportional to the sales of the new product and the productivity increase it brings about. Since the increase in income of a buyer is ϕ , the aggregate increase in income when the sales are Q is ϕQ . We posit that the benefit to the NGO of the partnership may be written as $\lambda \phi Q$, where λ can be interpreted as the weight that the altruistic NGO puts on a unit increase in the income of a poor person. In other words, the parameter λ captures the intensity of the mission-orientation of the NGO. In what follows we

¹⁵We can also show that the three functions are declining in the innovation cost parameter γ .

¹⁶It might appear that we are introducing an asymmetry between the MNC-LF and the MNC-NGO by examining the cooperative outcome in the former but the non-cooperative outcome in the latter. Actually, since we argue in this paper that the MNC-NGO arrangement can be superior to the MNC-LF, such a comparison rigs the case against the MNC-NGO and thus bolsters our argument.

let $\Phi \equiv \lambda\phi$ denote the NGO's valuation of the productivity increase brought about by a unit of the product/technology.

NGOs usually finance at least some of their own marketing costs through donations from private citizens, corporations, and the government. To keep things comparable between the MNC's arrangements with the local firm and the NGO, we shall assume for the most part that the MNC offers a lump sum grant to the NGO for its marketing expenditure.¹⁷ Here z will denote the effort of labor hired by the NGO. We presume that the NGO has many poverty-alleviating projects it can undertake using the scarce resources obtained from various donors. It recognizes that there is an opportunity cost to its marketing expenditure (in terms of poverty reduction elsewhere), despite the fact that these expenditures are defrayed from donations. In other words, it allocates its scarce funds in marketing to maximize net surplus value of the poverty reduction it brings about. Thus the objective function we attribute to the NGO may be written as its perceived benefit from poverty reduction in this project less the marketing expenditure on it:

$$\Phi f(z; \beta_n) - wz + G, \tag{6}$$

where G is a lump sum grant that the MNC offers to the NGO. The wage rate labor is paid here may differ from that paid by the for-profit local firm. This is often because those who seek employment in NGOs are altruistically inclined and may be willing work to for less than the market wage because the NGO's profits cannot be distributed [Hansmann (1980)]. However, we shall assume here that the wage rate is the same so as not to give the MNC-NGO this edge over the MNC-LF.¹⁸

The first order condition with respect to marketing effort of an NGO seeking to maximize poverty reduction net of costs is

$$\Phi f'(z; \beta_n) = w. \tag{7}$$

Since the marginal benefit of marketing effort is independent of R , the NGO's best response function is, too.

In its partnership with the NGO, the MNC solves

$$\max_R [P - C(R, \gamma)] f(z; \beta_n) - R - F - G. \tag{8}$$

¹⁷In the absence of such a grant, we would automatically be stacking the case in favor of the NGO partnership because the marketing cost would not be borne by the MNC in this case, whereas it would be in the MNC-LF merger.

¹⁸One might wonder why only NGOs have preferences of the sort depicted in (6). Why can't the managers of local, for-profit firms be managed by altruistic managers who might care for the wellbeing of the poor? We postpone to subsection 2.3 the discussion of the strict advantages of NGOs over for-profit firms in this regard.

The first order condition for the above optimization is the same as (5) with β_n replacing β_f . The MNC's best response function for R depends on z because the latter determines the market size and, hence, the return to R&D.

Denote the Nash equilibrium by $\{\tilde{z}(\Phi, \beta_n), \tilde{R}(\Phi, \beta_n)\}$ and the equilibrium profit of the MNC by $\Pi^N(P, \Phi, \beta_n)$. (Once again, for brevity we have suppressed the parameter γ as an argument of the functions \tilde{R} and Π^N ; \tilde{z} is independent of γ .) The lump sum grant the MNC offers the NGO is given by $\tilde{G} = w\tilde{z}(\Phi, \beta_n)$. The Nash equilibrium is clearly stable. It is readily verified that both the equilibrium marketing effort, $\tilde{z}(\Phi, \beta_n)$, and the R&D effort, $\tilde{R}(\Phi, \beta_n)$, are increasing in Φ . The latter implies that the equilibrium marginal cost of production to the MNC is also declining in Φ . The MNC's equilibrium profit, $\Pi^N(P, \Phi, \beta_n)$, is increasing in P but is non-monotonic in Φ . The MNC's profit is given by the objective function in (8) but the marketing effort, which it pays for with a lump sum grant, is determined by the NGO. If the MNC had full control over the NGO's marketing effort, it would choose this to be the profit maximizing level $\hat{z}(P, \beta_n)$; but it does not have this control. It is easy to see that $\Pi^N(P, \Phi, \beta_n)$ increases in Φ when $\tilde{z}(\Phi, \beta_n) < \hat{z}(P, \beta_n)$, reaches a maximum when $\tilde{z}(\Phi, \beta_n) = \hat{z}(P, \beta_n)$, and is declining in Φ when $\tilde{z}(\Phi, \beta_n) > \hat{z}(P, \beta_n)$.

Note that, in contrast to the scenario where the MNC merges with a local firm, the MNC's profit when it partners with an NGO *does depend* on the productivity increase its product brings about in buyers—even though the price, P , that BoP consumers are willing to pay for it is exogenously fixed independently of Φ . When Φ increases, the NGO's marketing effort rises and sales increase. This stimulates the MNC's R&D through strategic complementarity, which increases the profit margin.

If $\Phi = P$ and $\beta_n = \beta_f$, by comparing (4) and (7) we see that the MNC-NGO applies too much marketing effort compared to the MNC-LF, that is $\tilde{z}(P, \beta_n) > \hat{z}(P, \beta_f)$. This is because the NGO ignores the marginal production cost, which the merged MNC-LF firm accounts for. Since the NGO's marketing effort is increasing in Φ , we can always find a lower Φ , denoted by $\Phi^*(P)$, such that the NGO's marketing effort is the same that of the MNC-LF. Then from the common first order condition (5), it follows that the MNC's R&D effort is also the same in the two scenarios if $\beta_n = \beta_f$. In other words, there is always a $\Phi^*(P) < P$ such that the MNC's profit in the MNC-NGO arrangement when $\Phi = \Phi^*(P) \equiv P - C(\hat{z}(P, \beta_n), \gamma) < P$ and $\beta_n = \beta_f$ is exactly equal to that in the MNC-LF arrangement. We record these results in the following proposition.

Proposition 1: There exists a value of Φ , denoted by $\Phi^(P) \equiv P - C(\hat{z}(P, \beta_n), \gamma)$, such that when $\beta_n = \beta_f$, (a) $\tilde{z}(\Phi^*(P), \beta_n) = \hat{z}(P, \beta_f)$, (b) $\tilde{R}(\Phi^*(P), \beta_n) = \hat{R}(P, \beta_f)$, and (c) $\Pi^N(P, \Phi^*(P), \beta_n) = \Pi^F(P, \beta_f)$.*

In the MNC-LF merger, the MNC’s profit is the highest possible for given P and β_f because it chooses both z and R . For $\beta_n = \beta_f$, the profit of the MNC-NGO, $\Pi^N(P, \Phi, \beta_n)$, is increasing in Φ for $\Phi < \Phi^*(P)$, at $\Phi = \Phi^*(P)$ it reaches its highest value—which is the MNC-LF’s profit—and declines for higher values of Φ because the marketing cost (reimbursed to the NGO through a fixed grant) becomes excessively burdensome. When $\Phi = \Phi^*(P)$, the MNC-NGO’s outcome mimics the MNC-LF’s.

If $\Phi < \Phi^*(P)$ the MNC’s profit increases with Φ despite the fact the price, P , is exogenously fixed by the BoP consumers’ budgets, severing the link between what they are willing to pay and the contribution of the technology to their productivity. This increase occurs for two reasons. First, since the NGO cares about poverty reduction, its marketing effort and, therefore, sales is increasing in Φ . Second, as noted earlier, the marketing effort is a strategic complement of the MNC’s R&D effort. An increase in the former, by raising the marginal returns to R&D, increases the R&D effort that, in turn, increases the profit margin. Despite having an orientation that is decidedly not profit, the NGO could potentially make it profitable for an MNC to penetrate the BoP market in which buyers are severely credit-constrained. But, as we see below, for this arrangement to dominate that with a local firm, the NGO requires another advantage (which it tends to possess).

When the NGO’s marketing productivity parameter β_n increases, the Nash equilibrium values of z and R increase. This underlines the importance of several factors that impinge on sales. First, the reputation of the NGO is relevant because the more trusted the NGO is, the larger is β_n and this raises the likelihood that the technology will be viable. The above proposition also brings out the importance of mission-orientation, as captured by λ , of the NGO that is embedded in $\Phi (= \lambda\phi)$. All else constant, those NGOs that have a proven track record of dedication to the poor and whose mission statements emphasize poverty alleviation are the best partners of the corporation. Although the MNC is assumed to be interested only in profits, such a partnership will usefully harness the synergy between the firm’s R&D expertise and the NGOs marketing efforts to raise the firm’s returns to R&D. It has frequently been argued that poverty alleviation can go hand in hand with profits [Prahalad and Hart (2002), Prahalad (2004)]. Our model demonstrates that business profits and poverty alleviation are neither necessarily at odds nor mutually exclusive.

We may expect the MNC-NGO’s profit, $\Pi^N(P, \Phi, \beta_n)$, to be increasing in the NGO’s marketing productivity, β_n , and it is—except for very large values of Φ . For given marketing effort, an increase in β_n increases sales and therefore profit. But it also endogenously increases the NGO’s marketing effort and, therefore, increases the grant that the MNC has to offer the NGO. If the increase in marketing effort is “excessive” for the price, P , that the MNC receives, its

profit can conceivably go down. But this is so only in the empirically irrelevant scenario where Φ is very large. The following corollary follows immediately from Proposition 1 when the MNC's profit is positive.

Corollary 1: When evaluated at $\beta_n = \beta_f$, the derivative $\partial\Pi^N(P, \Phi, \beta_n)/\partial\beta_n$ is positive over a range of values $(\Phi_{\min}, \Phi_{\max})$ containing $\Phi^(P)$, that is, when $\beta_n \gtrsim \beta_f$, it is the case that $\Pi^N(P, \Phi, \beta_n) > \Pi^F(P, \beta_f)$ for $\Phi \in (\Phi_{\min}, \Phi_{\max})$.¹⁹*

Thus, there is a range of productivity improvements that the product brings about in buyers over which the MNC would prefer a partnership with the NGO to a merger with a local firm if the NGO enjoys an advantage over the local firm in terms of marketing. Put differently, the MNC could form a profitable partnership with an NGO if its fixed entry costs into the BoP market are so high as to render marginally unviable a merger with a local firm. We discuss below why NGOs can be expected to possess a marketing advantage in the BoP.

2.3 On the Advantages of NGOs in Marketing and Distribution

There are many reasons to expect that NGOs command an advantage over local firms in the marketing and distribution of products specifically earmarked for the BoP. This is especially so for goods that improve the productivity of buyers. Poverty-alleviating NGOs deal directly with the poor without intermediaries, and so have intimate knowledge of their needs. They work towards diverse ends such as providing access to education, health services, credit, pushing the adoption of appropriate technologies, helping with irrigation, delivering agricultural inputs (seeds, fertilizers, etc.), providing extension services, and ensuring that the development is sustainable when they leave. Since by its very nature agriculture is dispersed over the countryside, NGO involvement in agriculture, particularly, makes them a pervasive presence among the BoP.

Many of the services provided by NGOs are such that the organization providing them can-

¹⁹This can be easily seen by taking the derivative of $\Pi^N(P, \Phi, \beta_n)$ at the Nash equilibrium with respect to β_n and evaluating it at $\beta_n = \beta_f$:

$$\partial\Pi^N(P, \Phi, \beta_n)/\partial\beta_n = (P - C)f'\partial\tilde{z}/\partial\beta_n - w\partial\tilde{z}/\partial\beta_n + (P - C)\partial f/\partial\beta_n,$$

where we have invoked the fact that the derivative with respect to R (optimally chosen) is zero. Using the NGO's first order condition (7) with respect to z , this can be rewritten as

$$\partial\Pi^N(P, \Phi, \beta_n)/\partial\beta_n = (P - C - \Phi)f'\partial\tilde{z}/\partial\beta_n + (P - C)\partial f/\partial\beta_n.$$

On evaluating this derivative at $\beta_n = \beta_f$ and $\Phi = \Phi^*(P)$, the first term on the right hand side vanishes. The second term is strictly positive. By continuity, it follows that in the neighborhood of $\Phi = \Phi^*(P)$, too, the derivative must be positive.

not capture the benefits they confer, partly because the clientele cannot afford to pay and also because some of the services are of a non-excludable public nature. Private firms have little incentive to provide them, and therefore, have almost no presence in isolated areas. In their analysis of whether governments or NGOs should provide a public service or whether this should be provided by a partnership between them, Besley and Ghatak (1999, 2001) identify conditions under which NGOs would be the choice. Indeed, in many regions in the rural hinterland of developing countries, there is NGO presence but virtually no government presence. As a practical matter, therefore, NGOs are ideally positioned to utilize their existing infrastructure and social networks to persuade the poor to purchase productivity-improving products of MNCs.²⁰

But the advantages of NGOs go far deeper. Selling to the poor requires the trust of potential clients, especially in milieus where market transactions are few and far between and exchanges are embedded in social norms [Granovetter (1985)].²¹ Social capital matters in economic development [Das Gupta and Serageldin (2000)]. Since people in dire poverty can ill afford to spend on what does not contribute to immediate survival, trust and social capital acquire an even greater significance for poverty reduction at the BoP. As Stiglitz (2000) has emphasized, social capital undermines moral hazard. Among the extremely poor to whom even the concept of a legally binding contracts is an alien notion, there are good reasons to believe that NGOs evoke more trust and goodwill than do other organizations. For-profit firms stay away from the BoP precisely because individual members of these groups lack purchasing power.²² The presence of NGOs is much more pervasive in the BoP because they are not motivated by profits.

In a seminal contribution on nonprofit organizations, Hansmann (1980) argued that nonprofits are altruistic in intent and the constraint that profits cannot be distributed to the owners signals this altruism and engenders trust.²³ One line of argument hinges on the altruistic orientation of workers [Francois (2003)].²⁴ Workers can differ in their preferences and, in particular, some may derive utility by producing goods and services that deliver benefits to society, even if that entails donation of their labor for the cause. Since they receive satisfaction from the

²⁰We do not suggest that NGOs manage to reach *all* of the poor equally. The point, rather, is that they have greater access than other organizations, be they commercial firms or governments—and this is what is relevant to our argument. Riddell and Robinson (1996, p. 65) suggest from their case studies of poverty-alleviating NGOs that, while all of the poor do benefit from them, the poorest benefit less.

²¹On the importance of trust, see e.g. Webb et al (2010). Grootveld and Vermeulen (2016) provide a detailed description of the careful and time-consuming cultivation of trust in the BoP by an MNC. The study shows how Unilever engaged NGOs as essentially guarantors of its commitment to the local BoP communities in Tanzania in seeking to set up a supply chain for the oil derived from the nuts of the African Allanblackin trees, which are found only in remote and isolated regions in Africa.

²²Though, by dint of sheer numbers, the aggregate purchasing power can be quite high [Prahalad (2004)]. But it is doubtful whether this is true of the poorest 1 billion we focus on.

²³The role played by altruism in theories of nonprofits is reviewed in Rose-Ackermann (1996).

²⁴For a review of the role of other-regarding preferences in nonprofit organizations, see Francois and Vlasopoulos (2008).

activity itself, the nondistribution constraint of nonprofits provides at least some assurance to them that their philanthropic contributions or ‘labor donation’ will not be appropriated by the owners for private profit. Thus, such workers will self-select into nonprofit organizations. We may expect workers in nonprofits to exhibit more job satisfaction than workers in for-profit firms. Using large samples from the U.S. and Britain, Benz (2005) provides persuasive evidence that this is indeed the case even after controlling for wages, fringe benefits, and industry types. In fact, it is conceivable that the exercise of altruism may contribute here to the accumulation in nonprofits of ‘altruistic capital’ along the lines recently suggested by Ashraf and Bandiera (2017), who coined this general concept and measured it in a specific context.

Given the differences in the presence of, and the trust elicited by, NGOs and for-profit firms, it is reasonable to expect that NGOs have an edge in marketing and distribution to the BoP: $\beta_n > \beta_f$.²⁵ As long as marketing and distribution are undertaken by the local organization, this NGO advantage cannot be matched by the merged MNC-LF or, for that matter, by a partnership in which the MNC writes a contract with the local firm to align its incentives to mimic the NGO’s performance.

2.4 Comparison of MNC Merger with Local Firm and Partnership with NGO

In this section we inquire when a multinational would prefer an NGO to a local firm for its marketing. We examine this in (P, Φ) space, since all both parameters are exogenous to the MNC. In view of the discussion above, we shall presume that $\beta_n > \beta_f$. Consult Figure 1. Since the profit of the MNC-LF, $\Pi^F(P, \beta_f)$, is independent of Φ , the iso-profit contours of $\Pi^F(P, \beta_f)$ are vertical lines in (P, Φ) space. We show, as line AB, only the iso-profit contour corresponding to the zero profit in the MNC-LF case, $\Pi^F(P, \beta_f) = 0$, which occurs, say, when the price is P_0 . Furthermore, since the profit of the MNC-NGO, $\Pi^N(P, \Phi, \beta_n)$, is increasing in P and also Φ (within limits), the corresponding iso-profit contours are downward sloping. As the price of the product increases, the largest marginal cost of production compatible with covering variable costs increases and so the MNC can economize on R&D if it so chooses. Thus the minimal value of Φ required for the MNC to break even in an NGO partnership declines as P increases. In the Figure, we only show, as curve CD, the iso-profit contour corresponding to zero profit,

²⁵Of course, not all NGOs are more trustworthy than MNCs. Nevertheless, at an aggregate level, NGOs are the most trusted institutions in the world [Poret (2014)]. The 2016 Edelman Trust Barometer finds that, in a survey conducted over 28 countries, among the four broad categories of businesses, media, government and NGOs, NGOs were deemed to be the most trusted institutions.

$\Pi^N(P, \Phi, \beta_n) = 0$, in the MNC-NGO case.²⁶

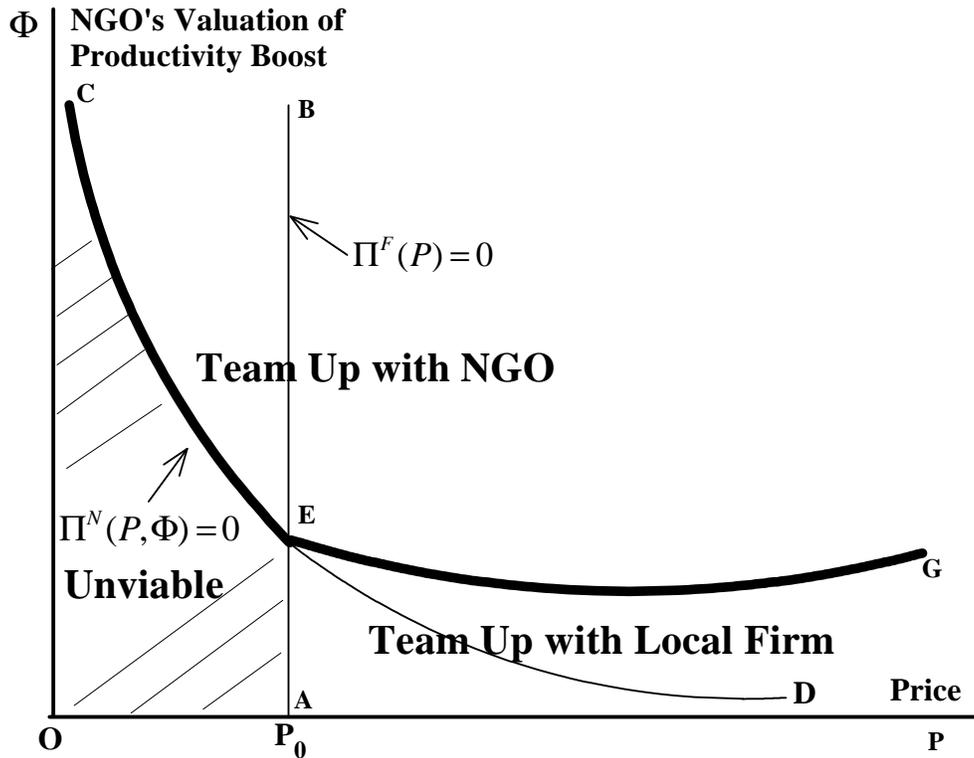


Figure 1: Regions of optimal partnerships of an MNC

At the point shown as E in Figure 1, the profits of the MNC are equal to zero in both sorts of arrangements. In the Figure, it is unprofitable for the MNC to operate in the region to the left of AE and below CE, and so no product will be provided to the BoP market by either arrangement in the shaded region indicated.

Consider the locus of points in (P, Φ) space for which the profits of the MNC are positive and equal in the two scenarios:

$$\Pi^N(P, \Phi, \beta_n) = \Pi^F(P, \beta_f).$$

The slope of this locus can be of either sign. However, since the derivative of $\Pi^F(P, \beta_f)$ with respect to P is increasing in P (the profit function is strictly convex in P) while that of $\Pi^N(P, \Phi, \beta_n)$ is independent of P , even if the locus under consideration declines at first, it

²⁶Strictly speaking, the contour CD should turn backwards for very high values of Φ because then the NGO chooses excessively high values of marketing effort (increasing the grant the MNC needs to pay) and so there would need to be an accompanying increase in P to compensate. But given that the inability to achieve adequate scale is the fundamental problem confronting MNCs in the BoP, this is a theoretical curiosity.

must ultimately have a positive slope. We show this locus in Figure 1 as EG. At all points above CEG the MNC will find a partnership with the NGO more profitable, and at all points in the region AEG a merger with a local firm will be more profitable.

What is clear from Figure 1 is that when the price that BoP buyers are willing to pay is above a threshold indicated by P_0 , the only scenario where mergers with local firms will be preferred by the MNC is when the goods are mostly *consumer* products (with low or zero Φ). But such products offer members of the BoP very limited increases in wellbeing, even though they might make profits for the MNCs. If the products are producer goods that significantly increase the productivity of the extremely poor, we see that partnerships with NGOs are more profitable. In fact, when the BoP's willingness to pay falls below the critical level P_0 , an MNC-LF is not even viable. Nevertheless, the product can still be marketed profitably through an MNC-NGO arrangement if it provides a sufficiently high productivity boost—precisely the scenario where the willingness to pay in the BoP would diverge greatly from the market value of the product were credit constraints absent. Thus, productivity-enhancing technologies of MNCs, which could make a significant dent on poverty, are best marketed through NGOs. This is a testable implication. This also provides a firm theoretical foundation for the observation that the success of MNCs at the BoP is tied to the *shared prosperity* of the poor [Rangan et al (2011), International Finance Corporation (2014), Karnani (2007)]. When the difference $(\beta_n - \beta_f)$ increases, the region in (P, Φ) space in which an MNC's partnership with an NGO dominates would be larger.

The observations made in this section provide one possible rationale for the steep rise in corporate-NGO partnerships across the world in recent decades [Poret (2014)]. This explanation does so without invoking the notion of corporate social responsibility through which the MNC tries to communicate to potential customers that it is a socially responsible citizen. In the model constructed here, the MNC partners with an NGO because the core competencies of the two entities are complementary and both better achieve their respective goals (profits and poverty reduction) through such an arrangement. And importantly, the NGO's marketing effort compensates the MNC for the dampening effect of the credit market constraints facing the BoP and, aided by its advantage in marketing, makes it profitable for the MNC to undertake the required R&D for appropriate technologies.

Some Examples of MNCs Successful at the Base of the Pyramid

Multinationals are playing an increasing role in delivering healthcare to the extremely poor not only as part of corporate social responsibility but also as for-profit business. An example of the latter is the case of the multinational Novartis, which in 2007 started a non-profit organi-

zation called *Arogya Parivar* (meaning ‘Healthy Family’) that operates in some states of India. This non-profit employs a large number of health educators who are trained to communicate with people in the BoP about health issues in rural areas and raise the level of awareness, often by relying on local NGOs to increase exposure. Simultaneously, Novartis’s sales force liaises with doctors, hospitals, and NGOs to set up health camps for screening, diagnosis, and remedies.²⁷ The endeavor of Novartis here is, through *Arogya Parivar*, to create a profitable market for pharmaceuticals while also improving the health of the BoP in the process; the initiative turned profitable within two-and-a-half years since its inception. With its network of 45,000 doctors and 28,000 pharmacies, *Arogya Parivar* has improved access to healthcare in 33,000 villages in 10 Indian states, benefitting up to 50 million people.²⁸

The importance of NGOs in the profitable alleviation of poverty by firms can be seen starkly in the case of the American firm called Female Health Company (FHC), a spin-off of Wisconsin Pharmacal, which acquired the patent for a female condom in the 1980s.²⁹ After several years of development and final FDA approval, the product went on sale in the U.S. in 1993. American women did not take to this prophylactic that not only prevented pregnancy but also sexually transmitted diseases. The firm was on the brink of bankruptcy when it received the invitation to provide the product to women in Zimbabwe, Africa. As is well known, HIV/AIDS is very prevalent in the continent of Africa and women are particularly prone to it because it is culturally acceptable for even married men to have multiple sexual partners. Since men often refuse to wear condoms, many African women sought to protect themselves with female condoms.³⁰ Access to female condoms, in addition to saving the lives of thousands of women and the associated economic costs, also reduces the number of children who are orphaned to HIV/AIDS. Zimbabwean women themselves were too poor to offer a price that could cover costs, and FHC teamed up with non-profit organizations like the WHO, USAID and, to facilitate the marketing and distribution of the product, with NGOs. Even though the stipulated price was low, the volume was large. Thus FHC first marketed its female condoms to Zimbabwean women in poverty who were vulnerable to HIV/AIDS, and gradually marketed its product in around 90 developing and 17 developed countries. FHC has now, ultimately, become a profitable company [Werhane (2010)].

The Mexican cement multinational CEMEX provides an example of poverty alleviation by

²⁷Business Call to Action, Novartis: *Commercial Innovation for Improved Health*, Case Study, <http://www.businesscalltoaction.org/case-studies/2013/10/novartis-commercial-innovation-for-improved-health/>

²⁸IFC-WISH (2014), *Inclusive Business Models of Healthcare in India: Brief Profiles*, <http://www.wishfoundationindia.org/node/28>

²⁹See the case study by Powell and Yemen (2014), from which much of the following details are drawn.

³⁰Anderson (2015) has recently shown that the bargaining power of African women in insisting on safe sex depends on whether the law of the country’s European colonial masters derived from common law or civil law.

a for-profit firm that did not use NGOs for the purpose. In 1998, CEMEX created a subsidiary called Patrimonio Hoy with the intent of providing low-cost housing for Mexicans in the BoP who could not afford the large lump sum amount needed to purchase the materials required to self-build their small (one-room) houses.³¹ Patrimonio Hoy hired ‘promoters’ (mostly women), who set about identifying creditworthy borrowers interested in building better quality houses than they could have managed with their limited incomes and access to credit. On a model not dissimilar to Grameen’s group-lending scheme families were allowed to self-select into groups of three, with the understanding that the members would be jointly liable for each others’ borrowing. The materials were arranged for—with the cement sold by CEMEX but distributed through local distributors—and construction proceeding at a steady clip with expert advice and supervision by Patrimonio Hoy. The arrangement was beneficial to Patrimonio Hoy (which became self-sustaining in 2004), to CEMEX, to the poor in the Mexican BoP, to the people hired as promoters, and to the distributors.

3 Pecuniary Externalities in Poverty Reduction

It is frequently the case that one productivity-enhancing innovation made available to the extremely poor could raise their income by enough for them to afford another.³² Recall the example of M-Pesa we gave in the Introduction. Likewise, access to cell phones and the price information they make available increase revenues of farmers and also lower the cost of production and marketing, thereby increasing the profitability of adopting a new agricultural technology (like seeds with higher yields).³³ ICT can impinge on agricultural productivity in many ways³⁴: lowering transaction costs, facilitating better price information and lower variability [Jensen (2007), Aker and Mbiti (2010), Goyal (2010)], improving technology adoption by drastically lowering the cost of agricultural extension services [Cole and Fernando (2016)], and coordinating logistics [Dixie and Jayaraman (2011), Deichmann (2016)]. Cell phone technology has been shown to have a positive effect on adult education [Aker et al (2012)], which presumably will show up in subsequent productivity increases. This potentially could create a virtuous circle in the alleviation of poverty at the BoP, but the problems of achieving scale makes the realization of this process doubly precarious. We focus here on an additional role MNC partnerships with NGOs can play: NGOs can bring about partial internalization of the pecuniary externality conferred by

³¹See Segal et al (2007) for a discussion.

³²See, for example, Qiang (2015) and Pepper and Garrity (2015) on the causal link between income and the adoption of ICTs.

³³Lio and Liu (2006), using panel data from 81 countries over the period 1995-2000, found that ICT significantly raises agricultural productivity.

³⁴Nakasone et al (2014) and Deichmann et al (2016) offer reviews of the evidence on the ICT on agriculture.

the pioneering MNCs. This facilitates the kickstarting of the virtuous circle, rendering it more feasible.

We adapt the one-product model considered in the previous section to the sequential setting that is the focus now. Suppose the original product (Tech 1) is introduced by an MNC-LF or MNC-NGO partnership in stage 1. In stage 2, a different MNC comes up with an entirely different productivity-enhancing technology (Tech 2) but which requires the first one as an essential input. It produces its own product with an R&D effort, R_2 , at a marginal cost, $C(R_2, \gamma')$, excluding the purchase cost of Tech 1 as an input. Here, γ' is a cost-shifting parameter with properties analogous to those of γ . The fixed entry cost of the MNC of Tech 2 is F' . We denote by ϕ' the increase in income that Tech 2 will make possible for its adopters, and by Φ' the NGO's valuation of this increase.

Those in the BoP who did not purchase Tech 1 may consider buying Tech 2 as long as its price does not exceed a level, say P again. As with Tech 1, and for the same reasons outlined earlier, the demand for Tech 2 is also not perfectly elastic at price P . If z_2 denotes the marketing effort for Tech 2, its sales to those who have not purchased Tech 1 is $f(z_2; \beta)$, where $\beta \in \{\beta_f, \beta_n\}$ depending on the type of arrangement involved. Since those who purchased Tech 1 may be somewhat less poor now, we posit that a fraction ν (> 0) of them would be willing to buy Tech 2, also at a price no greater than P . (We would expect this 'spillover' parameter ν to be increasing in the productivity improvement, ϕ , that Tech 1 brings about.) Thus the demand for Tech 2 can be written as $\nu f(z_1; \beta) + f(z_2; \beta)$. This additive form, simple as it is, captures the pecuniary externality between the two technologies on the demand side: the higher the sales of the first, the higher is the sales of the second, all else constant.

In each stage, the arrangement could either be MNC-LF or the MNC-NGO type. Rather than engaging in a taxonomic exercise of considering all permutations, we shall restrict ourselves to the two cases: MNC-LF in both stages and MNC-NGO in both stages. In either scenario, the MNC of stage 2 will have to purchase the output of Tech 1 as an input into its production. We assume that one unit of Tech 2 output requires one unit of Tech 1 as input in fixed proportion. We sidestep tangential bargaining issues by presuming that the second stage MNC has all the bargaining power. So, it purchases its requirements of Tech 1 at marginal cost $C(R_1, \gamma)$, where R_1 is the pioneer's R&D effort. While this assumption simplifies the analysis to follow, it does not change the qualitative features of the results.

We assume that Tech 2 and Tech 1 offer very different products/services, and so the local firm acquired by the pioneer MNC would have a very different expertise relative to the local firm acquired by the follower MNC. So it is not possible for the follower MNC to subcontract its marketing to the local firm subsidiary of the pioneer. In contrast, the same NGOs often take up many different projects to lift people out of poverty. For example, BRAC the largest

NGO in the world that originated in Bangladesh takes up several projects in regions that cover the country. This means that, in the MNC-NGO scenario, we may presume that the MNCs in stage 1 and 2 team up with the *same* NGO because its mission-orientation of reducing poverty serves the purpose of both MNCs. In what follows, we highlight the role that NGOs can play in helping the pioneering MNCs internalize more of the pecuniary externalities they confer on followers—thereby encouraging (sequential) entry into the BoP.

3.1 MNCs Merge with Local Firms in Both Stages

As is routine, we work backwards to solve for the equilibrium. In stage 2, the merged MNC-LF solves:

$$\max_{z_2, R_2} [P - C(R_1, \gamma) - C(R_2, \gamma')](\nu f(z_1; \beta_f) + f(z_2; \beta_f)) - wz_2 - R_2 - F', \quad (9)$$

where $C(R_1, \gamma)$ is the price the follower MNC pays the pioneer for a unit of its product to be used as an input. The MNC-LF in stage 2 takes as given the choices of stage 1, namely, z_1 and R_1 . Given the additive nature of the demand, z_1 does not appear in the marginal condition for z_2 . However, since the marginal condition for R_2 depends on total sales in that stage, the second stage MNC's choice of R&D effort will depend on z_1 .

In stage 1, the optimization problem confronting the MNC-LF turns out to be exactly the same as in the one-stage monopoly scenario considered in Section 2. This is because the MNC-LF of stage 1 has no stake in what transpires in stage 2; the pioneer MNC sells its technology at marginal cost to the MNC of stage 2 and so does not profit from it. Therefore, the choices of the first stage MNC-LF are determined by the stage 1 profit alone and its optimal marketing and R&D effort levels are the same as those in the single-stage scenario considered in Section 2. The decisions of the two MNC-LFs, being virtually de-linked, entail no strategic considerations; backward induction is inessential in this scenario.

3.2 MNCs Partner with NGOs

We assume now that both the MNC's partner with NGOs. In stage 2, the NGO and the MNC in the partnership, respectively, solve

$$\max_{z_2} \Phi'(\nu f(z_1; \beta_n) + f(z_2; \beta_n)) - wz_2 + G_2, \quad (10)$$

$$\max_{R_2} [P - C(R_1, \gamma) - C(R_2, \gamma')](\nu f(z_1; \beta_n) + f(z_2; \beta_n)) - R_2 - F' - G_2, \quad (11)$$

where G_2 is the grant that the second stage MNC offers the NGO. The stage 2 Nash equilibrium

market and R&D effort levels will depend, of course, on the stage 1 choices.³⁵ Denote these by $\{\tilde{z}_2(z_1, \Phi', \beta_n), \tilde{R}_2(z_1, \Phi', \beta_n)\}$.

Suppose, first, that the NGO in stage 2 is *different* from that in stage 1. Then, as with the MNC-LF scenario considered above, the decisions of the two NGOs will be delinked. As before, if $\Phi = \Phi^*(P)$, the marketing effort of the NGO and the local firm are the same in stage 1; the MNC's R&D efforts are, too. When this is so, by comparing the first order condition for z_2 associated with (10) with that of (9), one can show (as in Proposition 1) that there is a value of Φ' , call it $\Phi'^*(P)$, which is less than P , such that the solutions for z_2 and R_2 are the same in the MNC-NGO and MNC-LF scenarios. (This is shown explicitly in the proof of Proposition 2 below.) In this scenario, too, there are no strategic considerations linking the decisions of the MNC-NGOs across the two stages, and backward induction is inessential.

The conditions

$$\Phi = \Phi^*(P), \Phi' = \Phi'^*(P), \text{ and } \beta_n = \beta_f. \quad (12)$$

are special “leveling conditions” in the sense that, if they hold, the marketing and R&D effort levels will be the same for MNC-LF and MNC-NGO in each of the two stages if the two NGOs are different. The respective profits of the two MNCs are also the same in the MNC-NGO and MNC-LF scenarios. In other words, the conditions in (12) generate a convenient “base case” scenario for further comparisons.

Now suppose that the NGO is the *same* one in both stages. This NGO will recognize that marketing effort in stage 1 will have consequences on its poverty-reducing effectiveness in stage 2. In this scenario, backward induction is essential to what follows. In stage 1 the NGO will solve

$$\max_{z_1} \quad \Phi f(z_1; \beta_n) - wz_1 + \Phi'(\nu f(z_1; \beta_n) + f(\tilde{z}_2(z_1, \Phi', \beta_n); \beta_n)) - w\tilde{z}_2(z_1, \Phi', \beta_n) + G_1 + G_2, \quad (13)$$

where G_1 is the grant the MNC offers the NGO in that stage.

Imposing (12) to pivot the analysis, the following result (the proof of which is given in the Appendix) draws the comparison between the two types of arrangements.

Proposition 2: Assume the leveling conditions in (12) hold. Suppose that in the MNC-NGO case the two MNCs partner with the same NGO. For $\nu > 0$, compared to the MNC-LF mergers, the MNC-NGO partnerships exhibit

- (a) higher marketing effort in stage 1 and the same in stage 2,
- (b) higher R&D effort in both stages,

³⁵ Although the best response for z_2 of the NGO is independent of z_1 , its Nash equilibrium value does depend on z_1 because the best response function for R_2 , which depends on total sales in period 2, depends on z_1 .

- (c) greater poverty reduction in both stages,
- (d) magnified results of (a), (b), and (c) above as ν increases,

Higher marketing effort in stage 1 follows from the fact that the NGO, but not the MNC-LF, recognizes that its stage 1 marketing effort will generate additional sales and poverty reduction in the next stage. The stage 2 marketing effort is the same, however, because the additive nature of the sales in (10) implies that the marginal return to z_2 is independent of z_1 . This explains part (a) of Proposition 2. Part (b) follows from part (a) and the fact that the market size in both stages is larger when $\nu > 0$, and so the R&D efforts are larger. Part (c) follows directly from the fact that the sales of the productivity-enhancing technologies are higher in both stages in the MNC-NGO case, and so aggregate income is higher in both stages. Finally, part (d) is true because the pecuniary externality flowing from stage 1 to stage 2 is larger when more first stage buyers also purchase Tech 2. Since ν can be expected to be increasing in the productivity improvement, ϕ , that Tech 1 brings about, the higher the ϕ the greater will be the poverty reduction in stage 1 *and* in stage 2. This complementary effect on poverty reduction between the two technologies is actualized by NGOs but will not materialize through mergers with local firms. (Note that Proposition 2 and the ones that follow in this section do not require us to invoke the fact that $\beta_n > \beta_f$.)

How does partnering with the same NGO affect the profits of the two MNCs? To address this, define \tilde{G}_1 as the lump sum grant the pioneering MNC offers the NGO when condition (12) holds and the two NGOs are different. (Recall that this is also the expenditure of the pioneering MNC-LF on marketing, by Proposition 1.) We note that the NGO's marketing effort is independent of the grant it receives because the lump sum transfer does not appear in the marginal condition for marketing effort. The issue of how a common NGO impinges on the relative profitability of the MNC-NGO partnership is addressed in the following proposition, the proof of which is given in the Appendix.

Proposition 3: Suppose conditions (12) hold and the pioneer MNC caps its lump sum grant to the NGO at \tilde{G}_1 . Then, compared to the MNC-LF mergers, in MNC-NGO partnerships both MNCs earn higher profits when $\nu > 0$.

The NGO that is common to both MNCs increases its marketing effort in stage 1 because it recognizes the positive spillover for poverty reduction in stage 2 when $\nu > 0$. This increases the market size in both stages, endogenously raising the R&D levels in both stages. The marketing effort in stage 2 stays the same because of the additive nature of the spillover, and so the grant the follower MNC offers the NGO does not change. And the grant offered by the pioneer MNC

stays fixed at the cap \tilde{G}_1 . Thus the profit of both MNCs unambiguously increases. By capping the grant at \tilde{G}_1 the pioneer MNC ensures that it is not adversely affected by the NGO applying ‘too much’ marketing effort. But the cap does not temper the NGO’s marketing zeal, which is driven by the goal of poverty reduction. No such cap is required for the stage 2 profit to increase, however, because the NGO’s marketing effort in that stage is unaffected.

We see from Proposition 3 that the NGO indirectly enables the pioneering MNC to garner higher profits, at least partly compensating it for the positive pecuniary externality that it confers on the follower MNC. This provides an even stronger motivation for MNCs to tie up with NGOs while serving BoP markets. And such NGO tie-ups are even more conducive to poverty alleviation than mergers with local firms.

Hirschman (1958) emphasized the forward and backward linkages that are crucial in economic development. The model presented here brings out, in the BoP context, the role that NGOs could play in enhancing these linkages. The magnitude of the pecuniary externality that the pioneering MNC confers on its follower depends partly on its market size (since increases the sales of its follower) and partly by its marginal production cost (since that is the price at which the follower buys Tech1). The larger the market penetration in stage 1 (as determined by marketing effort), the higher is the pioneer’s R&D expenditure and the lower is its marginal cost. Thus there is the forward linkage generated by the pioneer, both on the demand and the supply sides. Furthermore, the larger the potential market for Tech 2 and the attendant poverty decline it engenders, the more intensive is the NGO’s marketing effort in stage 1—which benefits the pioneering MNC. This is the backward linkage that Tech 2 exerts on Tech 1, despite the fact that, by conferring all the bargaining power on the follower MNC, we have deliberately shut down the direct profit to the pioneer from the sale of Tech 1 to the follower.

It should be noted that it is common agency that helps internalize the pecuniary externality inherent in the situation. While any common stakeholder can perform this function—even local firms that are partners with both MNCs—for reasons already discussed it is poverty-reducing NGOs that, typically, are best suited for the task.³⁶

3.3 NGOs and the Big Push at the Base of the Pyramid

The phenomenon discussed above has further implications, which we now analyze. Since much depends on the entry of the pioneer into the BoP, let us assume that when the first MNC is viable, so is the second. This is facilitated by assuming that the follower MNC’s fixed cost is

³⁶Groupe Damone, a large MNC that supplies fresh dairy products, produces a nutritious yogurt that is particularly relevant for children in developing countries. It introduced the product in Bangladesh after teaming up in 2006 with Grameen Bank, the well-known NGO that has a long-term stake in alleviating poverty. A tie-up with a for-profit local firm would have been far less desirable for Groupe Damone.

lower: $F' < F$.³⁷ We can then focus on the incentives confronting the pioneer. Recall that when the levelling conditions in (12) hold, the marketing and R&D efforts are the same MNC-NGO and MNC-LF scenarios and the MNC profit is the same as long as the NGOs in the two stages are different. The viability of the pioneering MNC depends, among other things, on the magnitude of the fixed cost, F , that it must incur to enter the BoP. As noted earlier, this fixed cost can be expected to be nontrivial in view of the absence of infrastructure at the BoP. In the light of Proposition 3 above, the maximum fixed cost for which the pioneering MNC is viable will be larger if the MNCs share a common NGO. The following result compares the MNC-LF and MNC-NGO outcomes as a function of F .

Proposition 4: Suppose conditions (12) hold and the pioneer MNC caps its lump sum grant to the NGO at \tilde{G}_1 . Then there is an interval $(\underline{F}, \overline{F}]$ of values of the pioneer's fixed cost F such that if $F \in (\underline{F}, \overline{F}]$ Tech 1 is unviable in the MNC-LF merger but profitable in an MNC-NGO partnership.

In the above proposition, \underline{F} is the value of the fixed entry cost for which the pioneering MNC breaks even in the MNC-LF scenario; for $F > \underline{F}$ the pioneering MNC is unviable in the MNC-LF arrangement. In the MNC-NGO partnership, the pioneering MNC's positive externality on the follower MNC is internalized to some extent through the NGO's actions, as we have seen. So the MNC will be viable for higher levels of F , and \overline{F} denotes the value of F at which the MNC breaks even in an MNC-NGO partnership.

When $F \in (\underline{F}, \overline{F}]$ there will be multiple equilibria for MNC-NGO partnerships. If the NGO anticipates the entry of the second MNC it will apply a higher level of marketing effort in stage 1 and the pioneering MNC will be viable, and so would the MNC that follows. If the NGO does not anticipate this, however, it will apply only as much marketing effort as a local firm would and the pioneering MNC would not be viable (because its market is too small), and nor would the MNC that follows. We record this implication below.

Proposition 5: Suppose conditions (12) hold and the pioneer MNC caps its lump sum grant to the NGO at \tilde{G}_1 . With MNC-NGOs, we can obtain two Pareto-ranked equilibria when $F \in [\underline{F}, \overline{F}]$, one with both technologies introduced and the other with neither.

This, of course, is the classic coordination problem of the Big Push idea for industrialization proposed by Rosenstein-Rodan (1943), and formalized by Murphy et al (1989). We see that, in

³⁷This is reasonable since the pioneering MNC would have already identified some ways in which to compensate for inadequate infrastructure, cutting bureaucratic redtape, etc.

the context of the BoP, that NGOs can not only render a Big Push profitable but they can also coordinate such an outcome. Had the MNCs acquired local for-profit firms, only the Pareto-inferior outcome (neither technology introduced) will obtain when $F \in [\underline{F}, \bar{F}]$. Here we see that there is scope for coordination in the alleviation of extreme poverty. The potential role of NGOs for the Big Push at the BoP actually derives from three distinct advantages. One is their commitment to the poor, that magnifies the pioneer’s pecuniary externalities and facilitates partial internalization of it. The second, as discussed earlier, is that the NGO emphasis on poverty alleviation somewhat bridges the gap between the productivity increase a product can engender in its BoP users and the price they can afford to pay (which is constrained by lack of access to credit). In the absence of such a bridging function, the notion of a Big Push for the BoP may remain a purely abstract and remote theoretical possibility. And the third NGO advantage (which we do not invoke in the above proposition) is its greater marketing productivity arising from the greater trust it evokes in the BoP.

Evidence for the influential idea that the Big Push challenge is responsible for poverty traps in poor countries is scanty [see Easterly (2006)]. The Millennium Village Project of Sachs in Africa is based on the Big Push idea powered by foreign aid [Sachs (2004)]. Though the jury is still out on this experiment, the little evidence such as there is on this ambitious endeavor is not encouraging [Wanjala and Muradian (2013)], at least as implemented by the Millennium Village Project. Nevertheless, the poverty alleviation of the BoP that of interest in this paper is not one premised on aid; the explicit goal here is to investigate the extent to which *for-profit* business can succeed in alleviating poverty—an entirely different scenario.

How important the coordination problem is in the BoP context is an empirical issue. Nevertheless, the potential coordination problem that could arise in some situations should not detract from our more general point that, by magnifying pecuniary externalities and aiding its internalization, MNC-NGO partnerships have greater potential than MNC-LF mergers to alleviate poverty in the BoP. To be sure, in the range of F for which two Pareto-ranked equilibria exist for the MNC-NGO partnerships, there is a unique equilibrium for the MNC-LF mergers: one in which neither MNC viably offers its technology. Since the fixed entry cost for the BoP is typically quite large, this advantage of NGOs for poverty reduction can be quite important.

4 Conclusions

This paper examines with a formal model a neglected avenue for alleviating extreme poverty: for-profit business. The obvious Catch-22 in business serving the extremely poor who cannot access credit is that their willingness to pay is not in line with productivity enhancement

products or technologies can bring about and, anticipating this, for-profit firms do not make the effort. In the face of this real-world constraint, NGOs confer an advantage on MNCs seeking local partnerships for marketing and distribution. NGO effort is determined by the productivity enhancement—and hence the poverty reduction—the product can bring about and not by the price of the product. Thus public-private partnerships offer a way in which for-profit MNCs can benefit and thereby contribute to the reduction of extreme poverty.

If the ‘first-cut’ characterization of the BoP market offered here has some validity, several insights follow. First, entry into the BoP is often best made through partnerships with mission-oriented NGOs that seek to alleviate poverty because the latter’s altruistic marketing effort, which is a strategic complement to the MNC’s R&D, increases the size of the penetrated market and this in turn lowers production costs and increases profitability. Second, the MNC-NGO partnership is particularly attractive when the product that is offered is not merely a consumer good but one that raises the productivity of the adopters. The disincentive firms experience due to the disconnect between BoP consumers’ willingness to pay and the productivity increase the good or technology can bring about is partly attenuated by the actions of the NGO, which cares about poverty reduction and makes projects scalable. Third, when the introduction of a product by raising the productivity of its adopters increases the demand for other products through pecuniary externalities the forward and backward linkages are enhanced when the sequential partnerships are of the MNC-NGO kind rather than the MNC-LF kind. Fourth, under some circumstances, a coordination problem between two successive MNCs in the base of the pyramid might lead to multiple equilibria where either both or neither of the sequential products are adopted when the arrangements are of the MNC-NGO kind. The corresponding situation with MNC-LF mergers is a unique equilibrium entailing the Pareto inferior outcome of no adoption. In sum, the model of this paper identifies conditions that are conducive to the alleviation of extreme poverty through for-profit business, and partnership with NGOs appears to have many advantages precisely because of the latter’s non-profit orientation. Corporate social responsibility, however, is no part of the argument here.

There is an additional advantage that can be derived from business partnerships with NGOs in the endeavor to reduce extreme poverty in developing countries. In developing countries (as also in the developed), relative to men, women are over-represented among the poor.³⁸ Women are also known to spend a greater portion of their incomes on the health and the nutrition of their families than do men [Thomas (1990), Dufflo (2003, 2012)] Thus for a given penetration of a productivity-enhancing technology among the extremely poor, the multiplier effects on income generated for women will be higher. This specific targeting of women is more feasible

³⁸See e.g. United Nations (2015).

for NGOs than for local firms because NGOs devoted to poverty alleviation often also have gender equality as a goal. For example, Hindustan Lever (a subsidiary of Unilever) launched Project Shakti in India as a way of making inroads into India's remote villages and engaged NGOs in the recruiting of women who sold its products door-to-door [Rangan et al (2007)].

One possible extension of the paper is the investigation of the effect of greater competition in the BoP market due to globalization. It is commonly believed that competition alleviates poverty for the standard reason that it lowers the price of products [OECD (2013)]. We think that this is a secondary consideration. The cardinal difficulty at the BoP is in eliciting the R&D required to generate products that are useful to the extremely poor. And competition, by reducing profits further, typically dilutes the already-weak incentives to innovate.³⁹ Rather, the efficacy of competition may derive from its effect on marketing effort and the attendant penetration into the BoP market. By undermining profitability in easy urban markets, competition would force firms to serve more rural clients in the BoP.⁴⁰ Hindustan Lever, which we alluded to above, started making serious inroads into the long-unserved and isolated villages of India only after profits in its lucrative urban markets started getting eroded by the entry of multinationals with the liberalization of India's economy.

³⁹In an endogenous growth model, Baland and Francois (1996) showed that a monopolized sector, by skewing the income distribution in favor of profits, encourages innovation elsewhere in the economy and helps ease the way out of a poverty trap.

⁴⁰Recall the remark of Hicks (1935, p. 8), "The best of all monopoly profits is a quiet life."

APPENDIX

Proof of Proposition 2

In the MNC-LF mergers, the two local firms acquired are different. For the MNC-NGO partnerships, we first consider the case where the NGOs also are different in the two stages. (Or, equivalently, if it is the same NGO we assume that it does not anticipate in stage 1 the entry of another MNC in stage 2.) Then we consider the case in which the NGO is the same in the two stages and it also correctly anticipates the entry of another MNC in stage 2.

Case 1: Different NGOs in the two stages

Stage 2

The NGO solves the problem stated in (10) of the text, the first order condition of which is

$$\Phi' f'(z_2, \beta_n) = w, \quad (\text{A1})$$

and the solution to which we write as $\tilde{z}_2(\Phi', \beta_n)$.

The MNC in this stage solves the problem stated in (11) of the text, the first order condition to which is

$$-C'(R_2, \gamma)[\nu f(z_1, \beta_n) + f(z_2, \beta_n)] - 1 = 0, \quad (\text{A2})$$

and the solution to which we write as $\tilde{R}_2(z_1, z_2, \beta_n)$.

Stage 1

The NGO solves

$$\max_{z_1} \Phi f(z_1, \beta_n) - wz_1 + G_1,$$

where G_1 is the grant the MNC in stage 1 offers the MNC to cover its labor costs. The first order condition is

$$\Phi f'(z_1, \beta_n) = w, \quad (\text{A3})$$

the solution to which we write as $\tilde{z}_1(\Phi, \beta_n)$.

The MNC solves

$$\max_{R_1} [P - C(R_1, \gamma)]f(z_1, \beta_n) - R_1 - F - G_1, \quad (\text{A4})$$

which has the first order condition

$$-C'(R_1, \gamma)f(z_1, \beta_n) - 1 = 0, \quad (\text{A5})$$

and the solution to which we write as $\tilde{R}_1(z_1, \beta_n)$.

Thus, for the MNC-NGO scenario without anticipation, we may write the Nash equilibrium values of the endogenous variables as $\tilde{z}_1(\Phi, \beta_n)$ and $\tilde{R}_1(\tilde{z}_1(\Phi, \beta_n), \beta_n)$ for stage 1, and as $\tilde{z}_2(\Phi', \beta_n)$ and $\tilde{R}_2(\tilde{z}_1(\Phi, \beta_n), \tilde{z}_2(\Phi', \beta_n), \beta_n)$ for stage 2. All these equilibrium values are increasing in the indicated exogenous parameters where they appear.

As a point of comparison, we now consider the MNC-LF scenario.

Stage 2

The second stage MNC-LF firm, taking the stage 1 choices as given, solves the problem stated in (9) of the text. The first order conditions for z_2 and R_2 , respectively, are

$$[P - C(R_1, \gamma) - C(R_2, \gamma')]f'(z_2, \beta_f) = w, \quad (\text{A6})$$

$$-C'(R_2, \gamma')[\nu f(z_1, \beta_f) + f(z_2, \beta_f)] - 1 = 0, \quad (\text{A7})$$

the solutions to which we write as $\widehat{z}_2(z_1, R_1, P, \beta_f)$ and $\widehat{R}_2(z_1, R_1, P, \beta_f)$.

Stage 1

The first stage MNC-LF firm solves

$$\max_{z_1, R_1} [P - C(R_1, \gamma)]f(z_1, \beta_f) - R_1 - F - wz_1.$$

The first order conditions for z_1 and R_1 , respectively, are

$$[P - C(R_1, \gamma)]f'(z_1, \beta_f) = w, \quad (\text{A8})$$

$$-C'(R_1, \gamma)f(z_1, \beta_f) - 1 = 0, \quad (\text{A9})$$

the solutions to which we write as $\widehat{z}_1(P, \beta_f)$ and $\widehat{R}_1(P, \beta_f)$.

Thus, for the MNC-LF scenario, we may write the Nash equilibrium values of the endogenous variables as $\widehat{z}_1(P, \beta_f)$ and $\widehat{R}_1(P, \beta_f)$ for stage 1, and for stage 2 as $\widehat{z}_2(\widehat{z}_1(P, \beta_f), \widehat{R}_1(P, \beta_f), P, \beta_f)$, and $\widehat{R}_2(\widehat{z}_1(P, \beta_f), \widehat{R}_1(P, \beta_f), P, \beta_f)$.

Comparing (A3) and (A8), we see that, when $\beta_n = \beta_f$, in stage 1 the marketing effort levels of the MNC-NGO and the MNC-LF are the same when

$$\Phi = P - C(\widehat{R}_1(P, \beta_f), \gamma) \equiv \Phi^*(P). \quad (\text{A10})$$

Comparing (A1) and (A6), we see that, when $\beta_n = \beta_f$, in stage 2 the marketing effort levels of the MNC-NGO and the MNC-LF are the same when

$$\Phi' = P - C(\widehat{R}_1(P, \beta_f), \gamma) - C(\widehat{R}_2(\widehat{z}_1(P, \beta_f), P, \beta_f), \gamma') \equiv \Phi'^*(P). \quad (\text{A11})$$

When

$$\Phi = \Phi^*(P), \Phi' = \Phi'^*(P), \text{ and } \beta_n = \beta_f, \quad (\text{A12})$$

it follows from (A5) and (A9) the R&D efforts of the MNC-NGO and MNC-LF in stage 1 must be the same, and from (A2) and (A7) that the R&D effort levels in stage 2 must be the same. It then follows that, when (A12), or equivalently (12) of the text, holds the profits of the two MNCs are also the same in the MNC-NGO and MNC-LF arrangements.

Case 2: Same NGO in both stages

The NGO is assumed to correctly anticipate entry of another MNC in stage 2. The equilibrium values of the endogenous variables will be superscripted by "A" to indicate that the NGO anticipates entry in stage 2.

Stage 2

The NGO's problem is the same as in (10) of the text, and its best response, which we now write as $\tilde{z}_2^A(\Phi', \beta_n)$ is the same as $\tilde{z}_2(\Phi', \beta_n)$. The MNC's problem is the same as that in (11) of the text, and its R&D best response, which we now write as $\tilde{R}_2^A(z_1, z_2, \beta_n)$, is the same as $\tilde{R}_2(z_1, z_2, \beta_n)$. (The R&D equilibrium values, however, will be different because z_1 will be different.)

Stage 1

The foresighted NGO solves the problem stated in (13) of the text, the first order condition for which is

$$(\Phi + \nu\Phi')f'(z_1, \beta_n) = w, \quad (\text{A13})$$

and the solution to which we write as $\tilde{z}_1^A(\Phi + \nu\Phi', \beta_n)$ is also $\tilde{z}_1(\Phi + \nu\Phi', \beta_n)$.

The MNC, however, solves the same problem as in (A4), and the best response for its R&D effort is $\tilde{R}_1^A(z_1, \beta_n)$, which is $\tilde{R}_1(\tilde{z}_1^A(\Phi + \nu\Phi', \beta_n), \beta_n)$.

The results of Proposition 2 now readily follow when conditions in (12) of the text or (A12) hold.

(a) We have already seen above that $\tilde{z}_2^A(\Phi', \beta_n) = \tilde{z}_2(\Phi', \beta_n) = \hat{z}_2(P, \beta_f)$. The NGO marketing effort in stage 1 is now $\tilde{z}_1^A(\Phi + \nu\Phi', \beta_n) > \tilde{z}_1(\Phi, \beta_n) = \hat{z}_1(P, \beta_f)$.

(b) $\tilde{R}_2^A(\tilde{z}_1^A(\Phi + \nu\Phi', \beta_n), \tilde{z}_2(\Phi', \beta_n), \beta_n) > \tilde{R}_2(\tilde{z}_1(\Phi, \beta_n), \tilde{z}_2(\Phi', \beta_n), \beta_n)$. So stage 2 R&D is higher. Also, $\tilde{R}_1^A(\tilde{z}_1^A(\Phi + \nu\Phi', \beta_n), \beta_n) > \tilde{R}_1(\tilde{z}_1(\Phi, \beta_n), \beta_n)$, so stage 1 R&D is also higher.

(c) Since the sales are higher in both stages, poverty reduction is greater, too.

(d) The derivatives with respect to ν of the equilibrium endogenous variables in which ν appears are all positive. ■

Proof of Proposition 3

(a) The equilibrium profit, Π^1 , of the MNC in the MNC-NGO partnership of stage 1 is given by

$$\begin{aligned} \Pi^1 = & [P - C(\tilde{R}_1^A(\tilde{z}_1^A(\Phi + \nu\Phi', \beta_n), \beta_n), \gamma)]f(\tilde{z}_1^A(\Phi + \nu\Phi', \beta_n), \beta_n) \\ & - \tilde{R}_1^A(\tilde{z}_1^A(\Phi + \nu\Phi', \beta_n), \beta_n) - F - w\hat{z}_1(P, \beta_f), \end{aligned}$$

where the last term is the equilibrium value of the lump sum grant, \tilde{G}_1 , the MNC offers the NGO in stage 1 (which is also the stage 1 MNC-LF's expenditure on marketing, $w\hat{z}_1(P, \beta_f)$). Taking the derivative of this expression with respect to $\nu\Phi'$ and invoking the fact that the MNC is choosing its R&D optimally, we obtain

$$\frac{d\Pi^1}{d(\nu\Phi')} = (P - C)f' \frac{d}{d(\nu\Phi')} \tilde{z}_1^A(\Phi + \nu\Phi', \beta_n) > 0. \quad (\text{A14})$$

(b) The equilibrium profit, Π^2 , of the MNC in stage 2 is given by

$$\begin{aligned} \Pi^2 = & [P - C(\tilde{R}_1^A(\tilde{z}_1^A(\Phi + \nu\Phi', \beta_n), \beta_n), \gamma) - C(\tilde{R}_2^A(\tilde{z}_1^A(\Phi + \nu\Phi', \beta_n), \beta_n), \gamma')] \\ & \times [\nu f(\tilde{z}_1^A(\Phi + \nu\Phi', \beta_n), \beta_n) + f(\tilde{z}_2^A(\Phi', \beta_n), \beta_n)] \\ & - \tilde{R}_1^A(\tilde{z}_1^A(\Phi + \nu\Phi', \beta_n), \beta_n) - F - w\tilde{z}_1^A(\Phi + \nu\Phi', \beta_n), \end{aligned}$$

where the last term is the equilibrium value of the lump sum grant the MNC offers the NGO in stage 2. Taking the derivative of this expression with respect to $\nu\Phi'$ and invoking the fact that the MNC is choosing its R&D optimally, we obtain

$$\begin{aligned} \frac{d\Pi^2}{d(\nu\Phi')} &= [(P - C_1 - C_2)\nu f' \frac{d}{d(\nu\Phi')} \tilde{z}_1^A(\Phi + \nu\Phi', \beta_n)] \\ &> 0 \quad \text{when } \nu > 0, \end{aligned} \tag{A15}$$

where C_1 and C_2 , respectively, denote the equilibrium marginal production costs of the goods in stages 1 and 2. ■

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